Volume 22 • Supplement 30 • October 2021

PEDIATRICDIABETES

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Volume 22 • Supplement 30 • October 2021

Abstracts for the 47th Annual Conference of the International Society for Pediatric and Adolescent Diabetes (ISPAD)

October 13–15, 2021
Virtual

WILEY

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DOI: 10.1111/pedi.13268

SUPPLEMENT ABSTRACT

ISPAD International Society for Pediatric and Adolescent Diabetes WILEY

Oral Abstract

MODERATED ORAL SESSION I

O1 | A genetic risk score for type 1 diabetes identifies children for islet autoantibody screening to reduce diabetic ketoacidosis: A pilot study

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Introduction: 27,000 children develop T1D annually in the US, and as many as 60% present in DKA.

Objectives: A pilot study to test the feasibility to reduce DKA at new onset by pre-symptomatic islet cell antibody screening in individuals at elevated genetic risk of type 1 diabetes.

Methods: We recruited 3414 subjects 2–16 to from 8 general and specialty care clinics, including a diabetes clinic. 56 subjects (1.6%) self-reported T1D. Genomic DNA was isolated from saliva and genotyped for 89 SNPs that contribute to genetic risk or protection from T1D. A genetic risk score (GRS) was calculated for each subject, ranging from −18 (low risk) to +12 (high risk). Subjects with elevated GRS were offered screening for four islet antibodies. To reduce DKA at presentation of clinical T1D, those with ≥2 positive antibodies were offered (1) education on symptoms of diabetes, (2) periodic hemoglobin A1c assessment and/or home glucose monitoring, and (3) information on active T1D prevention trials for possible enrollment.

Results: A GRS ≥ 6 categorized 8.5% of subjects as elevated genetic risk and included 46% of subjects with reported T1D. This is close to the theoretical limit, as approximately 50% of the risk of T1D is considered 'genetic'. This group was 5.5-fold enriched in T1D subjects, from 1.6% of all subjects in the study reporting T1D to 8.9% of the elevated risk subjects reporting T1D. A GRS ≥ 7.8 categorized 3% of subjects as high genetic risk. This group contained 25% of subjects with reported T1D. This group was 8.8-fold enriched in T1D subjects, from 1.6% of all subjects reporting T1D to 14% of the high risk subjects reporting T1D.

Conclusions: Our data suggest that a T1D GRS screening protocol using GRS ≥6, followed by antibody screening of only 8.5% of children, would identify 50% of those who will develop T1D. A GRS of ≥7.8 would reduce the antibody screen to 3% of children and would still identify 25% of children who will develop T1D. Targeted pre-symptomatic education could eliminate up to 8000 DKAs in the US per year.

O2 | Intralymphatic GAD-ALUM (Diamyd®) improves hyperglycemia and glycemic control in type 1 diabetes patients carrying HLA DR3-DQ2 - exploratory analysis of continuous glucose monitoring data from the DIAGNODE-2 phase IIB clinical trial

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Introduction: Residual beta cell function is of crucial importance for prevention of both acute and late complications. However, most immune interventions have failed with no or minimal transient efficacy on preservation of beta cell function and/or unacceptable risks or adverse events. Autoantigen therapy with GAD-alum (Diamyd®) given intralymphatic in combination with Vitamin D has shown promising results in patients with HLA DR3DQ2 (Ludvigsson et al. Diab Care 2021, PMID: 34021020).

Objectives: We aimed to further explore the efficacy of intralymphatic GAD-alum (Diamyd®) therapy combined with vitamin D supplementation on blood glucose recorded by continuous glucose monitoring (CGM) in recent-onset Type 1 diabetes (T1D) patients carrying the HLA DR3-DQ2 haplotype.

Methods: DIAGNODE-2 (NCT03345004) was a multicenter, randomized, placebo-controlled, double-blind trial of 109 recent-onset T1D patients aged 12–24 years with GADA and a fasting C-peptide >0.12 nmol/L, which randomized patients to either three intralymphatic injections of 4 μg GAD-alum and oral vitamin D, or placebo. Here, we report results for exploratory endpoints assessed by 14-day CGM at Months 0, 6 and 15 (end of study). Treatment arms were compared by mixed-effects models for repeated measures adjusting for baseline values.

Results: We included 98 patients with CGM recordings of sufficient quality (27 Diamyd-treated and 15 placebo-treated DR3-DQ2-positive patients) with a median (mean) recording length of 14 (13) days. In DR3-DQ2-positive patients, % time in range (3.9–10 mmol/L; 70–180 mg/dL) declined less between baseline and Month 15 in Diamyd-

treated compared to placebo-treated patients (−5.1% and − 16.7%, resp, $P = 0.0075$), with reduced time ($P = 0.0036$) and number of excursions ($P = 0.0072$) >13.9 mmol/L (250 mg/dL), and glucose management indicator (GMI, $P = 0.0025$). No differences were detected for hypoglycemia.

Conclusions: Intralymphatic GAD-alum (Diamyd®) improves glycemic control in recently diagnosed T1D patients carrying HLA DR3-DQ2.

O3 | Longitudinal follow-up of 93,887 children and adolescents with type 1 diabetes - 26 years of quality management based on the DPV registry

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Introduction: The established multicenter diabetes patient follow-up (DPV) registry allows to show changes in diabetes care and associated outcomes over the last 26 years.

Objectives: To investigate temporal trends in diabetes treatment, metabolic control and acute complications in children and adolescents with type 1 diabetes (T1D) <21 years of age from 1995 to 2020.

Methods: Children and adolescents with T1D <21 years (≥ 6 months at onset), registered in DPV from 1995 to 2020 were included. Temporal trends in the use of insulin pumps (CSII), continuous glucose monitoring systems (CGMS), age at diabetes onset, HbA1c, events rates of severe hypoglycemia and diabetic ketoacidosis (DKA) were studied using repeated measurements logistic, linear and negative binomial regression models respectively. Sex, diabetes duration (≤2 year, >2 year), age (<6, 6- < 12, 12- < 18, ≥18 years), migration background and the interaction of age*year were considered as covariates.

Results: Among 93,887 children and adolescents (513,630 observation years) with T1D use of CSII increased consistently from <1% before 2000 to 54% in 2020 with a most significant increase in children.

<6 years (2020: 76% (95%-CI:69–82%), 45% ≥18 years (36–54%)). Use of CGM was below 5% in 2015 and 76% in 2020 (80% (70–87%) 6- < 12 years, 62% (49–74%) ≥18 years). We observed a consistent decrease in age at diabetes onset (1995: 7.9 years (7.8–7.9), 2020: 7.7 years (7.6–7.7)), HbA1c (8.4% (8.3–8.4), 7.9% (7.9–8.0)) and event rates of severe hypoglycemia (16.4 events/100 PY [13.2–20.4]), 6.6 events/100 PY (5.4–8.1)). Event rates of DKA remained stable over time (1.8 events/100 PY (1.6–2.2) in 2020).

Conclusions: Twenty-six years of longitudinal follow-up and benchmarking revealed improved metabolic control over time in children and adolescents with type 1 diabetes. Increasing use of diabetes technology might be associated with this significant improvement. However, increased awareness of DKA is mandatory and associated risk factors should be elaborated in further studies.

O4 | Mindfulness, disordered eating, and impulsivity in relation to glycemia among adolescents with type 1 diabetes: The flexible lifestyles empowering change (FLEX) intervention trial

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Introduction: The role of mindfulness in adolescent type 1 diabetes (T1D) management is unclear.

Objectives: To assess the relationship of mindfulness and glycemia in adolescents with T1D with suboptimal glycemia and potential mediation by impulsivity and ingestive behaviors including disordered eating.

Methods: We used linear mixed models for hemoglobin A1c (HbA1c) and linear regression for continuous glucose monitoring (CGM) to study the relationship of mindfulness [Child and Adolescent Mindfulness Measure (CAMM, score range 0–40)] and glycemia in 152 adolescents with T1D from the 18-month Flexible Lifestyles Empowering Change (FLEX) trial. We tested for mediation of the mindfulness-glycemia relationship by disordered eating (Diabetes Eating Problem Survey – Revised), ingestive behaviors (restraint and emotional eating, Dutch Eating Behavior Questionnaire), and impulsivity (total, attentional, and motor, Barrett Impulsiveness Scale).

Results: At baseline, participants were 14.9 ± 1.1 years old, 83.6% non-Hispanic white, 50.7% female, had an HbA1c of 9.4 ± 1.2% [79 ± 13 mmol/mol], and 73.0% used insulin pumps. A covariate-adjusted 5-point increase in mindfulness scores was associated with a − 0.19% (95%CI -0.29, −0.08, p = 0.0006) reduction in HbA1c. This relationship was partially mediated by emotional eating, total and motor impulsivity, but not by attentional impulsivity, restraint, nor disordered eating (Table 1). CGM analysis showed no statistically significant associations of mindfulness with mean glucose, time in range, hypo- nor hyperglycemia. Sensitivity analyses restricted to adolescents with ≥6

Table 1. Modeled estimates of predicated change in HbA1c from a 5-unit increase in mindfulness; and exploration of potential mediation by disordered eating, emotional eating, and impulsivity

	β (95% CI)	*P* value
Model 1	−0.22 (−0.33, −0.12)	<0.0001
Model 2	−0.19 (−0.29, −0.081)	0.0006
Model 3_a with DEPS-R	−0.17 (−0.28, −0.055)	0.004
Model 3_b with DEBQ emotional eating	−0.16 (−0.28, −0.046)†	0.007
Model 3_c with BIS-15 total	−0.16 (−0.27, −0.045)†	0.007
Model 3_d with BIS-15 motor	−0.16 (−0.28, −0.046)†	0.007
Model 3_e with BIS-15 non-planning	−0.18 (−0.28, −0.073)	0.001
Model 3_f with BIS-15 attention	−0.18 (−0.29, −0.065)	0.002

Note: Model 1 unadjusted estimates (for HbA1c, includes repeated statement for subject nested within site).
Model 2 adjusted for age, sex, site, insulin regimen, timepoint (for HbA1c), and intervention group.
Models $3_{a\text{-}f}$ potential mediators included sequentially.
Abbreviations: DEBQ, Dutch Eating Behavior Questionnaire; DEPS-R, Diabetes Eating Problem Survey - Revised; BIS-15, Barratt Impulsiveness Scale.

out of 7 days of CGM wear (53.4% of original sample) showed statistically significant associations of increased mindfulness with lower mean glucose (p = 0.02, unadjusted; p = 0.06, adjusted).
Conclusions: In FLEX adolescents, greater mindfulness was associated with lower HbA1c, suggesting mindfulness training as a promising part of therapy to improve glycemia in adolescents with T1D.
†Identifies partial mediation classified by attenuation of main effect by >10% (in comparison with Model 2)

O5 | Glycemic control with the Omnipod® 5 automated insulin delivery system in very young children with type 1 diabetes

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Introduction: The Omnipod 5 System is a novel automated insulin delivery (AID) system with on-body operation. A tubeless insulin pump containing a personalized model predictive control algorithm communicates directly with a Dexcom G6 continuous glucose monitor. This system may be ideal for young children with type 1 diabetes (T1D), who often have erratic eating behaviors and may dislike being tethered to devices, while parental concern may lead to permissive hyperglycemia.
Objectives: Following demonstration of positive safety and efficacy in older children (≥6y) and adults, we evaluated the system in younger children (2 to <6y) with T1D.

Table. Glycemic outcomes for very young children (N = 80) aged 2 to < 6y before and after 3 months of Omnipod 5 Automated Insulin Delivery (AID) System use

Measurement	Standard Therapy	3 months AID	Change
A1C, % (mmol/mol)	7.4 ± 1.0 (57 ± 10.9)	6.9 ± 0.7 (52 ± 7.7)	−0.55 ± 0.58* (6.0 ± 6.3)
Mean glucose, mg/dL (mmol/L)	171 ± 31 (9.5 ± 1.7)	157 ± 17 (8.7 ± 0.9)	−14 ± 20* (0.8 ± 1.1)
Percent time **< 54 mg/dL** (<3.0 mmol/L) †	0.24 [0.05, 0.84]	0.26 [0.16, 0.60]	0.06 [−0.3, 0.16]
Percent time **< 70 mg/dL** (<3.9 mmol/L), TBR †	2.19 [0.89, 4.68]	1.94 [1.18, 3.43]	−0.27 [−1.54, 0.46]*
Percent time **70-180 mg/dL** (3.9–10.0 mmol/L), TIR	57.2 ± 15.3	68.1 ± 9.0	10.9 ± 9.6*
Percent time **> 180 mg/dL** (>10.0 mmol/L), TAR	39.4 ± 16.7	29.5 ± 9.8	−9.9 ± 10.5*
Percent time **≥ 250 mg/dL** (≥13.9 mmol/L)	14.8 ± 12.1	9.2 ± 5.6	−5.6 ± 8.9*

Data are mean ± SD unless indicated by † in which data are median [IQR].
* Significant change assessed by two-sided Wilcoxon signed rank test, p-value <0.05.

Methods: Participants aged 2 to <6y with T1D and A1C < 10% (86 mmol/mol) used their standard therapy (ST) for 14d before transitioning to the AID system for 3mo. There was no minimum eligibility requirement for weight or total daily dose (TDD) of insulin. Primary safety outcomes were incidence of severe hypoglycemia (SH) and diabetic ketoacidosis (DKA). Primary effectiveness outcomes were change in A1C and percent of time in range (TIR, 70-180 mg/dL (3.9–10.0 mmol/L)) with the AID system compared with ST.

Results: Baseline characteristics of participants (N = 80) were (mean ± SD) age 4.7 ± 1y, T1D duration 2.3 ± 1.1y, and A1C 7.4 ± 1.0% (57 ± 10.9 mmol/mol), with mean (range) TDD 13.7 U/day (5.3–27.1) and weight 19.7 kg (11.7–27.9). No SH or DKA events were reported. Improvements with AID included a significant decrease in A1C to 6.9 ± 0.7% (52 ± 7.7 mmol/mol) and increase in TIR from 57.2 ± 15.3% to 68.1 ± 9.0% (both p < 0.05, Table), equating to an additional 2.6 h/day in range. Of note, time below range (TBR, <70 mg/dL (3.9 mmol/L)) also decreased significantly. All participants completed the study and chose to continue into the 12-mo extension phase.

Conclusions: The largest AID study in this age group to date, this multi-center pivotal study demonstrated safety and effectiveness of the Omnipod 5 System in very young children with T1D.

O6 | Omnipod® 5 automated insulin delivery system improves glycemic outcomes for people with type 1 diabetes across childhood development stages ranging from 2 to 26 years

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Introduction: The safety and efficacy of the Omnipod 5 Automated Insulin Delivery (AID) System, an on-body system consisting of a tubeless pump with a model predictive control algorithm communicating directly with a Dexcom G6 sensor, has been demonstrated in outpatient studies across a range of ages from 2 to 70y.

Objectives: In a secondary analysis of people with type 1 diabetes (T1D) aged 2 to <26y participating in an AID safety trial, we evaluated glycemic outcomes by childhood development stages: very young children (2 to <6y), younger children (6 to <10y), older children (10 to <13y), teens (13 to <18y), and young adults (18 to <26y).

Methods: Across 17 US institutions, people with T1D and A1C < 10% (86 mmol/mol) were enrolled and utilized their standard therapy (ST) including either multiple daily injections or pump for 14 days. Participants then transitioned to using the Omnipod 5 AID System for 3 months at home. Primary effectiveness outcomes were change in A1C and percent of time in range (TIR, 70-180 mg/dL (3.9–10.0 mmol/L)) with the AID system compared with ST. Secondary effectiveness outcomes were percent of time below range (TBR, <70 mg/dL [3.9 mmol/L]) and time above range (TAR, >180 mg/dL (10.0 mmol/L)).

Results: Mean A1C and TIR improved significantly across all age groups (p < 0.05, Table). Increases in TIR were mainly a result of decreased time above range (TAR), while time below range (TBR) either remained low (ages 6 to <18y) or decreased (ages 2 to <6y and

Table. Glycemic outcomes across childhood development stages ranging from 2 to < 26y during standard therapy (ST) and after 3 months of Omnipod 5 Automated Insulin Delivery (AID) System use

	A1C, %(mol/mmol)			TIR, %70–180 mg/dL (3.9–10.0 mmol/L)			TAR, % > 180 mg/dL (>10.0 mmol/L)			TBR, % † < 70 mg/dL (<3.9 mmol/L)		
Age (N)	ST	AID	Change	ST	AID	Change (hr/day)	ST	AID	Change (hr/day)	ST	AID	Change (min/day)
2 to <6y (80)	7.4 ± 1.0 (57 ± 10.9)	6.9 ± 0.7 (52 ± 7.7)	−0.6 ± 0.6* (−6.6 ± 6.6)	57.2 ± 15.3	68.1 ± 9.0	10.9 ± 9.6* (2.6)	39.4 ± 16.7	29.5 ± 9.8	−9.9 ± 10.5* (−2.4)	2.2 [0.9, 4.7]	1.9 [1.2, 3.4]	−0.3 [−1.5, 0.5]* (−4)
6 to <10y (48)	7.3 ± 0.9 (56 ± 9.8)	6.8 ± 0.6¥ (51 ± 6.6)	−0.6 ± 0.7* (−6.6 ± 7.7)	57.0 ± 15.2	69.2 ± 9.1	12.1 ± 9.9* (2.9)	40.6 ± 16.0	28.9 ± 9.8	−11.7 ± 10.4* (−2.8)	1.8 [0.7, 3.3]	1.7 [0.9, 2.2]	0.0 [−0.8, 0.6] (0)
10 to <13y (50)	7.8 ± 0.8 (62 ± 8.7)	7.1 ± 0.6 (54 ± 6.6)	−0.7 ± 0.5* (7.7 ± 5.5)	50.1 ± 14.9	67.9 ± 7.1	17.8 ± 11.4* (4.3)	47.5 ± 16.1	30.5 ± 7.4	−17.1 ± 12.2* (−4.1)	1.3 [0.4, 2.5]	1.4 [0.6, 2.5]	0.0 [−0.7, 0.6] (0)
13 to <18y (27)	7.9 ± 1.1 (63 ± 12.0)	7.2 ± 0.7 (55 ± 7.7)	−0.8 ± 0.8* (−8.7 ± 8.7)	52.2 ± 16.0	67.7 ± 8.8	15.5 ± 13.4* (3.7)	45.5 ± 17.5	30.5 ± 9.5	−15.0 ± 14.5* (−3.6)	1.6 [0.8, 2.9]	1.6 [0.9, 2.1]	−0.2 [−1.4, 1.0] (−3)
18 to <26y (21)	7.4 ± 0.9 (57 ± 9.8)	6.8 ± 0.8€ (51 ± 8.7)	−0.5 ± 0.5* (−5.5 ± 5.5)	57.3 ± 16.4	69.6 ± 10.8	12.3 ± 13.7* (3.0)	40.1 ± 17.5	29.2 ± 11.2	−11.0 ± 14.8* (−2.6)	2.7 [0.3, 4.4]	1.2 [0.5, 1.7]	−0.9 [−2.7, 0.3]* (−13)

Data are mean ± SD unless indicated by † in which data are median [IQR].
*Significant change assessed by two-sided Wilcoxon signed rank test or paired t-test, p-value <0.05.
¥ A1C data missing for 4 participants at the end of the study.
€ A1C data missing for 1 participant at the end of the study.

18 to <26y). The age groups with the highest A1C at baseline, older children and teens (ages 10 to <18y), saw the greatest improvement in A1C and TIR.

Conclusions: The effective glycemic control provided by the Omnipod 5 System across widely varying age groups from toddlers to young adults indicates its adaptability to differing needs and lifestyles. Results are particularly encouraging for older children and teens, who often face challenges when transitioning to independence in diabetes management.

O7 | International consensus targets are achievable for preschoolers: Hybrid closed loop use in children from 2–14 years

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Introduction: Currently, only one CE marked systems with a hybrid automated insulin delivery (H-AID) is available per prescription in Germany. It is not labeled for use in preschoolers. The only technical limitation of this system (Minimed670G) for small children is a total daily use of 8 units of insulin. International consensus targets recommend a Time in Range (TIR) of >70% and Time below Range < 4% in all ages with T1D.

Objectives: To verify whether the consensus targets can be achieved with an H-AID system for small children.

Methods: A two phase study of children aged 7–14 and < 7 years was conducted at our center. All children received training for the system and used it for 8 weeks in manual mode or 8 weeks in auto mode, the order was randomly assigned. Primary outcome parameter was the TIR 70–180%.

Results:

17 children from 2.5 to 6 years and 20 from 7–14 years completed the trial; younger group recruitment was stopped preliminary by Covid19 pandemic. After 8 weeks of HCL, TIR in 14-day-profile was 70.7% compared to 53.8% after PLGM in the older group, HCL 73.9% vs. PLGM 68.2% in preschoolers. Details on achievement are shown in table.

Conclusions: As shown in other trials, 670G is safe even under the labeled age. TIR was higher in our study than published before. In both groups the best results were achieved with the H-AID system. Preschoolers benefit from their parents performing the insulin therapy. To ensure safe use and modalities for children and prescribers, a label is also needed for small children.

O8 | CAMAPS FX hybrid closed-loop in very young children with T1D: A multi-national 4-month randomized trial

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Consensus targets		GMI ≤7%	≥70% TIR	≤4% TBR	≥70% TIR ≤4% TBR	≥70% TIR ≤4% TBR GMI ≤7%
Pre-schoolers	after PLGM	76%	53%	53%	18%	18%
	after AID	88%	88%	82%	59%	59%
7-14 years	after PLGM	20%	25%	80%	20%	10%
	after AID	55%	50%	80%	30%	25%

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Introduction: Closed-loop (CL) systems improve glycemic control in older children and adolescents with type 1 diabetes (T1D). Efficacy and safety of longer-term CL use compared to pump therapy in very young children is unknown.

Objectives: Evaluation of efficacy and safety of CamAPS FX hybrid CL compared to sensor-augmented pump therapy (SAP) over 4 months in very young children with T1D.

Methods: In this multi-national, multicenter, randomized crossover trial, children,1 to 7 years, with T1D ≥ 6 months, on insulin pump.
≥ 3 months, were recruited from 7 centers across the UK, Austria, Luxembourg, Germany. Participants underwent two 4-month periods comparing CL to SAP. Primary endpoint was the between group difference in time in target glucose range (3.9 to 10.0 mmol/L) measured by sensor glucose. Secondary endpoints included time above range (>10.0 mmol/L), HbA1c, mean sensor glucose, time below range (<3.9 mmol/L). Analyses were performed on intention-to-treat basis.

Results: 74 subjects were randomized: mean age 5 ± 2 years, baseline HbA1c 7.3 ± 0.7% (56,3 ± 7,6 mmol/L). One child dropped from SAP arm after randomization. Time in glucose target range was 8.7 percentage points (95% CI 7.4 to 9.9) higher during CL compared to control arm ($p < 0.001$). Time above range (>10.0 mmol/L) was 8.5 percentage points lower (95% CI 7.1 to 9.9; $p < 0.001$) during CL than during control. No difference in time in hypoglycemia (<3.9 mmol/L) between CL and control arm ($p = 0.74$). Mean glucose was 0.7 mmol/L lower (95% CI 0.5 to 0.8; $p < 0.001$), HbA1c 0.4% lower (95% CI 0.3 to 0.5; $p < 0.001$) with CL than with control. Mean CL usage was 93 ± 8% over 4 months. One hospital admission for severe hypoglycemia occurred in CL, due to missing reaction to alerts; one non-treatment related serious adverse event (hospital admission due to gastroenteritis) in the control arm.

Conclusions: The outcome of our study shows that CamAPS FX hybrid closed-loop is safe and significantly improves glycemic control in very young T1D children and should be considered as first line treatment for this age group.

O9 | The use of current diabetes technologies in different age groups with T1D from 2018–2020

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Introduction: Insulin pump and CGM technology has constantly evolved over the last years leading to Automated insulin delivery systems (AID). AID insulin delivery can improve glucose control without increasing the risk of hypoglycemia in adolescents with T1D.

Objectives: Analysis of the use of diabetes technologies in different age groups in children and adolescence with T1D from 2018 to 2020.

Methods: A large patients registry (Diabetes Prospective Follow up database, DPV) from Germany, Austria, Switzerland, and Luxembourg was used. The use of AID (Automated insulin delivery (including HCL (commercial hybrid closed loop/do it yourself closed loop system) and insulin pump with low glucose suspend/ predictive low glucose suspend)) and SAP (Sensor augmented pump therapy (Insulin pump therapy plus CGM for >90 days) was analyzed from 2018 to 2020. Patients were stratified into three age groups: 0.5 to <6 yrs, 6 to <12 yrs and 12 to <18 yrs. Children <6 months at diagnosis were excluded.
The data was analyzed using SAS 9.4 software.

Results: Of 37,386 patients with T1D treated in 364 diabetes centers between 2018 and 2020, 16,532 (44%) used SAP. Of these patients, 4150 (11%) used AID, including HCL technology for 1623 (4%) patients.
There is a significant difference in the use of SAP between male (42% (8349/19,920 pat.) and female (47% [8183/17,466 pat.] $p < 0.001$).
From 2018 until 2020 the use of SAP and AID constantly increased in all three age groups.

Conclusions: An increase in the use of SAP and AID technology was observed in all age groups during recent years. This technology has

Use of	0.5 to <6 yrs	6 to <12 yrs	12 to <18 yrs
SAP in 2018 (%, n)	52 (1,216/2,353)	40 (3,691/9,255)	28 (4,471/16,192)
SAP in 2019 (%, n)	59 (1,483/2,504)	46 (4,330/9,434)	35 (5,746/16,562)
SAP in 2020 (%, n)	66 (1,704/2,591)	51 (4,789/9,436)	41 (6,815/16,799)
AID in 2018 (%, n)	12 (272/2,353)	4 (411/9,255)	2 (336/16,192)
AID in 2019 (%, n)	17 (414/2,504)	8 (717/9,434)	4 (683/16,562)
AID in 2020 (%, n)	24 (619/2,591)	14 (1,301/9,436)	9 (1,434/16,799)

been used more frequently in younger children and SAP more frequently in female patients.

MODERATED ORAL SESSION II

O10 | Online project "newly diagnosed type 1 diabetes - Adaptation of parents and a child" during the COVID-19 pandemic

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Introduction: The development of the COVID-19 pandemic has shown the role of online technologies. Many teaching processes including therapeutic education of children with Type 1 diabetes (T1D) and their parents changed the usual format.

Objectives: To assess online education for parents of children with newly diagnosed T1D during the COVID-19 pandemic.

Methods: 64 families of children with T1D took part in the project. The age of children was 7.1 ± 3.5 years, the duration of T1D was 5.7 ± 3.7 months. There were 2 stages, each of which lasted 1 month. At the first stage in spring 2020 training the webinars were held: 3 theoretical (devoted to insulin, nutrition, self-control of glycemia, hypoglycemia, exercise), 3 gastronomic online workshops with analysis of dishes that were prepared by the participants, and the calculation of carbohydrates, 3 with psychologists. In addition, all participants were included in WhatsApp messenger, where experienced parents and a pediatric endocrinologist answered the questions. The second stage In autumn 2020 was aimed for solving practical issues with the involvement of experienced parents and professional athletes with T1D. The level of HbA1c was assessed before and after each stage of training. In addition, during the project, the level of knowledge about diabetes was assessed separately according to questionnaires for beginners before and after the first stage of training, and according to questionnaires for experienced parents before and after the second stage of training. In the first questionnaire there were 27 questions, in the second - 25, for each correct answer 1 point was assigned.

Results: The level HbA1c decreased from 8.1 ± 1.9 to 6.7 ± 0.7% ($p < 0.0001$) after the first stage and remained the same (6.6 ± 0.9%) after the second stage ($p < 0.0001$ compared initial, $p = 0.37$ compared after the first stage). Analysis of the level of knowledge about diabetes after the first stage showed that the number of parents increased, who scored >20 points: from 51.6% to 85.9% ($p < 0.0001$), the mean number of points scored increased from 19.1 ± 3,0 to 22.8 ± 3.1 ($p < 0.001$). After the second stage the number of parents who scored >20 points increased from 39.1% to 71.9% ($p < 0.0001$), the mean number of points scored increased from 19.4 ± 2.8 to 21.0 ± 3.9 points ($p < 0,01$).

Conclusions: Online education for parents of children with newly diagnosed T1D is effective in terms of glycemic control and diabetes knowledge during the COVID-19 pandemic.

O11 | A randomized control trial: To determine the efficacy of SMS as a tool for health education in families of children with type 1 diabetes in Pakistan

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Introduction: It is suggested that care-giver's knowledge of Type1 diabetes(T1D) is the primary determinant of patient's well-being rather than physician's knowledge. Telemedicine provides an opportunity to bridge the gap in health care in resource-limited countries.

Objectives: To determine the efficacy of SMS as a tool for educating families of children with T1D.

Methods: A single-blind registered randomized control trial was conducted in Rawalpindi, Pakistan from Mar-Jul 2021. 29 T1D patients between the ages of 1 and 18 years were randomly allotted to two groups: 15 to group A(intervention: receiving 5 SMS per week) and 14 to group B(control: receiving education during hospital visits). Patients were followed for 12 weeks and their blood sugar levels(BSLs); HbA1c levels; diary maintenance; number of ER visits; number of Self-Monitored Blood Glucose(SMBG) levels and hypoglycemic episodes compared before and after intervention. Independent t-test and fisher's exact test were used to evaluate the quantitative and qualitative data, respectively.

Results: HbA1c had a mean decrease of 2.17% ± 1.06 in group A and mean increase of 0.25% ± 1.26 in group B(p-value <0.001). Post-

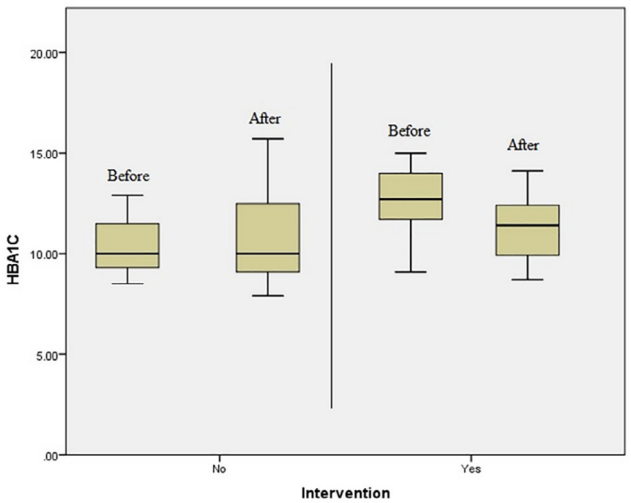

Figure 1: Box-plot diagram of comparison of HbA1C among cases and control based on their baseline and post intervention values.

	CasesMean ± Standard Deviation, Number (Percentage)	ControlsMean ± Standard Deviation, Number (Percentage)	P-Value
Decrease in HBA1C after intervention	2.17 ± 1.06	−0.25 ± 1.26	<0.001
BSL (mg/dl) before intervention	218.42 ± 152.86	233.50 ± 124.48	0.774
BSL (mg/dl) after intervention	109.93 ± 52.28	197.57 ± 114.77	0.012
Diary Maintenance before intervention	6 (40.0%)	3 (21.4%)	0.250
Diary Maintenance after intervention	14 (93.3%)	6 (42.9%)	0.005
Admission in ER before intervention	9 (60.0%)	8 (57.1%)	0.587
Admission in ER after intervention	1 (6.7%)	2 (14.3%)	0.473
Patients with hypoglycemic Episodes before intervention	8 (53.3%)	9 (64.3%)	0.413
Patients with hypoglycemic Episodes after intervention	2 (13.3%)	7 (50.0%)	0.041

intervention BSLs were significantly lower in both groups: 109.93 mg/dl ±52.28 in group A and 197.57mg/dl ±114.77 in group B(p-value = 0.012). Trends in secondary outcomes: diary maintenance; number of SMBG levels; admissions in ER; and hypoglycemic episodes in the past 3 months showed improving trends in both groups. However, post-intervention p-value remained insignificant except for hypoglycemia incidence(p-value = 0.041) and diary maintenance(p-value = 0.005).

Conclusions: SMS is a valuable tool for educating T1D patients, that improves metabolic control significantly. However, BSLs and secondary outcomes were dependent on the caregivers' memory and could be subjected to recall bias. Post Covid19, it is pertinent that we explore newer options for health education.

O12 | Continuing level 3 carbohydrate group education in the COVID-19 pandemic - how virtual cook and eat was developed and initiated

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Introduction: Since 2015 Cook and Eat carbohydrate group education for children and young people (CYP) has been taken up by 38–42% (n = 46–51) of the ≤16 year old caseload in Exeter. CYP attend with friends or family, prepare a savory and sweet dish, which is carbohydrate counted by the CYP then consumed over a 2–3 hour session in secondary schools. Due to Covid-19 restrictions these popular sessions were developed into virtual (Zoom) based groups.

Objectives: Cook and Eat aims to provide annual level 3 carbohydrate counting education for all CYP in a fun and engaging environment. It also adds an opportunity for CYP to meet others with diabetes and to include friends; siblings and other family members in learn about diabetes and nutrition.

Methods: Four timepoints (school holidays) were offered between October 2020 and April 2021 and CYP have cooked apple flapjacks, ginger cookies, pizza muffins and chocolate thumbprint cookies in a one hour session. The CYP work through the steps of the recipe at home (supported by carers) via PowerPoint presentation shared on Zoom with the facilitator and then work through the carbohydrate estimation process as a group.

Results: Twenty five CYP attended 54 times between October 2020 and April 2021 representing 18.5% of the n = 135 ≤ 16 year olds caseload. The majority of CYP (60%) attended at more than one time point and five CYP (20%) attended all four sessions. Seventeen CYP had attended a face to face session before the pandemic. A wide age range (4–15 years) and of diabetes duration (0 months – 10 years and 10 months) consistently attended across all group sessions. More boys attended the session (n = 15) than girls (n = 10) and (60%) are of primary school age.

Conclusions: Delivering education via online platforms allows cost-effective teaching of level 3 carbohydrate counting to a large number of young people. Fewer young people attended online compared to face to face sessions and the authors acknowledge a need to investigate potential barriers to virtual education in the health setting.

O13 | Perceived knowledge and exercise prescription for type 1 diabetes among pediatric diabetes healthcare providers

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	Overall N = 125	Exercise prescription (minutes per day)		Confidence to educate about exercise		ISPAD exercise guidelines familiarity	
		No (n = 61)	Yes (n = 63)	No (n = 34)	Yes (n = 91)	No (n = 57)	Yes (n = 68)
Sex	31 (24.8%)	13 (21.3%)	18 (28.6%)	7 (20.6%)	24 (26.4%)	13 (22.8%)	18 (26.5%)
M	93 (74.4%)	43 (78.7%)	44 (69.8%)	27 (79.4%)	66 (72.5%)	43 (75.4%)	50 (73.5%)
F	1 (0.8%)	0 (0%)	1 (1.6%)	0 (0%)	1 (1.1%)	1 (1.8%)	0 (0%)
Prefer Not to Say							
Age (years)	44 ± 9	43 ± 9	44 ± 10	45 ± 9	44 ± 10	45 ± 9	43 ± 10
Mean (SD)	42 (26, 70)	41 (26, 62)	42 (26, 70)	44 (26, 64)	41 (26, 70)	43 (28, 64)	42 (26, 70)
Median (IQR							
Continent	33 (26.4%)	15 (24.6%)	17 (27.0%)	**14 (41.2%)**	**19 (20.9%)**	15 (26.3%)	18 (26.5%)
N. America	14 (11.2%)	8 (13.1%)	6 (9.5%)	**1 (2.9%)**	**13 (14.3%)**	3 (5.3%)	11 (16.2%)
Cen & S. America	69 (55.2%)	32 (52.5%)	37 (58.7%)	**18 (52.9%)**	**51 (56.0%)**	35 (61.4%)	34 (50.0%)
Europe	9 (7.2%)	6 (9.8%)	3 (4.8%)	**1 (2.9%)**	**8 (8.8%)**	4 (7.0%)	5 (7.4%)
Other							
Years in Practice	12 ± 8	11 ± 7	12 ± 9	12 ± 9	11 ± 8	11 ± 8	12 ± 8
Mean (SD)	10 (1, 35)	9 (1, 30)	10 (1, 35)	10 (1, 35)	9 (1, 35)	9 (1, 35)	10 (1, 35)
Median (IQR)	1 (0.8%)	1 (1.6%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	1 (1.5%)
Missing Data							
HCP Type	91 (72.8%)	42 (68.9%)	49 (77.8%)	22 (64.7%)	69 (75.8%)	40 (70.2%)	51 (75.0%)
Doctor/Clinician	15 (12.0%)	8 (13.1%)	7 (11.1%)	4 (11.8%)	11 (12.1%)	6 (10.5%)	9 (13.2%)
Nurse	15 (12.0%)	7 (11.5%)	7 (11.1%)	5 (14.7%)	10 (11.0%)	8 (14.0%)	7 (10.3%)
Dietician	4 (3.2%)	4 (6.6%)	0 (0%)	3 (8.8%)	1 (1.1%)	3 (5.3%)	1 (1.5%)
Psychologist							
Healthcare Type	77 (61.6%)	37 (60.7%)	40 (63.5%)	19 (55.9%)	58 (63.7%)	37 (64.9%)	40 (58.8%)
Public	14 (11.2%)	7 (11.5%)	7 (11.1%)	2 (5.9%)	12 (13.2%)	4 (7.0%)	10 (14.7%)
Private	34 (27.2%)	17 (27.9%)	16 (25.4%)	13 (38.2%)	21 (23.1%)	16 (28.1%)	18 (26.5%)
Both							
# Patients Seen Monthly	16 (12.8%)	11 (18.0%)	5 (7.9%)	3 (8.8%)	13 (14.3%)	7 (12.3%)	9 (13.2%)
< 10	29 (23.2%)	16 (26.2%)	12 (19.0%)	10 (29.4%)	19 (20.9%)	14 (24.6%)	15 (22.1%)
10–25	39 (31.2%)	15 (24.6%)	24 (38.1%)	8 (23.5%)	31 (34.1%)	18 (31.6%)	21 (30.9%)
25–50	30 (24.0%)	13 (21.3%)	17 (27.0%)	9 (26.5%)	21 (23.1%)	12 (21.1%)	18 (26.5%)
50–100	11 (8.8%)	6 (9.8%)	5 (7.9%)	4 (11.8%)	7 (7.7%)	6 (10.5%)	5 (7.4%)
> 100							
HCP Team Size	90 (72.0%)	47 (77.0%)	43 (68.3%)	20 (58.8%)	70 (76.9%)	39 (68.4%)	51 (75.0%)
0–10	22 (17.6%)	9 (14.8%)	13 (20.6%)	8 (23.5%)	14 (15.4%)	10 (17.5%)	12 (17.6%)
11–20	13 (10.4%)	5 (8.2%)	7 (11.1%)	6 (17.6%)	7 (7.7%)	8 (14.0%)	5 (7.4%)
30–50							

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Introduction: Managing glucose levels during and after physical activity can be challenging for people living with type 1 diabetes (T1D) and their healthcare providers (HCP). We investigated pediatric diabetes HCP knowledge and confidence around physical activity for children and young people (CYP) with T1D across five continents.

Objectives: To assess 1) the amount of exercise HCP prescribe to CYP with T1D, 2) whether HCP have the confidence to deliver education about T1D and exercise, and 3) whether HCP are familiar with ISPAD exercise guidelines.

Methods: A total of 125 HCPs (median, IQR) age 42 (38–51) years, 74% female, 47% ISPAD members, 73% doctors/clinicians) working with CYP with T1D completed an online survey about exercise prescription, perceived knowledge, confidence, training, and barriers to physical activity prescription and T1D.

Results: Of the 125 completed surveys, 51% of HCPs recommended between 45–90 minutes of exercise per day. In addition, 54% of HCPs were familiar with the content of ISPAD Clinical Practice Consensus Guidelines about exercise. Lastly, 73% of HCP's responded that they feel confident with giving recommendations about exercise to CYP with T1D. In a univariate analysis, no significant differences in exercise prescription, confidence, or familiarity with ISPAD guidelines were observed for age, sex, type of HCP, years in practice, healthcare type, number of patients seen monthly, or HCP team size. However, significant differences were observed in exercise confidence based on geographic location ($p = 0.047$, Table 1).

Conclusions: In summary, safe exercise prescription for CYP with T1D remains a challenge. The recommended guidelines are at least 60 minutes of moderate-to-vigorous physical activity per day.

However, approximately half of the responders of this multi-continental online survey did not prescribe enough exercise. We need to recognize and address the barriers to exercise prescription and improve this important area of diabetes care.

O14 | Level of comfort among school nurses about diabetes management in schools

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Introduction: School nurses (SNs) have an important role in the management of pediatric type 1 diabetes (T1D).
Objectives: To assess the comfort level of SNs' performance of various diabetes management tasks for students with T1D.
Methods: We administered a survey about diabetes management in schools to SNs who attended SN diabetes education programs taught by a multidisciplinary pediatric team at a diabetes center in the US.
Results: From 2012 to 2019, 1796 SNs attended one of 24 programs (3 per year) and completed the survey. Over half (56%) of SNs had >20 years of total nursing experience, while nearly half (44%) had <5 years of experience working as a SN. Most (86%) SNs currently had at least 1 student with T1D. The percent of SNs who reported that they were mostly/very comfortable performing each diabetes task is shown in the figure (data for all years combined). SNs' comfort level did not change over time for any tasks except for working with CGM, which increased significantly ($p < 0.0001$). Those with ≥5 years of SN experience endorsed significantly greater comfort than those with <5 years of SN experience for all tasks except checking BG levels and working with CGM. SNs reported high comfort checking BG levels and low comfort with CGM regardless of their years of SN experience.
Conclusions: Although SNs reported a high level of comfort performing several diabetes tasks, they were less comfortable with tasks involving technologies (pump, CGM), supporting the need for ongoing SN education programs.

O15 | Aortic intima-media thickness in children and adolescents with type 1 diabetes: A systematic review with meta-analysis

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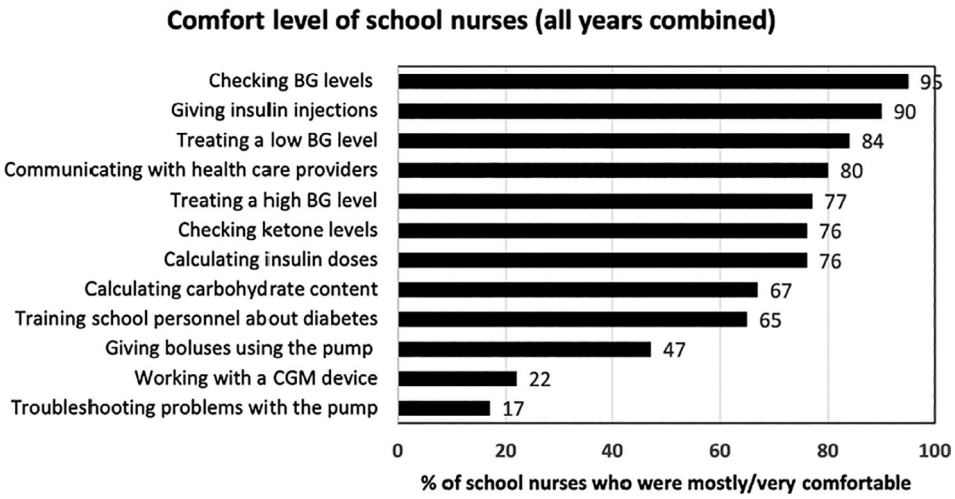
Introduction: Type 1 diabetes is associated with cardiovascular disease (CVD) related morbidity and mortality. Increased aortic intima-media thickness (aIMT), a marker of subclinical atherosclerosis, can identify individuals at risk of CVD and allow initiation of prevention strategies.
Objectives: This systematic review with meta-analysis aimed to evaluate the difference in aIMT between participants with type 1 diabetes and healthy controls.
Methods: A systematic search of published literature up to April 2021 was undertaken using electronic databases MEDLINE, EMBASE, Scopus, CINAHL and AMED. Eligible studies assessed and reported aIMT in participants <20 years with type 1 diabetes and healthy controls. Data were extracted by one reviewer and cross-checked. Meta-analysis was used to combine outcome data and moderator analysis and metaregression conducted to identify study and participant characteristics influencing aIMT.
Results: Meta-analysis of 11 studies ($n = 1165$ with type 1 diabetes and $n = 578$ healthy control participants) indicated that children and adolescents with type 1 diabetes have increased aIMT compared with healthy controls (mean difference [95% CIs]: 0.14 [0.07–0.20] mm, $P < 0.001$, I^2 98%) (Figure 1).
Factors associated with greater increases in aIMT in type 1 diabetes compared to controls included: use of a phased versus linear array probe; ultrasound frequency 1–10 MHz versus >10 MHz; calipers to measure aIMT versus software; assessing aIMT in the distal 15 mm of the aorta; longer diabetes duration; lower insulin dose; increased waist circumference; higher total and LDL cholesterol; lower HDL cholesterol; higher triglycerides; and higher systolic and diastolic blood pressure.



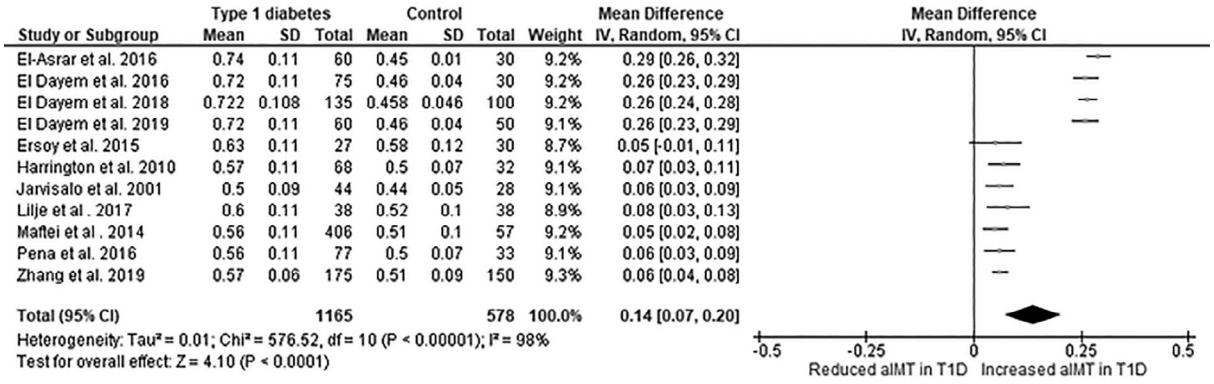


Figure 1. Meta-analysis of aIMT in young people with type 1 diabetes versus healthy controls.

Conclusions: Type 1 diabetes in children and adolescents is associated with increased aIMT compared with healthy control individuals. Longer duration of diabetes and several CVD risk factors were also associated with increased aIMT in youth with type 1 diabetes. Together, these findings demonstrate evidence of early and progressive CVD risk in youth with type 1 diabetes and highlight the need to target modifiable risk factors in CVD prevention.

O16 | Long-term adult health outcomes of an incident cohort of children diagnosed with childhood onset type 1 diabetes 1990–2009: A data linkage study

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Introduction: Diabetes management goals have changed since the outcome of the DCCT and uptake of technology may impact long-term health of those with childhood-onset Type 1 diabetes (T1D).

Objectives: We aimed to examine diabetes complications and mortality in young adulthood in a 20-year incident cohort of all children diagnosed with T1D in NSW, followed over a thirty year period.

Methods: Data on all children aged <15 years diagnosed with T1D in NSW from 1990–2009 was ascertained from the NSW APEG Childhood Type 1 Diabetes Register, and data then linked with their corresponding records from administrative hospital admission and NSW death registry datasets up to 2019. Acute and chronic complications were identified based on relevant ICD10-AM coded records in any of the administrative datasets.

Results: 5424 children were diagnosed with T1D in 1990–2009. Mean age at diagnosis was 8.9 (SD 4.0) years and mean follow-up from diagnosis was 19.5 (SD 5.5) years. During follow-up period to 2019, 4929 (90.9%) individuals were linked to a hospital admission record and almost half of the cohort (2661, 49.1%) were admitted for acute T1D complications (DKA and hypoglycemia). The most common chronic complications at hospitalization were: ophthalmic (330, 6.7%), kidney (370, 7.5%), kidney failure (324, 6.6%), dialysis (37, 0.8%), heart disease (9, 0.2%), stroke (11, 0.2%), peripheral neuropathy (121, 2.5%) and vascular ulcer (82, 1.7%). Overall, there were 115 deaths, of which 50 (43%) were classified as diabetes-related and being the principal cause. The mean age of death was 24.8 years. Of this cohort, half (54%) had attended a dedicated clinic for diabetes complications screening during adolescence at a major pediatric tertiary hospital.

Conclusions: There was substantial morbidity and mortality from childhood diabetes in follow-up of this contemporary cohort. Further analysis of adolescent characteristics will help clarify the effect of childhood antecedent health care and behavior.

O17 | Does poor metabolic control effect cognitive function in children and adolescents with type 1 diabetes mellitus?

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Introduction: Attention, processing speed, long-term memory and management skills of children with diabetes are weaker than healthy children.

Objectives: Our aim is to investigate the effect of duration of diabetes, HbA1c variability, metabolic control on neurocognitive functions in children and adolescents with Type 1 Diabetes Mellitus (T1D).

Methods: 47 T1D children between 6 and 18 yrs, followed up for at least 5 years, were included. 38 healthy children without a chronic disease served as the control group. Wechsler intelligence scale for children (WISC-R),Visual Auditory Number Sequence Test B (GISD-B), Bender Gestalt Test and Moxo Continuous Performance Test for Children and Adolescents (Moxo d-CPT) were used to evaluate cognitive functions. HbA1c-CV was used to assess HbA1c variability.

Results: Mean age at diagnosis, diabetes duration, HbA1c and HbA1c-CV were; 5.58 ± 2.83 years, 7.18 ± 2.57 years, 8.62 ± 1.30% and 14.98 ± 7.54 respectively. 20 (43%) were on insulin pump therapy (IPT), and 27 (57%) were on multiple daily injection (MDI) therapy. Mean HbA1c levels were significantly higher in MDI group (9.09 ± 1.33 vs 7.99 ± 0.97; p:0.003). Verbal IQ, Performance IQ and Total IQ scores were significantly higher in the control group (95.19 ± 17.92 vs 104.63 ± 16.03, p:0.013; 99.79 ± 17.69 vs 106.92 ± 14.55, p:0.049; 97.17 ± 18.35 vs 106.68 ± 14.95, p:0.012). Moxo impulsivity score was higher in the T1D group (2.36 ± 1.31 vs 1.66 ± 1.02; p:0.007). Patients with poor metabolic control (HbA1c ≥9%) had a lower Moxo hyperactivity score (1.25 ± 0.45 vs 1.97 ± 1.29; p:0.007), Verbal IQ and Total IQ scores were higher (84.42 ± 19.12 vs 98.89 ± 16.16, p: 0.014; 86.92 ± 22.52 vs 100.69 ± 15.55, p:0.023). Diabetes duration and HbA1c variability did not show any correlation with the cognitive function tests.

Conclusions: T1D was associated with a lower verbal and performance IQ and increased hyperactivity. Poor glycemic control was associated with more impulsivity. These results show that hyperglycemia can affect cognitive function.

O18 | Evaluation of retinopathy screening practice and outcomes in a transitioning cohort with pediatric-onset type 1 diabetes mellitus

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Introduction: There is mounting evidence that retinopathy rates in the pediatric type T1DM population have reduced significantly in recent decades. Based on retrospective analyses of DCCT data, a less stringent approach to retinopathy screening centered on current HbA1c is suggested(1).

Objectives: We aimed to examine the current practice of complication screening at the Royal Children's Hospital (RCH), in a peri-transitioning cohort to determine if adverse outcomes would have been expected using a protocol based on glycemic control rather than current guidelines.

Methods: All youth ≥16 years old with T1DM who transitioned from RCH to adult care between 2018–2021 were identified. Demographic data, date and age at diagnosis, HbA1c at time of each screen, the frequency and outcomes of retinopathy screening results from diagnosis to transition were examined. This was compared to the frequency recommended by the 2018 ISPAD guidelines and the individualized HbA1c-based protocol suggested by Nathan et al(1).

Results: In total 103 patients(M = 55, 53%) with T1DM transitioned from RCH during the study period. Mean HbA1c was 7.9% (SD1.2), age and duration of T1DM at time of transition were 18 and 6.4 years respectively. The timing of the first screen at mean(SD) age of 15.6 (2.1)years aligned with ISPAD guidelines in 84%(n = 87); however 16%(n = 17) had biennial testing once screening commenced. At transition, zero cases of diabetic retinopathy were detected. Using the HbA1c-based protocol, only 2.9% of patients(3 patients) would have required screening no more frequently than every 3 years. Furthermore, using this protocol, with improvement in glycemic control, the recommended time between screens increased.

Conclusions: This study demonstrated that the frequency of initial retinopathy screening at RCH was aligned with current guidelines with reduced frequency thereafter. In this cohort, zero cases of retinopathy were detected suggesting that a needs-based rationalization of the approach to retinopathy screening in T1DM may be appropriate.

MODERATED ORAL SESSION III

O19 | Children and adolescent patients with pre-existing type 1 diabetes and additional comorbidities have an increased risk of hospitalization from COVID-19; data from the T1D exchange COVID registry

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Introduction: Children and adolescents with pre-existing type 1 diabetes (T1D) diagnosed with COVID-19 are at risk of adverse outcomes such as hospitalizations and diabetic ketoacidosis (DKA). There is limited data on the association between the presence of one or more comorbidities and the risk of adverse outcomes for patients with pre-existing T1D and COVID19.

Objectives: This study's aim is to determine if pediatric and adolescent patients with T1D and other pre-existing comorbidities were more likely to experience adverse outcomes than T1D patients with COVID-19 who did not have any other comorbidities.

Methods: Data from 592 patients with previously established T1D aged <24 years with COVID-19 were analyzed from the T1Dx COVID-19 Surveillance Registry. Data were collected from 52 endocrinology clinics across the US using an online survey tool. Each clinic completed the survey using electronic medical record (EMR) data between April 2020 and May 2021. Descriptive statistics were used to describe the study population, and multivariate logistic regression models were used to analyze the relationship between age, insurance type, use of diabetes technology, presence of comorbidities, adverse outcomes, and hospitalization.

Results: The most frequent comorbidities were obesity (14%), asthma (11%), celiac disease (9%), and hypothyroidism (7%). T1D patients with at least one other comorbidity had a higher DKA presentation (16% vs 12%, p = 0.03) and a higher all-cause hospitalization rate (24% vs 15%, p = 0.02) compared to T1D patients without additional

Table: Characteristics of T1D Patients with Comorbidities vs without Comorbidities and COVID-19; data from the T1D Exchange COVID19 Registry as of May 2021 (Total N=592) N (%)

	T1D Patients with other Comorbidities N=184	Patients without other Comorbidities N=408	P-value
Mean Age (SD) Years	16.6 (4.1)	15.5 (4.3)	0.002
Age Category (Years)			0.03
0 to 5	1 (1)	13 (3)	
6 to 10	13 (7)	33 (8)	
11 to 15	52 (28)	145 (36)	
16 to 19	69 (38)	143 (35)	
20 to 24	49 (27)	74 (18)	
Female	105 (57)	201 (49)	0.09
Race/Ethnicity			0.001
NH White	93 (51)	274 (67)	
NH Black	29 (16)	47 (12)	
Hispanic	51 (28)	68 (17)	
Other	11 (6)	19 (5)	
Insurance			0.1
Public	83 (45)	155 (38)	
Private	97 (53)	240 (59)	
Median A1c (IQR),%	8.7 (2.5)	8.4 (2.3)	0.2
Mean A1c (SD),%	9.2 (2.4)	9 (2.3)	0.2
Duration of T1D			<0.001
< 1 year	8 (4)	36 (9)	
1- 5 years	60 (33)	189 (46)	
> 5 years	116 (63)	183 (45)	
CGM Use (Yes)	109 (59)	280 (69)	0.03
Insulin Pump Use (Yes)	86 (47)	201 (49)	0.6
CGM and Pump Use (Yes)	72 (39)	175 (43)	0.4
Level of Care			0.02
ICU	20 (11)	28 (7)	
In-patient Hospitalization	24 (13)	31 (8)	
Non-Hospitalized	140 (76)	349 (86)	
Adverse Outcomes			
DKA (Yes)	29 (16)	48 (12)	0.03

comorbidities. T1D Patients with comorbidities and COVID-19 were almost twice as likely to be hospitalized than those with no comorbidities (Odds Ratio 1.94, 95% CI: 1.23–3.03).

The most frequent comorbidities were obesity (14%), asthma (11%), celiac disease (9%), and hypothyroidism (7%). T1D patients with at least one other comorbidity had a higher DKA presentation (16% vs 12%, p = 0.03) and a higher all-cause hospitalization rate (24% vs 15%, p = 0.02) compared to T1D patients without additional comorbidities. T1D Patients with comorbidities and COVID-19 were almost twice as likely to be hospitalized than those with no comorbidities (Odds Ratio 1.94, 95% CI: 1.23–3.03).

Conclusions: Our data reveal higher rates of hospitalizations and adverse outcomes among children and adolescents with T1D with at least one more comorbidities and COVID-19 in comparison with T1D patients without additional comorbidities.

O20 | Safety and immunogenicity of the BNT162B2 MRNA vaccine for COVID-19 in adolescents and young adults with type 1 diabetes

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Introduction: No data are available on immunogenity and safety of mRNA vaccines for COVID-19 in patients with type 1 diabetes (T1D).
Objectives: To evaluate antibody responses to the BNT162b2 mRNA vaccine in adolescents and young adults with T1D.
Methods: BNT162b2 mRNA vaccine (Pfizer-Biontech®) was offered to patients with T1D aged 16–22 ys according to national vaccination campaign following a 2-dose schedule, separated by 21 days. Sars-Cov-2 IgG levels (Spike protein subunit S1) were measured at the time of the 1st dose (T0), at the time of the 2nd dose (T1) and after 1 month from the second dose (T2). The test was performed with PerkinElmer GSP®/DELFIA® Anti-SARS-CoV-2 IgG kit using GSP Instrument. The Anti-SARS-CoV-2 IgG assay is based on a solid phase fluoroimmunoassay based on the DELFIA sandwich technique. The assay is qualitative measuring the ratio between sample counts and calibrator counts. The positive cut-off of at least 1.2 arbitrary units was adopted.
Results: 25 patients were included,5 (20%) refused the vaccination. We enrolled 20 patients (10 males) mean age 18.8 ± 2.59 ys, with mean disease duration of 7.53 ± 3.69 ys, BMI 23.12 ± 2.82 kg/m^2, Hba1c 7.12 ± 1.19%. At T0 Sars-Cov-2 IgG were 0.30 ± 0.16. At T1 100% of patients had an antibody titer >1.2 with a mean value of 11.02 ± 11.20 (range 2.1–53.8). At T1 the average value of Sars-COV-2 IgG was 32.14 ± 18.01 (range 8.9–64.5). At T2 the antibody titer was neither significantly different in females compared to males ($p = 0.72$), nor related to age ($p = 0.39$), disease duration ($p = 0.78$), BMI ($p = 0.8$) or HbA1C ($p = 0.21$). The most common adverse events were localized injection-site symptoms. Pain was the most frequent symptom reported after the 1°dose (90% vs 75% after the 2° one). Fever was reported more frequently after the 2°dose (30%) than after the 1° one (5%). No serious adverse events nor hospitalization occurred.
Conclusions: T1D patients developed vaccine-induced antibody responses after the BNT162b2 mRNA vaccine. The vaccine showed a good safety profile.

O21 | Organized sport and cardiovascular risk factors in children and young adults with type 1 diabetes during the COVID-19 pandemic in Germany

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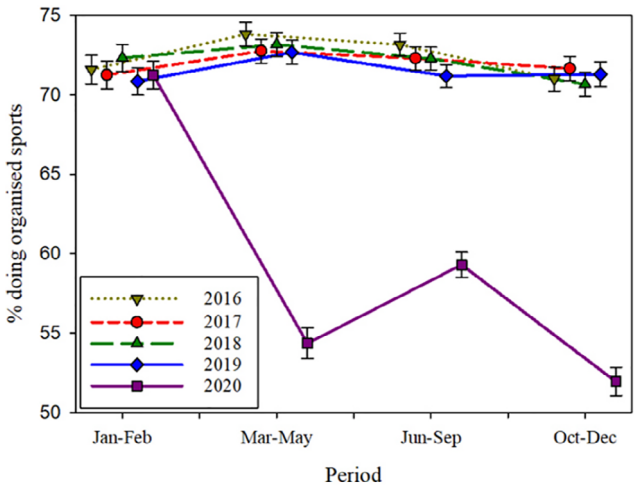

Figure 1. Proportion doing organised sports, 2020 vs. 2016-2019 by period.

Introduction: Sports clubs were widely closed during the COVID-19 pandemic in Germany.
Objectives: To evaluate the differences in organized sport and cardiovascular risk in children and young adults with type 1 diabetes (T1D) during the COVID-19 pandemic in Germany compared to previous years.
Methods: 30,799 individuals aged 6–21 years at baseline with T1D from the German diabetes-patient registry (DPV) contributed 227,347 observation intervals between 2016 and 2020. The first visit of each individual was considered as baseline. Organized sport, systolic blood pressure (BP-SDS), body-mass index (BMI-SDS, both according to KiGGS reference data), low-density lipoprotein (LDL), non-high-density lipoprotein (non-HDL) and Triglycerides (TG) were analyzed using multivariable logistic/linear regression models comparing four periods in 2020 with previous years: period 1 (January–February), period 2 (March–May), period 3 (June–September), period 4 (October–December).
Results: The proportion of organized sport decreased significantly in periods 2–4 in 2020 compared to previous years (Figure 1). Systolic BP-SDS was higher in 2020 compared to previous years for periods 2–4 (all $p < 0.001$). The highest difference was observed from March

to May with 0.84 [0.82–0.86] vs. 0.70 [0.68–0.72] to 0.72 [0.70–0.74] in previous years. BMI-SDS increased from 2016 to 2020 in all periods (all $p < 0.001$), showing a similar course 2016–2019 with lower BMI-SDS in period 1, rising in period 2, falling in period 3 and increasing again in period 4, while in 2020, the reduction in period 3 was not found. All lipid levels were higher during period 2 in 2020, but only significantly for non-HDL (119 [115–123] mg/dl vs. 110 [107–113] mg/dl to 111 [108–114] mg/dl from 2017–2019, all $p < 0.01$).

Conclusions: Organized sport decreased while blood pressure and lipid levels increased since March 2020. It is important to follow these individuals to identify whether the cardiovascular risk factors normalize or stay increased.

O22 | ANTI-SARS-COV-2 antibodies in new-onset type 1 diabetes in children during pandemic in Belgium

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Introduction: A pandemic of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is developing worldwide and questions are emerging concerning the long-term consequences, as a possible increase in type 1 diabetes.

Objectives: To describe the prevalence of anti-SARS-CoV-2 antibodies in Belgian children developing type 1 diabetes during the pandemic.

Methods: Inclusion criteria were all patients admitted with new-onset type 1 diabetes to our Diabetes Clinic between March 2020 and February 2021. SARS-CoV-2 positivity was assessed by polymerase chain reaction (PCR) test from a nasopharyngeal swab at admission. SARS-CoV-2 serology was taken within the first month of diabetes and total antibodies (IgG, IgM and IgA) were measured. A second sample was taken 3 to 12 weeks after the first sampling.

Results: Between 1 March 2020 and 28 February 2021, 86 patients were diagnosed with type 1 diabetes. Of the 75 who accepted to participate, only one was SARS-CoV-2 PCR positive. We found positivity of anti-SARS-CoV-2 antibodies in 20% patients. Participants with positive anti-SARS-CoV-2 antibodies had an increased bicarbonate and base excess compared to participants without anti-SARS-CoV-2 antibodies. Overall 29% patients presented DKA at diagnosis and 2 (9%) of whom were positive for anti-SARS-CoV-2 antibodies. Of the 75 participants, 72% were IA2A positive but IA2A positivity had significantly higher frequencies in children without anti-SARS-CoV-2 antibodies. Nine patients, initially seronegative, have developed anti-SARS-CoV-2 antibodies between the two samples (mean time 8 ± 4 weeks).

Conclusions: This study showed a prevalence of anti-SARS-CoV-2 antibodies in children with newly diagnosed type 1 diabetes similar to that found in children without diabetes in a country severely affected by this pandemic. Longer-term follow-up is needed to define a possible link between the SARS-CoV-2 pandemic and the development of autoimmune diabetes in children.

O23 | Diabetic ketoacidosis at presentation of type 1 diabetes mellitus – Is the increased frequency a result of the COVID-19 pandemic or a longer-term increasing trend?

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Introduction: Reports from several countries have suggested the frequency of diabetic ketoacidosis (DKA) at presentation of type 1 diabetes mellitus (T1DM) increased during the COVID-19 pandemic. Published data on this from the United Kingdom is limited.

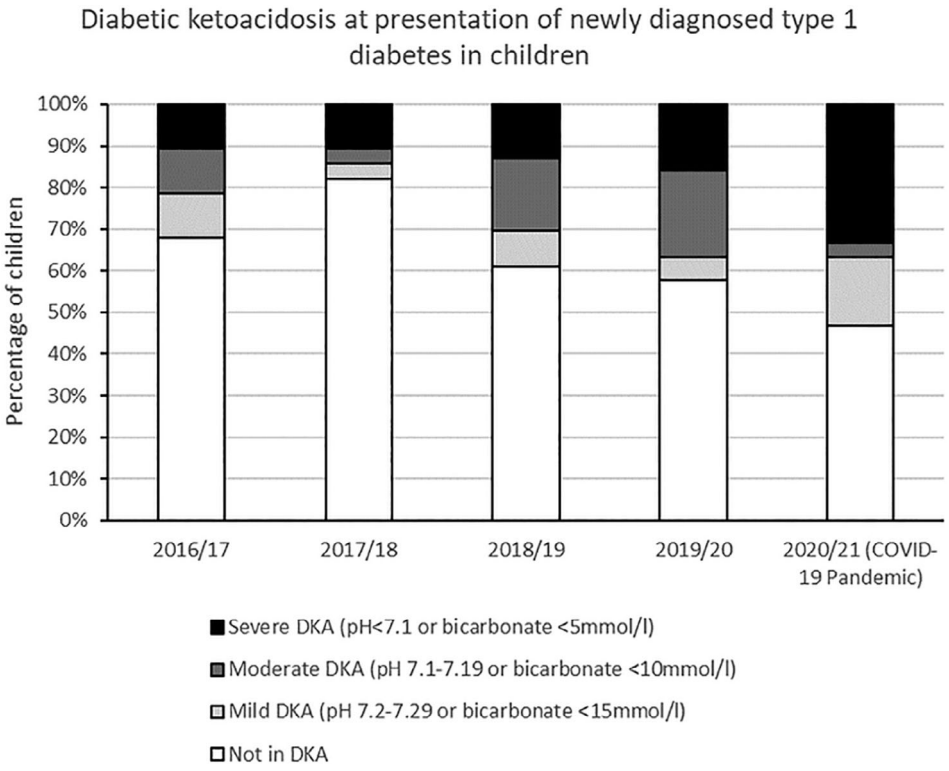
Objectives: We reviewed the frequency and severity of DKA at diagnosis of T1DM in children presenting to a large teaching hospital during the first year of the COVID-19 pandemic and the four preceding years.

Methods: In England the first COVID-19 national lockdown began on 23/03/20. This date was used to define the start of the pandemic. Data was compared to the four previous years each starting on 23rd March. All children (<18 years) presenting to University Hospital Southampton NHS Foundation Trust, UK, with a new diagnosis of T1DM were included. Children transferred into the Intensive Care Unit from other hospitals were excluded.

Data was extracted from electronic case records. Occurrence and severity of DKA was defined as per the British Society for Pediatric Endocrinology and Diabetes 2020 guideline using blood pH and bicarbonate. Weight and body mass index (BMI) z-scores for age and sex were calculated using British 1990 reference data.

Results: 30 children presented with T1DM during the first pandemic year. This is similar to the preceding 4 years (n = 19–28 per year). 53.3% presented with DKA during the pandemic; this proportion has increased each year since 2017/8 (p trend 0.02), with a similar trend in worsening severity of DKA (p trend 0.02), as shown in the figure. Age, sex, HbA1c, weight and BMI z-scores did not differ by year of presentation.

Conclusions: Over half of children with newly diagnosed T1DM presented with DKA during the COVID-19 pandemic. In our hospital there has been an upward trend in the frequency and severity of DKA at T1DM diagnosis that predated but continued to increase during the COVID-19 pandemic. A novel education strategy to facilitate diagnosis before DKA onset might be beneficial.



O24 | Survival in children and youth with type 1 diabetes in Tanzania

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Introduction: T1DM is a chronic conditions in children/youth that contribute to high mortality and morbidity. Special diabetes clinics for children/youth have been implemented in Tanzania since 2005. With the introduction of these clinics, survival of these children is has never be evaluated.

Objectives: To assess the survival of children and youth with type 1 diabetes in Tanzania.

Methods: Data of children and youth with T1DM attending 39 clinics, between 1991–2009 were extracted from the pediatrics diabetes clinic registers variables extracted were date of birth, date of diagnosis and date of death together with other parameters. Data were then compared within the groups using survival analysis, which were divided in three periods i.e., 1) before the special clinics (before 2005), 2) during the implementation of the program (2005–2010), and after the implementation (2010–2019). Data were analyzed using STATA-version 14, where parametric survival model was used.

Results: A total of 3822 children and youth were enrolled in this retrospective survival analysis. Fifty one percent (50.8%) were male with mean age of 14 ± 5.7 years. Total follow-up was 28 years and Median duration of diabetes being 5 (IQR) (2,8) years. Total death was 126 (3.9%). Children/youth included were 163, 719, and 2353 for the period before 2005, between 2005–2010, and 2011–2019 respectively. Most deaths occurred in the first year after diagnosis 31(24.6%) compared to the remaining 28 years 95(75.4%%). Overall, mortality rate was 6/1000 persons-years (95%CI = 5–7), higher in women and increased with age at the onset. The odds of survival were higher in male (OR = 0.43; 95%CI = 0.20–0.93) with expected time to death of 47% longer than female. Older age of at least 15 was associated with 37% shorter time to death. Also, expected time to death for the cohort of 2011–2019 was 52% longer.

Conclusions: This study has shown that survival in children/youth with T1DM in Tanzania has improved tremendously, an important milestone for the developing countries

O25 | Type 1 diabetes care and outcomes in Laos between 2016 and 2021

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Introduction: Laos is a low-to-middle income country (LMIC) in Southeast Asia (SEA). Its GDP per capita is USD 2534 of which only 2.5% represent government healthcare spend, and does not provide for diabetes treatment. No known Laotian had previously survived Type 1 diabetes (T1D). Since 2016, a program started by a non-government organization (NGO), Action4diabetes (A4D) has been providing regular insulin, blood glucose monitoring kits and HbA1c tests for Laotian children and young people (CYP) with T1D, including education and training for healthcare professionals in partnership with the Laos government through a Memorandum of Understanding (MOU) signed between the Laos government and A4D.

Objectives: In this study, we report for the first time a 5-year data from 2016–2021 of Laotian CYP demographics, DKA on admission, hospital re-admissions and glycemic control.

Methods: Data from 2016–2021 were analyzed in 53 T1D patients from Laotian hospitals across 17 provinces and the capital Vientiane who were enrolled into the A4D program.

Results: There were 53 CYP (31 male; 58%) diagnosed with T1D at a mean (SD) age of 10.4 (4.2) years. 31 CYP (58%) presented in DKA at diagnosis. 44 CYP (83%), currently aged 12.9 (4.8)y, remain on active follow-up (24 male; 55%), and have had T1D for 2.4 (2.3) years. From 2016–2021, mean HbA1c was 9.0% (75 mmol/mol) overall, and 8.5% (69 mmol/mol), 8.1% (65), 9.1% (76), 9.8% (84), and 7.7% (61) among the CYP aged 0-5y, 6-10y, 11-15y, 16-20y, and 21-25y, respectively. There were a total of 39 hospital re-admissions for DKA (0.3/person/y), 9 re-admissions for severe hypoglycemia (0.07), and 9 re-admissions for other reasons (0.07).

Conclusions: This is the first report of T1D glycemic outcomes in Laos. There is a great need for more global efforts to improve T1D care in Laos and other LMICs in SEA. Close partnership between NGOs and governments has enormous potential in developing sustainable and locally owned solutions for improving diabetes care for CYP with T1D in these LMICs.

MODERATED ORAL SESSION IV

O26 | Psychosocial care in U.S. pediatric diabetes clinics: staffing and adherence to the ISPAD psychological care guidelines

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Introduction: ISPAD published Clinical Practice Consensus Guidelines for psychological care of children and adolescents with type 1 diabetes (T1D). Data on psychosocial staffing and implementation of these Guidelines into pediatric T1D care across the U.S. are not available.

Objectives: The purpose of this study is to report levels of psychosocial staffing and adherence to the Guidelines nationally.

Methods: 98 of 115 (85%) contacted pediatric T1D clinics completed an online survey about T1D psychosocial care. 95 medical (77 endocrinologists, 18 nurse practitioners) and 86 psychosocial providers (43 social workers, 43 psychologists) reported on the number of psychosocial staff, rated adequacy of psychosocial staffing, and rated adherence to the Guidelines (1 = never to 5 = always). Chi-square and independent samples t-tests were used to compare ratings by clinic size (treated <1000 vs. ≥1000 patients annually) and across medical and psychosocial providers.

Results: On average, T1D clinics cared for 1246 patients and diagnosed 162 patients with T1D annually. The mean number of social workers was 1.28 Full Time Equivalents (FTEs) and mean number of psychologists was 0.53 FTEs per clinic. Only 27.1% of all providers agreed that psychosocial staffing was adequate. Psychosocial providers reported more frequently meeting Guidelines around psychosocial assessments ($M = 3.46$; $M = 3.93$; $t(177) = 3.61$, $p < 0.05$), preventive psychosocial interventions ($M = 3.09$; $M = 3.49$; $t(176) = 2.75$, $p < 0.05$), and evidence-based psychosocial interventions, ($M = 3.52$; $M = 3.98$; $t(176) = 3.29$, $p < 0.05$) than did medical providers. Medical providers reported greater access to mental health specialists for large compared to small T1D clinics ($M = 3.84$; $M = 4.16$; $t(92) = 2.32$, $p < 0.05$), which marked the only difference in adherence to Guidelines by clinic size.

Conclusions: Psychological care in T1D clinics in the U.S. does not consistently meet ISPAD Guidelines and many clinics lack adequate psychosocial staff. These data are a foundational step to improve pediatric T1D psychosocial care.

O27 | Depressive symptoms and protective factors in diverse parents of children with type 1 diabetes (T1D) one year into the COVID-19 pandemic

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Introduction: The COVID-19 pandemic has negatively impacted psychosocial functioning in parents, racial/ethnic minorities, and those of lower socio-economic status. High family functioning and knowledge of social support resources may serve as protective factors.

Objectives: We examined demographic group differences in protective factors and depressive symptoms between 2020 and 2021.

Methods: Participants (n = 91) were parents of children with T1D (67% non-Hispanic White, 11% non-Hispanic Black, 12% Hispanic, 10% another race; 69% private insurance, 31% public) who finished a behavioral RCT and later completed surveys in June–July 2020 and February–March 2021. They self-reported depressive symptoms

Variable	Hispanic	Non-Hispanic White	Non-Hispanic Black	Another Race, Non-Hispanic	Statistic	p
2021 CES-D, M ± SD	15.9 ± 15.5	8.8 ± 6.1	9.6 ± 15.5	7.2 ± 6.0	F(3,86) = 2.846	0.042
2020–21 Δ PFS-FF	−0.62 ± 0.69	0.21 ± 0.66	0.08 ± 2.1	0.24 ± 0.90	F(3,84) = 2.745	0.048

(Center for Epidemiological Studies-Depression [CES-D]), family functioning (Protective Factor Survey: Family Functioning/Resiliency [PFS-FF]) and social support resources (Social Support [PFS-SS]). ANOVAs compared 2021 CES-D and PFS subscale scores by group. CES-D and PFS subscale associations were examined by Pearson correlations. We also examined change scores (Δ) in CES-D and PFS subscales between 2020 and 2021.

Results: CES-D 2021 scores differed by race/ethnicity, with Hispanic parents scoring significantly higher than non-Hispanic White parents and parents of another race (Table). Higher CES-D scores significantly correlated with lower PFS-FF ($r = -0.52$) and PFS-SS ($r = -0.45$) scores, $p < 0.01$. From 2020–21, PFS-FF Δ significantly differed by race/ethnicity, with Hispanic parents PFS-FF scores reducing while other races/ethnicities increased. PFS-SS Δ scores did not differ by race/ethnicity. There were no differences by insurance.

Conclusions: Links between depressive symptoms and lower family protective factors highlight a necessity for screening parental mood and offering support during the stressful COVID-19 pandemic. Family-focused counseling and support resources during this challenging time may positively benefit Hispanic parents.

O28 | Significant improvements in diabetes-specific psychosocial outcomes in pediatric users with type 1 diabetes using the t:SLIM X2 insulin pump with control-IQ technology

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Introduction: Recent improvements in advanced hybrid closed loop systems offer opportunities for effective diabetes management in pediatric patients with type 1 diabetes (T1D). Monitoring psychosocial aspects of these technologies can facilitate holistic achievement of diabetes targets.

Objectives: We studied the impact of t:slim X2™ insulin pump with Control-IQ® technology on quality of life and other psychosocial variables in pediatric users with T1D.

Methods: The Control-IQ Observational (CLIO) Study prospectively follows a diverse cohort with T1D (age ≥ 6) evaluating real-world initiation and use of Control-IQ technology. We evaluated glycemic and psychosocial outcomes in pediatric participants (6–17 years). They completed questionnaires at baseline and 3 months after study start (post), uploaded at least 21 days of pump data to Tandem's t:connect® web application, and had ≥75% CGM use during this time. Repeated measures ANOVA was used to assess differences from baseline to 3 months post.

Results: Sample included 365 pediatric participants with self-reported baseline HbA1c = 8.01% (mean, SD = 1.5). At 3 months post, GMI was 7.3% (mean, SD = 0.61) and time in closed loop was 89% (median, 79.8–94.5). Participants reported significant reduction in diabetes-related (negative) impact (4.43 vs 3.18, $p < 0.001$) and significant improvement in satisfaction with their insulin delivery device (from their prior therapy at baseline) (7.36 vs 8.84, $p < 0.001$) with continued use of Control-IQ technology. Significant improvement in quality of life was also demonstrated at post ($p < 0.001$) across various aspects of life including "freedom to eat," and "emotional wellbeing". Additionally, 68% of participants reported improved sleep quality with Control-IQ technology.

Conclusions: Early results from the CLIO study highlight positive psychosocial outcomes for pediatric participants. Future long-term analyses of glycemic and psychosocial impact of the t:slim X2 pump with Control-IQ technology are planned.

O29 | Diabetes in school health (DISH): Telementoring collaboration between pediatric diabetes specialists and school nurses to improve care of children with diabetes

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Introduction: Worldwide, the incidence and prevalence of diabetes (type 1 and type 2) in youth is rising and over one million children live with diabetes. School nurses are central in a child's diabetes care, yet access to up-to-date technological and practical diabetes education is limited.

Objectives: This study evaluated school nurse comfort with and knowledge about diabetes care in the school setting to inform design and dissemination of a collaborative learning community, Diabetes in School Health (DiSH).

Methods: We administered an online questionnaire to school nurses in Wisconsin, USA. Questions evaluated school nurse comfort and knowledge with managing hyperglycemia, hypoglycemia and illness in youth with diabetes, as well as school nurse interest in an educational program with diabetes experts. DiSH program development occurred via adaptation of a well-established telementoring educational model, Project ECHO. We collaborated with identified content experts (e.g. diabetes providers, nurses, dietitians, mental health professionals)

DiSH Development: Needs Assessment Questionnaire (n = 60 survey responses)				
Comfort with managing hyperglycemia/ hypoglycemia % (n)	Extremely Comfortable	32 (18)	**Highly Requested Topics**	**Quotes: Interest in DiSH**
	Moderately Comfortable	61 (34)	Diabetes Technology	"*I think this is a great way to get school nurses involved and learning more about caring for a student with diabetes. I have quite a bit of experience and have been doing this for a long time - but am always interested in making sure I am following what is considered best practice in diabetes care.*"
	Neither Comfortable or Uncomfortable	4 (2)	Sports/Exercise and Diabetes	
	Slightly Comfortable	4 (2)	Sickness and Diabetes	"*All I have to say is that this would be so beneficial, and I look forward to participating.*"
Knowledge about managing diabetes during illness % (n)	Extremely Knowledgeable	5 (3)	Psychosocial Adjustments	
	Very Knowledgeable	20 (11)	Legal Issues / Liability	"*I would like to learn more on how to help teens with diabetes become independent and more compliant.*"
	Moderately Knowledgeable	48 (27)	Insulin Dose Calculation	
	Slightly Knowledgeable	21 (12)	Carbohydrate Counting/ Nutrition	"*This sounds wonderful. As a health assistant, I'd like to understand diabetes care a little better. I do not want to become anything close to expert - I just want to understand why we do what we do.*"
	Not Knowledgeable at All	5 (3)	Field Trips and Diabetes	

and promoted DiSH via a state school nurse consultant email list. Forwarding via email was encouraged. Session attendance and chat data was collected via Zoom videoconferencing software.

Results: Sixty school nurses responded to the online questionnaire (Table). Survey results informed curriculum development. The DiSH program offered 9 sessions in the initial season. Topics included diabetes technology, sickness and diabetes, COVID-19 and diabetes, psychosocial adjustment and others. Session attendance ranged from n = 36 to n = 150.

Conclusions: While some school nurses reported high baseline comfort and knowledge with diabetes care, many did not, supporting a need for expanded education and collaboration with diabetes experts. DiSH, a novel approach to the Project ECHO telementoring model, was designed, well-attended and has powerful potential benefit. Future aims include evaluation of DiSH's impact on diabetes care and health disparities.

O30 | Assessing school nurses' experience and comfort level working with insulin pumps and continuous glucose monitoring (CGM) devices

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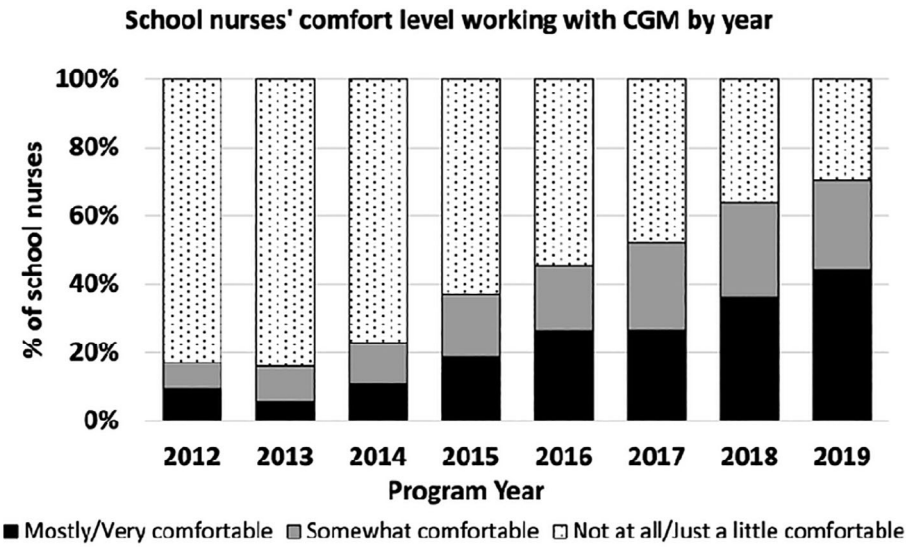
Introduction: There have been many advancements in diabetes technologies in recent years.

Objectives: We assessed school nurses' (SNs) experience and comfort level working with diabetes devices over a recent 8-year period.

Methods: We administered a survey about diabetes management in schools to SNs who attended SN diabetes education programs taught by a multidisciplinary pediatric team at a diabetes center in the US.



Results: From 2012 to 2019, 1796 SNs attended one of 24 programs (3 per year) and completed the survey. Almost half (44%) had <5 years experience as a SN, 21% had 5–10 years, and 35% had >10 years. 86% of SNs currently had at least 1 student with T1D (median = 2) under their care. Overall, 73% of SNs with at least 1 T1D student had at least 1 student using insulin pump therapy; there was no change over time. The % of SNs with at least 1 T1D student and at least 1 student using CGM increased steadily over time, from 24% in 2012 to 86% in 2019 ($p < 0.0001$). SNs' comfort level working with CGM also increased significantly over time ($p < 0.0001$), but less than half of SNs were mostly/very comfortable with CGM in 2019. SN comfort with pump therapy remained fairly stable over time.

Conclusions: There is a need to educate and support SNs in the use of diabetes technologies, especially given the proliferation of automated insulin delivery systems dependent on CGM, in order to provide a safe school environment for students with T1D and drive better health outcomes.

O31 | Associations between technology-based therapy use and social determinants of health in pediatric type 1 diabetes mellitus

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Introduction: While insulin pump therapy (CSII) and continuous glucose monitoring (CGM) may improve glycemic outcomes in children with type 1 diabetes, barriers exist in widespread adoption of these technologies. These include difficulties related to device coverage, as well as barriers to technology adoption that encompass the social determinants of health (SDH).

Objectives: To assess diabetes technology use (CGM and CSII) on glycemic control using validated measures of SDH in a pediatric type 1 diabetes population in Toronto, Canada.

Methods: Cross-sectional evaluation of children aged 0–18 (n = 813) with type 1 diabetes followed at the Hospital for Sick Children between 2018–2020. Material Deprivation (MD) indices were used to determine population-level measures of SDH. CSII and CGM use, as well as HbA1C were evaluated based on MD.

Results: CGM and CSII were used by 42.5% and 30.3% of patients respectively. Those in the highest deprivation quintile (Q5) had HbA1c levels 1.1% greater than those in the lowest deprivation quintile (Q1) ($P < 0.0001$). Real time CGM (rtCGM) and CSII use were 2.7 and 5.0 times less likely in the highest deprivation quintile (Q5 vs Q1; $P < 0.0001$) respectively, while no differences in flash CGM use was seen across MD quintiles. CGM use (all types) and CSII use were associated with lower HbA1c of −0.41% ($P < 0.01$) and − 0.88% ($P < 0.0001$) respectively. Regression modeling, controlling for the effects of age and deprivation, revealed the largest difference in HbA1c (−1.0%) when comparing the use of rtCGM in combination with CSII therapy to no technology use ($P < 0.0001$).

Conclusions: Greater deprivation was associated with poorer glycemic control and overall lower use of diabetes technology. Nevertheless, use of diabetes technology was associated with improved glycemic control across all socioeconomic levels, supporting the idea that providing greater access to diabetes technology to the most marginalized populations may help to improve outcomes.

O32 | Physical activity and glucose management in newly diagnosed youth with type 1 diabetes: 4 T exercise pilot study results at 6 months

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Introduction: The 4 T Study and 4 T Exercise Pilot Study involved starting newly diagnosed youth with type 1 diabetes (T1D) on continuous glucose monitoring (CGM) and physical activity trackers approximately 1-month post-diagnosis.

Objectives: To assess physical activity behaviors and glycemia in newly diagnosed youth with T1D during the first 6 months post-diagnosis.

Methods: Currently, 29 youth with T1D are enrolled in the IRB-approved 4 T Exercise Pilot Study. In this analysis, complete data were available on 22 youth who started CGM (median [IQR]) 19 [9, 28] days post-diagnosis and started wearing an activity tracker (Garmin Vivosmart 4) 30 [13, 35] days post-diagnosis. Participants were asked to wear the activity tracker for at least 14 days each month. CGM metrics (time below range [<70 mg/dL], time in range (TIR) [70–180 mg/dL], and time above range [>180 mg/dL]) were retrieved from Dexcom Clarity. Data were analyzed by a simple linear regression.

Results: Youth (n = 22, 13.7 [11.9, 15.2] years, 30.8% female, 72.7% non-Hispanic white, and 15.4% publicly insured) wore activity trackers 12 [7–14] hours per day for up to 14 days each month. In the linear regression, minutes of moderate-to-vigorous physical activity (MVPA) and active time decreased from Month 1 to Month 6 (Table, $p < 0.05$). Physical activity metrics were (mean ± SD) 4684 ± 1848 steps, 25 ± 19 MVPA minutes, and heart rate 90 ± 9 beats per minute (bpm) at Month 1, respectively. At Month 6, physical activity levels were 4815 ± 2565 steps, 16 ± 14 MVPA minutes, and heart rate 81 ± 7 bpm. Glucose TIR was 81.9 ± 14.4% at Month 1 and 77.9 ± 15.7% by Month 6 ($p = 0.25$).

Conclusions: Regular physical activity and obesity remain a significant challenge for youth with T1D. Newly diagnosed youth with T1D consistently fell short of meeting physical activity recommendations of 60 minutes of MVPA per day. However, glucose TIR was maintained above clinical guidelines (>70% TIR) across the first 6 months of

PHYSICAL ACTIVITY METRICS	Month 1(n = 21)	Month 2(n = 19)	Month 3(n = 14)	Month 4(n = 13)	Month 5(n = 12)	Month 6(n = 12)	p-value *
Steps	4,684±1,848 4,914 [2,853, 6,461]	4,719±2,272 4,874 [3,268, 6,049]	5,366±3,133 4,919 [3,317, 6,515]	5,067±2,448 5,305 (3,024, 7,217)	4,786±2,020 4,627 [3,285, 5,542]	4,815±2,565 4,735 [3,371, 6,561]	p=0.25
Active time (hour:min)	**1:55 ± 0:45** **1:52 [1:19, 2:41]**	**1:52 ± 0:47** **1:53 [1:15, 2:16]**	**2:10 ± 1:09** **1:53 [1:24, 2:32]**	**2:00 ± 0:54** **2:03 [1:15, 2:55]**	**1:41 ± 0:45** **1:38 [1:03, 2:39]**	**1:45 ± 0:51** **1:48 [1:07, 2:11]**	**p = 0.0006**
MVPA (minutes)	**25 ± 19** **24 [9, 37]**	**17 ± 16** **11 [5, 26]**	**21 ± 28** **9 [1, 30]**	**19 ± 17** **18 [3, 33]**	**21 ± 19** **16 [2, 40]**	**16 ± 14** **18 [3, 24]**	**p = 0.01**
Heart rate (bpm)	**90 ± 9** **90 [83, 94]**	**88 ± 7** **86 [83, 92]**	**89 ± 8** **89 [83, 93]**	**86 ± 8** **87 [82, 91]**	**82 ± 5** **81 [80, 88]**	**81 ± 7** **79 [75, 87]**	**p < 0.0001**
CGM METRICS	**Month 1 (n = 22)**	**Month 2 (n = 21)**	**Month 3 (n = 20)**	**Month 4 (n = 17)**	**Month 5 (n = 17)**	**Month 6 (n = 16)**	
Glucose % TBR (<70 mg/dL)	1 ± 1 1 [0, 2]	2 ± 1 1 [0, 2]	1 ± 1 1 [0, 2]	1 ± 2 0 [0, 3]	2 ± 2 1 [0, 2]	2 ± 2 1 [0, 3]	p = 0.78
Glucose % TIR (70–180 mg/dL)	81.9 ± 14.4 87.5 [76.3, 91.3]	82.9 ± 15.3 87.0 [75.5, 94.5]	78.7 ± 17.4 85.5 [67.3, 93.8]	77.5 ± 19.4 86.0 [59.5, 92.0]	78.2 ± 15.9 86.0 [63.5, 93.5]	77.9 ± 15.7 78.5 [68.3, 92.0]	p = 0.25
Glucose % TAR (>180 mg/dL)	15.8 ± 14.9 10.0 [5.8, 21.5]	14.6 ± 15.5 8.0 [2.5, 22.5]	19.2 ± 17.4 12.0 [4.3, 31.0]	20.6 ± 19.5 13.0 [5.0, 38.5]	19.3 ± 16.3 12.0 [5.0, 34.5]	19.7 ± 15.7 18.0 [5.5, 30.3]	p = 0.25

Data presented as mean ± SD and median [IQR].
TBR = time below range, TIR = time in range, TAR = time above range, MVPA = moderate-to-vigorous physical activity, bpm = beats per minute.
* p-value represents slope from 1 month to 6 months for each category. Significance set at p < 0.05.

diagnosis. Future work should assess whether increased MVPA relates to improved TIR in this group.

MODERATED ORAL SESSION V

O33 | Analysis of bone metabolism turnover markers in patients with Alstrom and Bardet-Biedl syndromes

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Introduction: Causative variants in the genes responsible for Alström syndrome (ALMS) and Bardet-Biedl syndrome (BBS) cause damage to primary cilia associated with correct functioning of cell signaling pathways in many tissues, which determines the variety of symptoms observed in patients. Despite the differences in genetic background, both syndromes affect multiple organs and numerous clinical manifestations are common to both syndromes. The presence of primary cilia on bone cells and their involvement in bone development, metabolism and disease prompts the search for potential disorders of bone metabolism in patients with ALMS and BBS syndromes.

Objectives: The aim of the study was to evaluate markers of bone metabolism turnover and their relation to metabolic disorders in patients with ALMS and BBS syndromes.

Methods: In 18 patients with ALMS and BBS as study group and in 42 healthy subjects, the following markers of bone turnover were evaluated: serum osteocalcin (OC), osteoprotegerin (OPG), sRANKL and urinary deoxypyridinoline - DPD.

Results: Lower urinary DPD levels ($p = 0.0055$) and serum OC ($p = 0.0003$) were observed in the study group compared to controls, as well as a trend toward lower sRANKL values in ALMS and BBS patients compared to controls ($p = 0.0511$). In patients in the study group, serum OC and urinary DPD values negatively correlated with the HOMA-IR index ($R = -0.78$, $p = 0.0004$ and $R = -0.52$ $p = 0.0316$, respectively). There was also a positive correlation between the OC and 25OHD levels ($R = 0.58$, $p = 0.0242$) and a negative correlation between sRANKL and fasting glucose concentrations ($R = -0.55$, $p = 0.0211$).

Conclusions: The first-time identification of abnormalities in markers of bone metabolism turnover in patients with ALMS and BBS syndromes indicates the necessity to provide them with appropriate diagnosis and treatment of these abnormalities. This study is supported by National Science Centre grant No 2018/29/B/NZ5/00330

O34 | Mechanisms of hypoglycemia during OGTT in youth with cystic fibrosis

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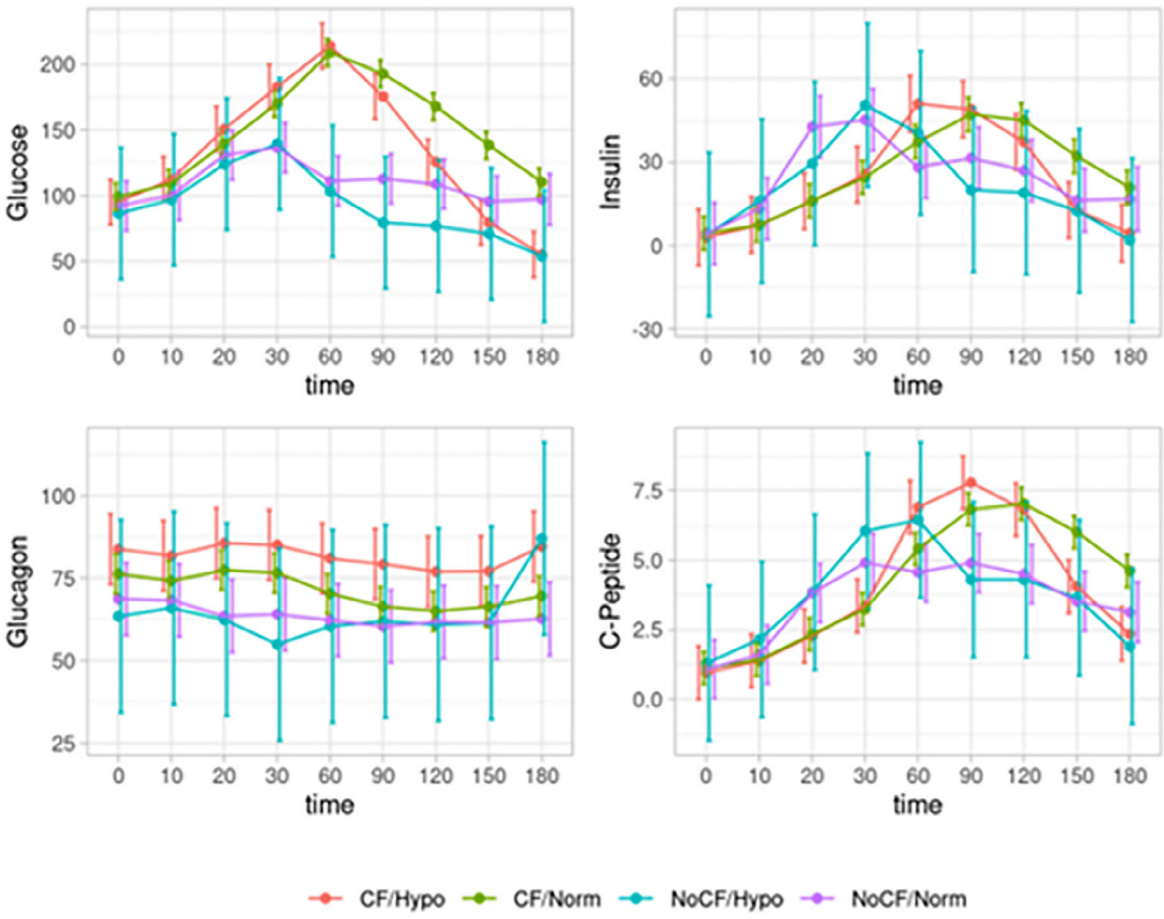
Introduction: Hypoglycemia is common in patients with cystic fibrosis, but the mechanisms responsible for this hypoglycemia are unclear.

Figure 1: Hypoglycemia defined as any OGTT glucose <60 mg/dL in CF vs controls



Objectives: To investigate mechanisms of hypoglycemia, using a 3-hour oral glucose tolerance test (OGTT), in youth with and without cystic fibrosis (CF).

Methods: A 3-hour frequently sampled OGTT (0, 10, 20, 30, 60, 90, 120, 150, 180 min) was performed in youth with CF and healthy controls. Individuals were classified as experiencing hypoglycemia, defined as glucose <60 mg/dL, or not. Insulin, C-peptide, glucose, and glucagon concentrations during the OGTT were measured. Insulin sensitivity was calculated with the Matsuda Index (10,000/√[fasting glucose*fasting insulin*mean glucose*mean insulin]). Descriptive statistics were calculated.

Results: OGTTs from 79 youth (mean age 13.0 ± 3.6 yrs), 63 with CF and 16 controls, were examined. CF participants included 12 with CF related diabetes, 39 with abnormal glucose tolerance, and 12 with normal glucose tolerance. There were no differences in age nor sex between CF youth and controls. 17 CF youth (27%) CF had hypoglycemia (CF Hypo+) vs. 2 controls (13%) (Control Hypo+). CF Hypo+ did not have delayed timing of C-peptide peak vs. CF Hypo- (Figure 1). Insulin and C-peptide AUC were no different between CF Hypo+ vs. CF Hypo-. CF youth had higher fasting glucagon, delayed glucagon suppression during the OGTT, and in contrast to Control Hypo+, CF Hypo+ did not mount a glucagon response despite drop in glucose between 150–180 min. There were no differences in insulin sensitivity between Control Hypo+ vs Control Hypo-. CF Hypo+ were more insulin sensitive than CF Hypo- (Matsuda = 15.1 ± 5.9 vs 11.7 ± 8.2 ($p = 0.03$).

Conclusions: Fasting hyperglucagonemia with impaired glucagon response and increased insulin sensitivity appear to contribute to mechanisms of hypoglycemia in youth with CF.

O35 | Adolescent diabetes as a part of Werner syndrome

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Introduction: Werner syndrome, a rare genetic disorder is characterized by adult progeria, cataract, diabetes mellitus along and some malignancies. It is an autosomal recessive disorder and is caused by loss of function of Werner gene (WRN). There is variable prevalence of diabetes mellitus reported in this syndrome.

Objectives: To present the clinical features of 13 patients, diagnosed with Adult progeria-Werner syndrome, who presented as diabetes mellitus to our department.

Methods: Over a period of three years, thirteen patients referred to as type 2 diabetes mellitus were diagnosed to have Werner syndrome. Clinical features, associated syndromic features and, biochemical parameters were noted. Glycemic control and diabetic complications were noted.

Results: History of consanguinity was present in nine patients. Mean age of patients was 29.23 ± 5.26 years and the mean age of diagnosis of diabetes mellitus was 20.46 ± 3.86 years. Eight patients had onset of diabetes mellitus below the age of 20 years. The mean HbA1c was 9.6 ± 1.28%. Seven patients were on insulin injections. Bilateral cataract was present in eleven patients (85%) and Achilles tendon non-healing ulcer was the cause of referral in 6 patients. Half of the patients were following rheumatology for scleroderma, contractures, and osteoarthritis.

Conclusions: Werner syndrome presents as adolescent diabetes mellitus. A higher than average prevalence of Werner syndrome is likely in Kashmir valley due to consanguinity. Late diagnosis is the rule rather than an exception in this syndrome and efforts to improve awareness is warranted.

O36 | Integration of physical activity metrics into electronic health records using apple HealthKit for youth with type 1 diabetes

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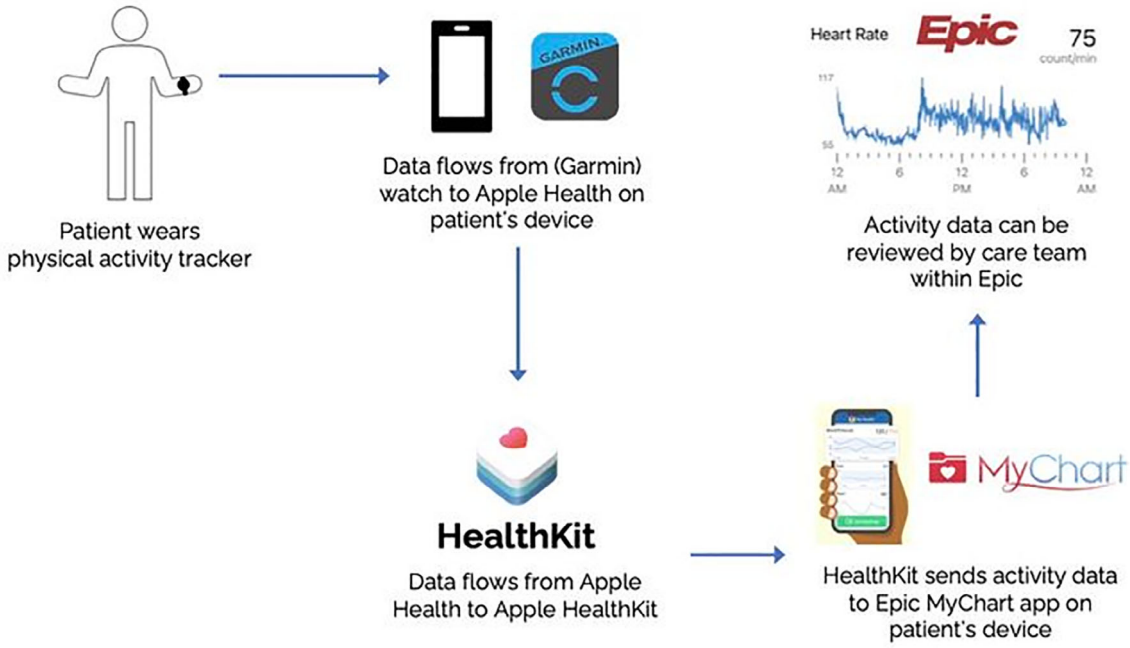
Introduction: We have previously developed a system for sharing patients' CGM data into our Electronic Health Records (EHR) using Apple HealthKit on iOS devices. An additional element of patient data that has not yet been integrated into the EHR is physical activity data from wearable activity trackers.

Objectives: The objectives are to integrate physical activity tracker data into the Epic EHR for healthcare providers to visualize and integrate exercise discussions into standard diabetes care visits.

Methods: Following a one-time enable step, the physical activity tracker (Garmin Vivosmart 4) and GarminConnect app passively share activity data using the Apple HealthKit interface. As data is received by HealthKit, it is then passively shared with the patient portal (Epic MyChart). The provider is required to establish this initial connection by placing an order for collecting certain data types in a patient's chart in the EHR (Epic Systems). The patient (or parent) then accepts this connection request on the patient portal app to bridge the communication between HealthKit and the EHR. The data is then stored in a standard flowsheet within the EHR.

Results: Our team has successfully implemented various physical activity metrics including heart rate, steps, active energy, and floors climbed into the EHR test environment using HealthKit (Figure 1).

Conclusions: Our next steps will include testing the activity tracker data in the patient setting as part of the larger 4 T Study: Teamwork, Targets, and Technology for Tight Control. This physical activity data integration in the EHR will allow providers to determine whether patients are reaching physical activity targets. If patients are not achieving recommended targets, this may be an opportunity to connect patients with the diabetes care team to discuss activity levels or potential barriers to physical activity. In the future, we also hope to relate physical activity data to CGM data that is already a current feature in our system.



O37 | Do non-HLA genes contribute to age of type 1 diabetes onset in monozygotic twins?

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Introduction: Development of islet autoimmunity (IA) and type 1 diabetes (T1D) are associated with high-risk HLA class II loci as well as non-HLA genes. Monozygotic (MZ) twins have a high rate of concordance to T1D progression after the first twin develops T1D, especially for those diagnosed at a young age.

Objectives: We analyzed 52 T1D-associated non-HLA SNPs from ImmunoChip data in 159 MZ twins from the Twin Family Study: 79 twin probands with T1D and their 80 unaffected cotwins/triplets (including one set of triplets). Subjects are enrolled into the Twin Study when the proband is diagnosed with T1D and cotwins are followed longitudinally for the development of IA and/or T1D.

Methods: In the cotwins, we analyzed the association between each of the non-HLA SNPs and IA after adjusting for HLA DR3/4*0302. In the twin probands with T1D, we used a linear regression model to evaluate the association of non-HLA SNPs with diabetes age at onset after adjusting for HLA DR3/4*0302.

Results: Median (IQR) age of diagnosis of the twin probands was 9.9 (5.4–13.9) years and age of last visit for the cotwins was 17.5 (11.2–26.7) years. Of the 80 cotwins, 41 (51.3%) developed IA and 15 (18.8%) were diagnosed with T1D. After adjusting for HLA DR3/4*0302, SNPs in *CTLA4* (rs3087243), *IL2* (rs4505848), *IKZF1* (rs62447205), and *INS* (rs7111341) were found to be associated with the development of IA in cotwin subjects (all $p < 0.04$). After adjusting for HLA DR3/4*0302, SNPs in *CTSH* (rs3825932) and *TYK2* (rs34536443) were found to be associated with younger age of diabetes onset in the twin probands ($p < 0.05$).

Conclusions: In this cohort of MZ twins, non-HLA SNPs in *CTSH* and *TYK2*, which function both in the immune system and in beta cells, were associated with younger age of onset in the twin probands. Further studies are needed to evaluate the specific role of these genes for immunity and T1D onset.

O38 | Genetic causes of atypical diabetes mellitus in pediatric patients: Experiences of a single medical center in Taiwan

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Introduction: Genetic causes of diabetes mellitus (DM) have been an ongoing interest of research. Monogenic diabetes is sometimes coined for this type of diabetes with a unique hereditary transmission, and its clinical presentations are often atypical and distinctive from type 1 or type 2 DM. Understanding these genetic factors in the role of diabetic management represents a bright future for personalized or precision medicine as it creates a window to select the treatment based on etiology.

Objectives: This study aimed to identify genetic variants associated with atypical DM using whole exome sequencing (WES).

Methods: We enrolled a total of 20 pediatric DM patients with atypical presentations, such as the absence of autoantibodies and insulin resistance. WES was applied to obtain these participants' massive genetic information. The sequencing data were aligned and annotated using commercial and publicly accessible software algorithms. Diabetes mellitus-associated genes enlisted in the Online Mendelian Inheritance in Man (OMIM) were used to filter out relevant and functionally damaged variants according to in silico algorithms. Segregation analysis was performed based on Sanger sequencing if potential causative variants were identified.

Results: In total, 81 functionally damaged variants were found in the patients and they were dispersed in 47 DM-associated genes. Each patient carries a wide-ranging number of variants (1 ~ 10 variants in each patient). Only 2 pathogenic variants (*HNF1A* c.1135C > T, p.Pro379Thr and GCK c.556C > T, p.Arg186Ter) were found in genes related to maturity-onset diabetes of the young.

Conclusions: Genetic investigations of pediatric DM pose several challenges, given the co-occurrence of multiple genetic variants that may have diverse degrees of pathogenic effects. Further functional validation of each variant, considering synergistic effects of environmental factors, may be needed to elucidate the complex mechanism underlying atypical DM in pediatric patients.

O39 | Circulating hematopoietic (HSC) and very-small embryonic like (VSEL) stem cells in newly diagnosed childhood diabetes type 1 – Novel parameters of beta cell destruction/regeneration balance and possible prognostic factors of future disease course

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Introduction: Velocity and intensity of the beta cell damage progression observed type 1 diabetes varies among patients. A rapid loss of beta cell function can be observed in some patients, in contrary to others experiencing partial remission. Beta cell mass and function might be also regulated through spontaneous regeneration and stimulated recovery.

Objectives: We aimed to evaluate hematopoietic stem cells (HSC) and very small embryonic-like stem cells (VSEL) mobilization to establish their role in beta cell function maintenance and partial remission occurrence in children newly diagnosed with type 1 diabetes.

Methods: We recruited 59 type 1 diabetic patients (aged 6–18 years) monitored for 2 years, and 31 healthy children as a control group. HSC and VSEL levels were assessed at disease onset in PBMC isolated from whole peripheral blood with the use of flow cytometry. An assessment of beta cell function was based on C-peptide secretion. Studied groups were stratified on the basis of VSEL, HSC and/or C-peptide median levels in regard to beta cell function and partial remission.

Results: Patients with higher stimulated C-peptide secretion at disease onset demonstrated lower levels of HSC ($p < 0.05$), while for VSEL and VSEL/HSC ratio higher values were observed ($p < 0.05$). Accordingly, after 2 year follow-up, patients with higher C-peptide secretion presented lower initial levels of HSC and higher VSEL/HSC ratio ($p < 0.05$). Patients with lower values of HSC levels demonstrated a tendency for better partial remission prevalence in the first 3 to 6 months after diagnosis.

Conclusions: These clinical observations indicate a possible significant role of HSC and VSEL in maintaining residual beta cell function in type 1 diabetic patients.

O40 | Worrying increase of DKA at diagnosis of type 1 diabetes during restrictions imposed by SARS-COV-2 in Italy

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Introduction: In Italy, due to the SARS-CoV-2 pandemic, forced restrictions were imposed on all (extreme) activities in the period March–May 2020 and partial restrictions in the period June–December, limiting accessibility to health services.

Objectives: To analyze the proportion of children with DKA at type 1 diabetes (T1D) diagnosis during the SARS-CoV-2 pandemic in Italy.

Methods: Data on children under 15y with a new diagnosis of T1D were collected from 40 Italian pediatric diabetes centers, representing over 75% of all pediatric centers in the country, in the period 2017–2020. The DKA was defined according to the ISPAD guidelines. Results were evaluated as percentage and 95% confidence intervals (95% CI). The frequency of DKA in the months of extreme restriction and in the months of alternating total and partial restrictions in 2020 was compared with the frequency in the same months of the 2017–2019 period.

Results: Overall 3363 children were recruited, 1247 had DKA with a percentage of 37.1% (35.4–38.7) without gender differences. The annual DKA proportion was 35.2% (31.8–38.7) in 2017; 36.8% (33.4–40.3) in 2018; 35.7% (32.5–38.9) in 2019; 40.1% (37.0–43.3) in 2020. DKA and severe DKA significantly increased during the forced restriction of activities in 2020 compared to the same months of the previous three years. Forced extreme restrictions of all activities were associated with an increase of about 10% in DKA at T1D diagnosis, which remained elevated by more than 6% during partial restrictions. Severe DKA showed a similar pattern during activity restriction periods (Table 1).

Conclusions: Our data showed that the huge increase in DKA frequency observed during activity restrictions is largely due to the increase in severe forms. Since DKA is often a consequence of delayed diagnosis in new-onset diabetes, additional efforts must be made to prevent this serious complication in all conditions that can lead to delayed diagnosis, such as pandemics.

O41 | Incidence of non-type 1 diabetes mellitus (NT1DM) measured ten years apart: A Canadian pediatric surveillance program (CPSP) Study

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Table 1. Proportion of children with DKA at the diagnosis of T1D during forced suspension of activities due to SARS-CoV-2 pandemic in Italy.

	2017-2019		2020		
	Frequency		Frequency		
DKA (pH<7.3)	(%)	95% CI	(%)	95% CI	*p*
Jan-Feb (no restrictions in 2020)	35.4	31.1-40.0	28.4	22.0-36.0	0.122
Mar-May (extreme restrictions in 2020)	32.9	29.1-36.9	42.3	35.6-49.3	0.018
Jun-Dec (partial restrictions in 2020)	36.1	33.6-38.7	42.4	38.4-46.4	0.010
Severe DKA (pH<7.1)					
Jan-Feb (no restrictions in 2020)	9.7	7.2-12.8	4.1	1.8-8.5	0.033
Mar-May (extreme restrictions in 2020)	11.0	8.6-13.9	18.3	13.4-24.3	0.011
Jun-Dec (partial restrictions in 2020)	10.7	9.1-12.4	16.4	13.6-19.7	<0.001

Table 1: Estimated minimum incidence rates in cohorts 1 and 2

	Cohort 12006–2008	Cohort 22017–2019	Comparison of cohort 2/cohort 1	
Type	**Incidence per 100,000 per year**	**Incidence per 100,000 per year**	**Incidence rate ratio (95%CI)**	**p-value**
Overall	2.34	3.40	1.45 (1.26, 1.66)	< 0.001
Type 2 diabetes (T2D)	1.54	2.50	1.62 (1.37, 1.91)	< 0.001
Monogenic diabetes (MODY)	0.20	0.23	1.09 (0.67, 1.78)	0.73
Medication induced diabetes (MID)	0.40	0.45	1.17 (0.82, 1.68)	0.38
Indeterminate	0.22	0.22	1.03 (0.62, 1.69)	0

Introduction: The landscape of childhood diabetes has evolved and addressing the knowledge gaps in NT1DM are key to early recognition.
Objectives: This study aimed to describe: 1) the minimum incidence of NT1DM and its subtypes measured 10 years apart; and 2) the clinical characteristics of NT1DM in Canada.
Methods: National surveillance was conducted via the CPSP. Pediatric clinicians reported new cases (children <18 years old) of NT1DM for two 24-month periods (cohort 1: 2006–08; cohort 2: 2017–19). Cases were classified based on a diagnosis of diabetes as defined by Diabetes Canada, clinical features of NT1DM, and the absence of diabetes associated auto-antibodies, when available. Descriptive statistics and incidence rate ratios between cohorts were estimated.
Results: There were 345 cases of NT1DM in cohort 1 and 442 cases in cohort 2. The minimum incidence of NT1DM increased by 45%, accounted for by an increase in T2D (Table 1). Children of White and First Nation background predominated in both cohorts, and this did not change with time. Similarly, there was a female predominance in both cohorts. The median age, proportion of asymptomatic cases, median hemoglobin A1c, and rate of diabetic ketoacidosis did not differ between cohorts. Obesity was more common in cohort 2 (77.1% vs. 71.7% in cohort 1). Among children with T2D, dyslipidemia and hypertension were diagnosed more frequently in cohort 2 than cohort 1 ([64.9% vs. 44.8%] and [46.9% vs. 28.3%] respectively).
Conclusions: The number of NT1DM cases continues to rise in Canada, with T2D being the predominant sub-type. The increasing burden of T2D in children and youth, in addition to comorbidities, underscores the importance of prevention and screening.

MODERATED ORAL SESSION VI

O42 | Adipose insulin resistance relates to albuminuria and increased renal oxygen consumption in obese youth with and without type 2 diabetes

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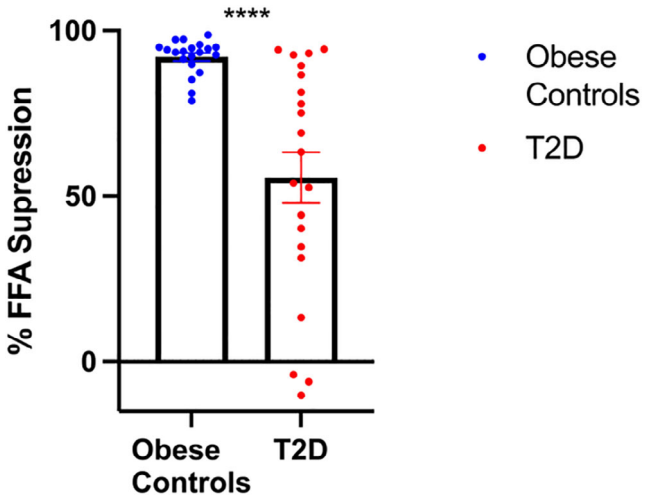
Introduction: Fatty kidney disease and insulin resistance (IR) contribute to diabetic kidney disease (DKD) in type 2 diabetes (T2D), yet the underlying mechanisms are poorly understood.
Objectives: The objective of this study was to examine the associations among adipose IR, albuminuria, and renal oxygen consumption by functional MRI in obese youth with and without T2D.
Methods: We assessed adipose IR, albuminuria and renal oxygen consumption in obese youth with (n = 31, 15.8 ± 1.8 years, BMI 35.6 ± 6.6 kg/m^2, HbA1c 6.9 ± 1.6%, 58% female) and without (n = 20, 15.3 ± 2.1 years, BMI 38.2 ± 7.4 kg/m^2, HbA1c 5.45 ± 0.3%, 30% female) T2D. A hyperglycemic clamp was performed with 20% dextrose to maintain hyperglycemia (~190–200 mg/dL) for 240 minutes. Insulin, C-peptide, and free fatty acid (FFA) concentrations were assessed at baseline and every 10 minutes of the steady state (190–240 minutes). FFA suppression was calculated as steady-state FFA subtracted from baseline FFA, and represented as a percentage of baseline FFA. Albuminuria was calculated as urine albumin-to-creatinine ratio from a first morning void. A multiple gradient-recalled-echo MRI sequence was used to acquire blood oxygen level dependent (BOLD) images of the kidney before and after furosemide (20 mg



IV injection). The change in fractional renal oxygen availability (R2*) in response to furosemide estimated renal oxygen consumption.

Results: FFA suppression was attenuated in youth with T2D compared to obese controls (55.6% vs. 92.1%, $p < 0.0001$). Lower FFA suppression was associated with higher albuminuria ($r = -0.43$, $p < 0.01$,) and higher furosemide-suppressible renal oxygen consumption ($r = -0.43$, $p < 0.01$).

Conclusions: Youth with T2D had impaired FFA suppression, consistent with adipose IR, compared to obese control participants. Impaired FFA suppression was associated with higher albuminuria and renal oxygen consumption, indicating a potential role for adipose IR in the development of perturbed renal energetics, and ultimately DKD.

O43 | Early versus late histological confirmation of celiac disease in children and adolescents with new-onset type 1 diabetes and positive screening result – Analysis of the multicenter diabetes follow-up registry DPV

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Introduction: Celiac disease (CD) is common in children and adolescents with type 1 diabetes (T1D).

Objectives: The aim of this study was to compare the outcomes of children with positive screening at the onset of T1D, in whom CD was histologically confirmed either within the first six months or between six and 36 months after diabetes onset.

Methods: This study analyzed data of 87,055 patients <18 years with new-onset T1D between 1995 and June 2020 from the multicenter (German/Austrian/Swiss/Luxembourgian) Prospective Diabetes Follow-up Registry DPV. Elevated IgA antibodies against tissue-transglutaminase (anti-tTGA) > 2 x the upper limit of normal (ULN) were present in 1604 out of 24,165 patients (6.6%) screened for CD at diabetes onset. Of these, we obtained long-term data of 355 patients with biopsy-proven CD within the first 36 months of diabetes. Outcomes were compared between patients with histological confirmation of CD either within the first six months (N = 227 (64%)) or between six to 36 months (N = 128 (36%)) of diabetes. Statistical analyses were adjusted for demographics and use of continuous glucose monitoring and insulin pumps.

Results: The median diabetes duration at follow-up was 5.2 years (interquartile range, 3.0–7.1) in the early and 4.9 years (3.0–6.6) in the late group ($p = 1.00$). Adjusted mean HbA_{1c} levels (8.0% (63.6 mmol/mol) vs 7.9% (62.5 mmol/mol), $p = 0.49$), cardiovascular risk markers, the proportion of patients reaching anti-tTGA levels within the normal range (55.0% vs 53.6%, $p = 0.84$), and rates of acute diabetes complications, did not differ between both groups. Patients with delayed histological confirmation of CD showed no impairment of growth or weight gain during the observation period.

Conclusions: Our study suggests that the histological confirmation of CD in asymptomatic patients with new-onset T1D can be postponed by several months without short-term disadvantage for the patient.

O44 | The association between treatment modality, lipid profile, metabolic control in children with type 1 diabetes and celiac disease – Data from the international sweet registry

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Introduction: A higher frequency of dyslipidemia is reported in children with type 1 diabetes (T1D) and celiac disease (CD). Recently, continuous subcutaneous insulin infusion (CSII) has been associated with better lipid profiles in patients with T1D. The aim of this study was to investigate the association between treatment modality and lipid profile, metabolic control, and body mass index (BMI)-SDS in children with both T1D and CD.

Objectives: The aim of this study was to investigate the association between treatment modality and lipid profile, metabolic control, and body mass index (BMI)-SDS in children with both T1D and CD.

Methods: Cross-sectional study in children registered in the international SWEET database in November 2020. Inclusion criteria were children (2–18 yrs) with T1D and CD with available data on treatment modality (CSII and multiple daily injections, MDI), triglyceride, total cholesterol, HDL, LDL, dyslipidemia, HbA1c, and BMI-SDS.

Overweight/obesity was defined as > + 1 BMI-SDS for age. Data were analyzed by linear and logistical regression models with adjustment for age, gender, and diabetes duration.

Results: In total 1009 children with TD1 and CD (female 54%, CSII 54%, age 13.9 yrs ±3,6, diabetes duration 7.2 yrs ±4,1, HbA1c 7.9% ± 1,4) were included. Significant differences between children treated with CSII vs MDI were respectively found; HDL 60.0 mg/dl vs 57.8 mg/dl, LDL 89.4 mg/dl vs. 94.2 mg/dl, HbA1c 7.7 vs. 8.1%, BMI-SDS 0.4 vs 0.6, overweight and obesity 17% vs 26% (all p < 0.05).

Conclusions: CSII is associated with higher HDL and lower LDL, HbA1c, BMI-SDS, and percentage of overweight and obesity compared to MDI in this study. Further prospective studies are required to determine whether CSII improves lipid profile, metabolic control and normalize body weight in children with both T1D and CD.

O45 | Efficacy of additional insulin based on the fat plus protein counting method to control postprandial glycemic excursions in children and adolescents with type 1 diabetes: A systematic review and meta-analysis

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Introduction: Optimizing postprandial glucose (PPG) blood levels is considered one of the most challenging aspects of treating patients with type 1 diabetes (DM1). A limited number of studies have revealed the influence of fat and protein macronutrients on PPG levels, however, there is no validated equation for insulin dose calculation for fat plus protein.

Objectives: To evaluate the benefit of the method of calculating the insulin dose by counting fat plus protein macronutrients in a mixed meal compared to the method of counting carbohydrates alone to overcome postprandial hyperglycemia.

Methods: An electronic search of the MEDLINE, Embase and Cochrane databases using keywords and MeSH terms. The search was restricted to randomized controlled trials (RCTs) published between January 2000 and April 2021.The inclusion criteria consisted of studies examining children (1–18 year old) with DM1 who were on a basal-bolus regimen and in whom the method of calculating the insulin for mixed meals was by counting fat plus protein macronutrients in addition to the carbohydrate counting. The primary outcome was the PPG level (mean and standard deviation) at 120, 180 and 240 minutes postprandial, and the pooled final estimate is expressed as the mean difference (MD).

Results: Of the n = 4874 articles, n = 9 RCTs matched our eligibility criteria. Of these 9 RCTs, 5 were appropriate to pool in the forest plots. The pooled final estimate (MD) was in favor of the additional protein and fat counting technique, with the maximum PPG level reduction observed at 240 minutes postprandial. The pooled MDs of the PPG levels were − 19.16 [95% CI = -34.22 to −4.10] at 120 minutes postprandial, −37.71 [95% CI = -53.18 to −22.23] at 180 minutes postprandial and − 59.29 [95% CI = -99.54 to −19.04] at 240 minutes postprandial.

Conclusions: Controlling PPG level by using the fat plus protein counting method is more efficacious than using the carbohydrate counting alone. Further research is required to determine the optimal equation for fat plus protein counting.

O46 | Cultural background and its impact upon responsive feeding, glycemic control, weight status and diet quality in young Australian children with type 1 diabetes

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Introduction: Australian children with type 1 diabetes (T1D) are an ethno-culturally diverse group. Dietary management of T1D in early childhood must consider a range of culturally driven feeding norms and mealtime behaviors.

Objectives: To investigate non-responsive feeding in a culturally and linguistically diverse (CALD) group of 1–5 yrs old with type 1 diabetes (T1D) by establishing its prevalence and association with weight status, dietary quality, glycemic control and mode of insulin delivery.

Methods: A retrospective, cross-sectional multi-center study used validated tools to assess parental feeding practices and child's dietary intake. Clinical data was collated and socio-demographic data was self-reported. Descriptive statistics, independent sample t-tests and chi squared tests were performed (p < 0.05).

Results: 76 families participated with 48% of parents from CALD backgrounds. Mean age 4.1 yrs, diabetes duration 1.4 yrs and HbA1c 7.8%. CALD parents were more likely to engage in Reward for Behavior (p = 0.02), Persuasive Feeding (p = 0.04) and Overt Restriction (p = 0.01). Eating >2 meals in front of a TV/screen was associated with Reward for Eating (p = 0.0004), Persuasive Feeding (p = 0.014) and CALD background (p = 0.001). Children with HbA1c < 7.0% experienced more Covert Restriction (p = 0.02). Those on multiple daily injections were more likely to be Rewarded for Eating (p = 0.04) and Persuaded to Eat (p = 0.02), but more Willing to try new foods (p = 0.01) than those using insulin pump therapy. Regardless of CALD status, 54% of children were above a healthy weight, 67% consumed excess discretionary foods and only 9% met Australian recommendations for vegetables.

Conclusions: A child's exposure to non-responsive feeding practices is culturally sensitive. Children are not meeting healthy eating guidelines and higher than average numbers are above a healthy weight. Identification of feeding and mealtime concerns remains a priority as it facilitates targeted conversations about what children eat and how they are fed.

O47 | Physical (in)activity surveillance in children with type 1 diabetes: A pilot mixed-methods investigation

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Introduction: Type 1 Diabetes (T1D) affects over 2500 children in Ireland. Physical activity (PA) is an important component of management plans. Despite the potential benefits of PA, international figures suggest that children with T1D are not meeting the recommended daily 60 minutes of Moderate to Vigorous (MVPA). Surveillance of PA in this population in Ireland to date has been limited. Technology could provide a solution to monitoring and managing PA in this population.

Objectives: The purpose of this study was to pilot a mixed methods protocol for assessing habitual PA in children with T1D.

Methods: Research grade thigh-mounted accelerometers were used to quantify parameters of PA over an 8-day period in 21 male and female children and adolescents (10–17 years) attending an outpatient pediatric diabetes clinic. Clinical parameters (HbA1c, insulin regimen and weight centiles) were measured. Total steps, standing time, seated time were recorded. Self-report was used to measure perceived activity levels.

Results: Mean daily steps recorded was 8220. Differences in mean daily steps between females (7, 306 steps) and males (10,806 steps) reached significance ($p = 0.001$). No significant differences were found between genders in sitting time or standing time. Overweight or obesity was identified in 44% of females and 15% of males. Mean HbA1c for both females 8.25% (67 mmol/mol) and males 7.97% (64 mmol/mol) were above the ISPAD recommended <7.0% (53 mmol/mol). Self-reported PA showed that participants perceived achieving a minimum of 30–60 mins of PA on most days.

Conclusions: The purpose of this research was to pilot empirical research methodologies. Although there is international consensus on the importance of PA for T1D populations the results of this study show that this cohort are not achieving the recommended targets for sustaining health. It is hoped that further research will aid the development intervention to promote the translation of ISPAD guidelines into real-world practice for PA promotion.

O48 | "Your own pace, your own path": Perspectives of adolescents navigating life after bariatric surgery

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Introduction: The Bariatric surgery is an established weight-loss tool but few studies have explored adolescents' postoperative experiences beyond quality of life measures.

Objectives: The objective of this study was to explore adolescents' postoperative experiences following bariatric surgery.

Methods: Between 2016–2021, 45 semi-structured interviews were conducted with adolescents (16-20y) at 6, 12 and 24 months following bariatric surgery. A deductive thematic analysis framework was applied. Themes were identified and refined iteratively, and discrepancies were resolved through discussion.

Results: Five major themes emerged related to: 1) weight loss expectations vs. reality, 2) social landscape, 3) body image, 4) eating and moving, and 5) challenges for long-term success. The pace of and satisfaction with weight-loss and side effects was heterogenous among participants, with most changes occurring early and stabilizing by 24-months. Adolescents adapted over time to new social interactions and reported improved body image and confidence, yet persistently struggled to reconcile their internal identity with evolving external perceptions and discomfort with new attention. Participants experienced changes to lifestyle routines after surgery which introduced distress at 6-months but resolved over time. Life transitions in early adulthood concurrent with their evolving and increasing autonomy, physical, social, and financial independence, imposed unexpected challenges to postoperative routines and support systems. Participants unanimously reaffirmed that bariatric surgery is a lifelong journey and that they were committed to long-term success.

Conclusions: Our findings highlight important life transitions during this developmental period and how they impact postoperative experiences and outcomes. Adolescents may benefit from postoperative counseling focused on managing weight loss expectations and adapting to evolving nutritional needs and changing social circumstances.

O49 | Fasting blood glucose (FBG) and cardiovascular disease (CVD) risk in Hispanic youth with obesity

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Introduction: Youth of minority race-ethnicity have higher prevalence of obesity and are at increase in risk for comorbidities. Elevated FBG within the normal range has been related to a decline in beta cell function. The relationship of FBG to CVD risk in youth is not clear.

Table 1. Physical and Metabolic Characteristics Across Tertiles of FBG in Hispanic Youth with Overweight/Obesity

	BG <90 mg/dL	BG 90-96 mg/dL	BG>96 mg/dL	p value**
Male / Female	41 / 75	82 / 55	63 / 56	<.001
BMI z-score	1.9 ± 0.5	2 ± 0.5	2.1 ± 0.5	<.001
% Body Fat	39.1 ± 6.5	37.8 ± 7.4	39.1 ± 7.3	ns
Glucose (mg/dL)	84.9 ± 4.3	92.9 ± 1.7	102.1 ± 5.6	<.001
Insulin (µU/mL)	27.1 ± 16.2	31.4 ± 19	41.2 ± 26.2	<.001
HOMA-IR	5.7 ± 3.4	7.2 ± 4.4	10.5 ± 6.9	<.001
CRP (ng/mL)	1159.6 ± 1018.7	1507.6 ± 1481.7	1743.5 ± 1805.3	0.017
ALT (U/L)	25 ± 26.4	27.2 ± 27.7	32.2 ± 33.3	ns
Total Cholesterol (mg/dL)	163.6 ± 37.1	171.3 ± 33.8	176.4 ± 31.7	0.043
Triglycerides (mg/dL)	115.4 ± 45.5	133.5 ± 58.3	139.4 ± 64.4	0.008
TG/HDL ratio	2.77 ± 1.3	3.4 ± 1.8	3.52 ± 1.9	0.003
Systolic BP (mmHg)	112.2 ± 9.1	114.1 ± 9.1	116.8 ± 10.1	<.001
Diastolic BP (mmHg)	52.2 ± 6.5	51.1 ± 6.9	53.7 ± 6.9	0.012

Mean ± SD; Abbreviations: BMI, body mass index; TG, triglycerides; HDL, high density lipoprotein
** p value for Chi-square or GLM

Objectives: We investigated the relationship between FBG and CVD risk factors in a cohort of Hispanic youth with overweight (OW) and obesity (OB).

Methods: 372 (186 males) pubertal, non-diabetic adolescents; mean age (SD) 13.9 ± 2.5 years; 26% OW and 74% OB underwent measurement of anthropometrics, blood pressure (BP); body composition; fasting glucose, insulin, CRP, ALT, AST, triglycerides (TG), total, LDL and HDL-cholesterol. The homeostasis model assessment of insulin resistance (HOMA-IR) and TG to HDL ratio were calculated. Subjects were divided into tertiles of FBG (<90 mg/dL, 90–96 mg/dL, >96 mg/dL) and compared using general linear model adjusting for sex.

Results: The three FBG tertiles did not differ with respect to age, Tanner stage, %body fat, truncal fat, or liver transaminases. Measures of insulin resistance (IR), inflammation, dyslipidemia and BP increased across tertiles of FBG (Table 1).

Conclusions: Elevated FBG in the non-diabetic range is associated with greater degree of IR, inflammation and adverse CVD risk profile, independent of total body or truncal fat or evidence of fatty liver disease. This data suggest that higher FBG identifies obese Hispanic youth at high risk for CVD.

O50 | Effects of inflammation on cardiometabolic risk in adolescents

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Introduction: Obese adolescents have increased C-reactive protein (CRP) levels which are thought to represent increased inflammation and may to play a role in increasing cardiometabolic risk.

Objectives: The objective of this study was to determine whether increased inflammation mediates the effects of increasing weight on vascular and endothelial function and insulin sensitivity in adolescents.

Methods: Endothelial function [reactive hyperemia (RH), venous occlusion plethysmography], arterial stiffness [augmentation index (AI), arterial tonometry], insulin sensitivity (ISEN) and secretion (ISEC) (oral glucose tolerance test), high sensitivity c-reactive protein (CRP), interleukin-6 (IL-6) and neutrophil count (NC) were measured in 75 subjects (34 female, age = 15.2 ± 1.7 years, BMI 22.0 ± 5.8). Spearman correlation coefficients and robust rank order regression were used to assess relationships.

Results: CRP ($r_s = 0.506$, $p < 0.001$) and NC ($r_s = 0.23$, $p < 0.05$), but not Il-6 ($r_s = 0.21$), negatively correlated with BMI%. AI was not related to BMI% ($r_s = 0.02$) while RH decreased with increasing BMI% ($r_s = 0.34$, $p < 0.01$). ISEN decreased ($r_s = -0.42$, $p < 0.01$) and ISEC increased ($r_s = 0.32$, $p < 0.01$) with increasing BMI. RH decreased with increasing CRP ($r_s = 0.29$, $p < 0.05$) and NC ($r_s = 0.29$, $p < 0.01$). ISENS was not related to CRP, IL-6, or NC while ISEC was related to IL-6 ($r_s = 0.24$, $p < 0.01$) Robust rank order regression analysis with RH, ISEN, and ISEC as the dependent variable and BMI% and CRP as the independent variables showed that RH, ISEN, and ISEC remained significantly related to BMIPC but was not related to CRP. Similar results were found with IL-6 instead of CRP as the independent variable. However when NC was included as the independent variable RH was related to NC and not BMIPC.

Conclusions: Increased inflammation, as reflected by increased NC, may play a role in impairing endothelial function put does not appear to affect insulin sensitivity. The high CRP in obese adolescents may be due to something other than inflammation.

DOI: 10.1111/pedi.13269

SUPPLEMENT ABSTRACT

ISPAD International Society for Pediatric and Adolescent Diabetes WILEY

Poster Abstract

ePoster - 01: Diabetes and COVID-19

ePO01 | Increase in newly diagnosed type 1 diabetes among pediatric and adolescent patients during the COVID-19 pandemic in the United States: A multi-center analysis

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Introduction: An increase in newly diagnosed type 1 diabetes (T1D) has been posited during the COVID-19 pandemic, but data have been conflicting.

Objectives: We aimed to determine trends in newly diagnosed T1D and severity of presentation at diagnosis for pediatric and adolescent patients during COVID-19 year (2020) as compared to the previous year (2019) in a multi-center data analysis across the United States.

Methods: This retrospective multi-center study included data from seven large U.S. clinical centers recruited from the T1D Exchange Quality Improvement Collaborative (T1DX-QI). Data on diagnosis, diabetic ketoacidosis (DKA), and clinical characteristics were collected from January 1 to December 31, 2020, compared to the prior year. Chi-square tests were used to compare differences in patient characteristics during the pandemic compared to the pre-pandemic comparison group.

Results: Across seven member sites, there were 1399 newly diagnosed patients with T1D in 2020, compared to 1277 in 2019 (p=0.007). Of the newly diagnosed patients, a greater number, presented in DKA in 2020 compared to 2019 (599/1399 (42.8%) v. 493/1277 (38.6%), p<0.001), and a higher proportion of these patients presented with severe DKA (p=0.01) as characterized by a pH<7.1 or bicarbonate of <5mmol/L. The mean age at diagnosis was not different, but there were fewer females (p=0.004), and fewer NH White youth diagnosed in 2020 (p<0.001). Newly diagnosed T1D patients in 2020 were less likely to have private insurance (p=0.001). Monthly data trends demonstrated a higher number of new diagnoses of T1D over the spring and summer months (April to September) of 2020 compared to 2019 (p=0.007).

Conclusions: We found an increase in newly diagnosed T1D and a greater proportion of newly diagnosed T1D patients presenting in DKA at diagnosis during the COVID-19 pandemic compared to the prior year. Future longitudinal studies are needed to confirm these findings with population level data and determine the long-term impact of COVID-19 on diabetes trends.

ePO02 | COVID-19 and the impact on youth onset type 2 diabetes new diagnoses and severity

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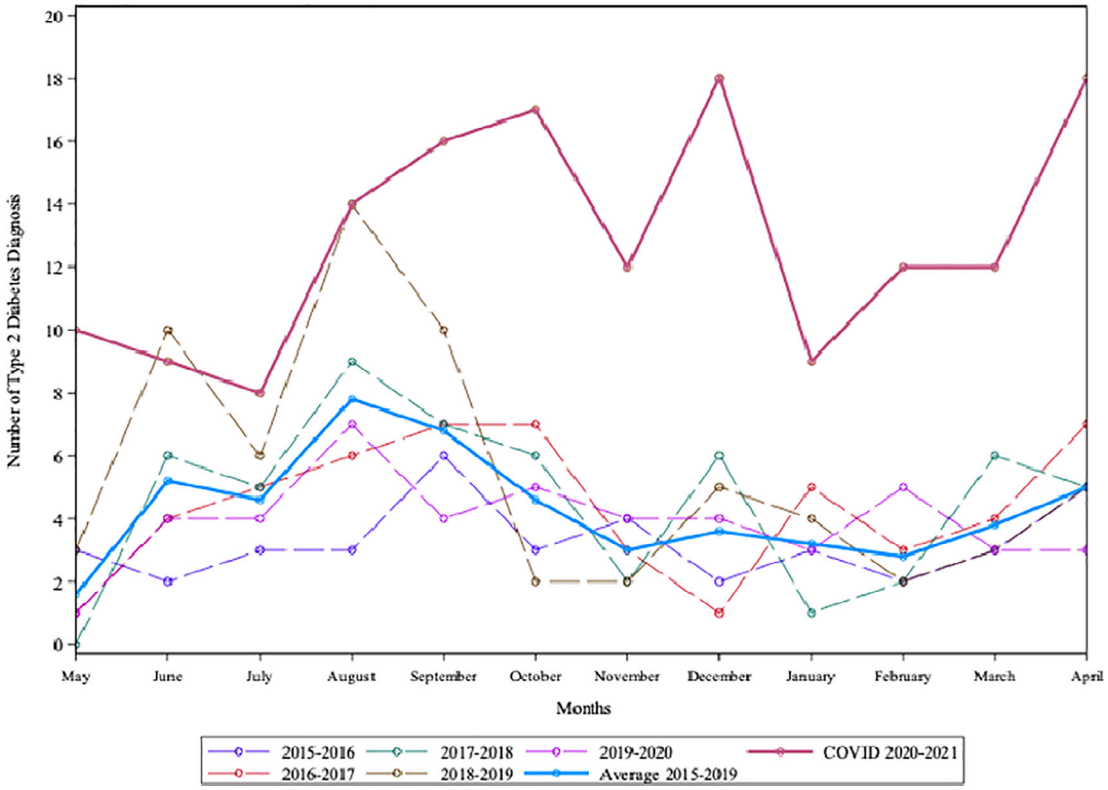
Introduction: Initial studies of pediatric diabetes and COVID-19 focused on type 1 diabetes with some initial reports showing an increase in youth onset type 2 diabetes (T2D). We aim to expand on this initial evidence in a larger population over a longer period.

Objectives: The purpose of our study was to describe the amount, the severity, and the demographics of youth onset T2D diagnoses during the COVID-19 pandemic compared to the five years prior.

Methods: We performed a retrospective cross-sectional review of youth (age≤21) diagnosed with T2D during the COVID-19 pandemic (5/1/2020 to 4/30/2021) and the five years prior (5/1/2015-4/30/2020) at a pediatric tertiary care center. Children were identified by ICD codes (ICD9 250.00, ICD10 E13.9 or E11.9). Charts were reviewed to confirm diagnosis and exclude those with medication induced diabetes, MODY, >1 positive autoantibody, or BMI<85%. Chi-squared, t-tests, and fisher's exact tests were used for analyses.

Results: In the pre-pandemic era annual diagnoses of T2D ranged from 39-66 (mean=52). During the pandemic 155 children were diagnosed with T2D, an increase of 298% from the pre-pandemic mean. New diagnoses increased 455% in Black patients and 248% in Hispanic patients. The average A1C at presentation was higher during the pandemic (9.47%±2.57) than prior (8.69% ±2.09) (p=0.001). Rates of acidosis (pH<7.3) were similar before (7.3%) and during (6.4%) the pandemic (p=0.741). Rates of hyperosmolarity (serum osm ≥330 and glucose >600) were also similar, 1.9% vs 0.6% respectively (p=0.418). Of those diagnosed during

Figure 1. Observed Number of Monthly Pediatric Type 2 Diabetes Diagnoses by Year, May 2015-April 2021



the pandemic, 56% were tested for COVID-19 and three tested positive.

Conclusions: New diagnoses of T2D increased during the COVID-19 pandemic particularly among Black youth. A1C values at diagnosis increased, but rates of acidosis and hyperosmolarity did not. Clinical COVID infection was very uncommon. The findings display the significant effect of the COVID-19 pandemic on youth, specifically Black youth. Given the lack of COVID-19 positivity, the increase may be tied to social-distancing practices and behavioral changes.

ePOO3 | Factors associated with hospitalization in youths and young adults with type 2 diabetes and COVID-19 infection

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Introduction: Considerable research has addressed the impact and increased severity of coronavirus disease 2019 (COVID-19) in adult patients with type 2 diabetes (T2D). However, findings from older adult patients cannot be generalized to affected children and young adults.

Objectives: In this retrospective cohort study, we examine whether race/ethnicity and other factors are associated with hospitalization in pediatric and young adult patients with T2D and COVID-19 infection.

Methods: The de-identified COVID-19 patient cohort from the December 2020 release of *Cerner Real-World Data*^{TM} includes longitudinal data for patients who received care at 87 US-based health systems between December 2019 and September 2020. A rigorous, multi-step algorithm was used to identify patients with T2D (n=229). Analysis was limited to patients <27 years old with a positive laboratory test or billing code consistent with COVID-19 infection. A generalized linear mixed model was used to evaluate race/ethnicity, gender, HbA1c, body mass index (BMI), mean blood glucose, age, payer, and Elixhauser comorbidity score as correlates of hospital admission.

Results: In this cohort, 204 (89.1%) patients were 18-26 years old, and 133 (58.1%) were female. Fifty-two percent were Hispanic, 27.1% were non-Hispanic Black, and 12.2% were non-Hispanic White. Median BMI was 37.9 kg/m^2 (IQR 32.3-45.1 kg/m^2); median HbA1c was 9.25% (IQR 7.2-12.3%). Ninety-four patients (41.0%), including all 21 patients in diabetic ketoacidosis (DKA; 9.2%) were hospitalized. Male gender (OR 2.46 [CI 1.23-4.91], p=0.011), HbA1c (OR 1.29 [CI 1.10-1.52], p=0.001), and BMI (OR 1.44 [CI 1.02-2.03], p=0.040) were associated with hospitalization.

Conclusions: Male gender, increased HbA1c, and increased BMI are associated with hospitalization in youths and young adults with T2D and COVID-19 infection. Further study is needed to identify targeted interventions to prevent hospitalization in youths and young adults with T2D.

ePO04 | **Strong association between health insurance type and adverse outcomes for pediatric and adolescent patients with type 1 diabetes and COVID-19; Data from the T1D Exchange COVID Registry**

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Introduction: Health insurance coverage type differs significantly by socio-economic status and racial groups in the United States. There is limited data on the association between insurance and the risk of adverse outcomes for patients with pre-existing T1D and COVID19.

Objectives: The aim of this study was to determine if publicly insured pediatric and adolescent patients with Type 1 Diabetes (T1D) were more likely to experience adverse outcomes compared to privately insured patients with acute COVID-19 infections.

Methods: Data from 575 patients with previously established T1D aged <24 years with acute COVID-19 infections was analyzed from the T1DX-COVID-19 Surveillance Registry. Data for the registry was collected from 52 endocrinology clinics across the U.S, using an online survey tool. Each site completed the survey using electronic medical record (EMR) data between April 2020 and May 2021.

Results: Privately insured patients were more likely to identify as Non-Hispanic White than publicly insured patients (63% vs 18%, p<0.001). T1D patients with COVID-19 that were on public insurance reported higher A1c (9.5% vs 7.9%, p<0.001), lower insulin pump use (29% vs 62%, p<0.001), as well as lower continuous glucose monitor (CGM) use (51% vs 77%, p<0.001) compared to privately insurance patients. Publicly insured patients with T1D and COVID-19 were three times more likely to be hospitalized than privately insured patients (Odds Ratio 3.4, 95% Confidence Interval: 2.1-5.4).

Table: Characteristics of Public vs Private insurance among patients with laboratory confirmed COVID-19 and previously established type 1 diabetes (N=575)

	Public Insurance N=238	Private Insurance N= 337	P-value
	N(%)	N(%)	
Mean Age (SD) Years	15.1 (4.6)	16.4 (4)	<0.001
Age Category (Years)			0.02
0 to 5	10 (4)	4 (1)	
6 to 10	22 (9)	32 (9)	
11 to 15	91 (38)	99 (29)	
16 to 19	73 (31)	124 (37)	
20 to 24	42 (18)	78 (23)	
Female	135 (57)	161 (48)	0.04
Race/Ethnicity			<0.001
NH White	86 (36)	275 (82)	
NH Black	54 (23)	17 (5)	
Hispanic	82 (34)	31 (9)	
Other	16 (7)	14 (4)	
Median A1c (IQR),%	9.5 (3.6)	7.9 (2.1)	<0.001
Mean A1c (SD),%	10 (2.5)	8.4 (1.9)	<0.001
Duration of T1D			0.1
< 1 year	23 (10)	21 (6)	
1- 5 years	105 (44)	135 (40)	
> 5 years	110 (46)	181 (54)	
CGM Use	121 (51)	259 (77)	<0.001
Insulin Pump Use	70 (29)	210 (62)	<0.001
Level of Care			<0.001
ICU	33 (14)	13 (4)	
In-patient Hospitalization	31 (13)	20 (6)	
Non-Hospitalized	174 (73)	304 (90)	
Adverse Outcomes			<0.001
DKA	51 (21)	21 (6)	
Severe Hypoglycemia	3 (1)	4 (1)	
None	173 (73)	295 (88)	

Conclusions: Our data reveals a high rate of hospitalization and DKA among children and adolescents with T1D and COVID19 with public health insurance despite controlling for other potential confounders. This underscores that those on public health insurance are more vulnerable to adverse health outcomes during the COVID19 pandemic.

ePOO5 | Diabetic ketoacidosis rates rose among patients with type 1 diabetes during U.S. COVID-19 peaks with highest burden on non-Hispanic Blacks

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Introduction: The COVID-19 pandemic has had far-reaching consequences for individuals with type 1 diabetes (T1D) and has laid bare inequities in health care.

Objectives: We sought to examine the United States (US) trends in diabetic ketoacidosis (DKA) across the lifespan during the COVID-19 pandemic and factors associated with these trends, compared to DKA rates the year prior to the pandemic.

Methods: The T1D Exchange Quality Improvement Collaborative (T1DX-QI) collected aggregate data on the incidence of DKA among children and adults with established and new-onset T1D from 7 large medical centers in the US (total T1D population >15,000). We compared DKA rates during COVID-19 Wave 1 (March-May 2020) and COVID-19 Wave 2 (August-October 2020) to the same periods in 2019. Descriptive statistics were used to summarize data. Chi-square tests were used to compare differences in patient characteristics.

Results: DKA rates were higher in patients with established T1D during COVID-19 Wave 1 compared to the same period in 2019 (6.15% vs 4.71%, p=<0.001). DKA rates were also higher in patients with established T1D during COVID-19 Wave 2 compared to 2019 (5.55% vs 4.90%, p=0.02). There were no differences in rates of DKA by age or DKA severity. DKA rates were lower among individuals on insulin pumps during both COVID-19 waves compared to 2019 (Wave 1: 6.43% vs 10.25%, p=0.008; Wave 2: 8.14% vs 11.21%, p=0.03). Consistent with known T1D inequities, DKA rates were exacerbated for NH Black patients in 2020, with 18% of NH Blacks with T1D experiencing DKA compared to 6% of NH Whites.

Conclusions: DKA rates rose among patients with T1D during US COVID-19 Waves 1 and 2, with the highest rates among NH Blacks. These findings highlight the urgent need for improved strategies to decrease the risk of DKA in individuals with T1D under pandemic conditions, especially among populations most affected by health inequities.

ePOO6 | Anthropometric measurements and laboratory investigations in children and youth with Type 1 diabetes (T1D) before and during the COVID-19 pandemic

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Introduction: At the onset of the COVID-19 pandemic, the Diabetes Clinic at BC Children's Hospital (BCCH) in British Columbia (BC), Canada experienced a rapid shift from in-person to telehealth visits. Virtual diabetes care has shown to be feasible and effective and will likely continue beyond this pandemic. However, there are still many challenges.

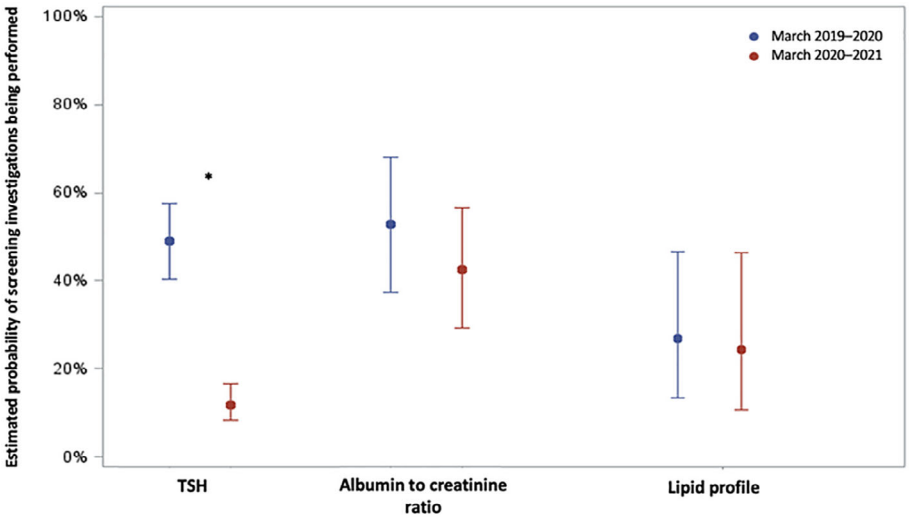
Objectives: To compare rates of measurement of height, weight, blood pressure (BP), A1c and laboratory screening for diabetes-related complications (based on clinical practice guidelines), 1 year before and after the onset of COVID-19.

Methods: Retrospective review of the BC Pediatric Diabetes Registry that includes clinical data of patients seen in the BCCH Diabetes Clinic. Inclusion criteria were children and youth with T1D who had at least one visit during March 2019-2021. Logistic and Poisson mixed effect models were used.

Results: Among 434 patients included, mean (SD) age and time since diagnosis were 12.2 (3.92) and 5.49 (3.72) years, respectively. Mean (SD) A1c was 8.1% (1.53). Table 1 shows the number of clinic visits, anthropometric and A1c measurements per patient during both periods. Over the pandemic year, 47% of patients had no growth data,

Table 1. Number of clinic visits, anthropometric, blood pressure and A1c measurements, per patient

	Pre-COVID onset (March 19th, 2019–March 18th, 2020)	During COVID pandemic (March 19th, 2020–March 18th, 2021)	RR[1] (95% CI), p-value
# of clinic visits, mean (SD)	2.10 (0.72)	2.21 (0.66)	1.06 (1.01–1.10), p=0.01
# of height measurements, mean (SD)	2.09 (0.72)	0.68 (0.73)	0.32 (0.28–0.36), p<.0001
# of weight measurements, mean (SD)	2.09 (0.72)	0.73 (0.72)	0.34 (0.31–0.38), p<.0001
# of BP measurements, mean (SD)	2.00 (0.72)	0.01 (0.10)	0.005 (0.002–0.014), p<.0001
# of A1c measurements, mean (SD)	2.82 (1.20)	1.47 (1.21)	0.52 (0.48–0.57), p<.0001



21% had no laboratory measured A1c, and only 1% had BP measurements. Screening for hyperthyroidism and nephropathy showed a downward trend (Figure 1)

[1]Estimated relative risk, after adjustment for age, sex, time since diagnosis, A1C before COVID onset, pump use and CGM use

Conclusions: After the shift to telehealth diabetes clinic visits, our patients had a dramatic decrease in anthropometric, A1c and BP measurements. Laboratory screening for complications was already suboptimal and continued to decline post-pandemic onset. Our data show a hybrid model of virtual and in-person visits are needed to ensure standards of care related to anthropometric and laboratory screening for children and youth with T1D. Understanding patient and provider perspectives on barriers to completing investigations will inform future processes and recommendations.

eP007 | The impact of COVID-19 on diabetes management for adolescents with T1D and their parents

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Introduction: For families with type 1 diabetes (T1D), anxiety from the COVID-19 pandemic may be elevated due to potential for increased vulnerability.

Objectives: We aimed to describe the impact of the pandemic on adolescents with T1D and their parents.

Table 1. Responses to COVID-19 impact questionnaire (modified from an adapted natural disaster tool; Felton et al, 2013) for n=122 adolescents and n=102 parents (percents)

	Not at all - Slightly		Moderately		Very - Extremely	
	Adolescent	Parent	Adolescent	Parent	Adolescent	Parent
Overall, how worried or anxious have you been about the COVID-19 pandemic?	44	29	37	34	19	37
In what ways has COVID impacted your/your child's T1D management?:						
Struggled to properly manage diabetes	71	67	16	20	13	13
Have been worried about having adequate access to T1D supplies	78	85	16	10	7	5
Have noticed more fluctuations/variability in blood glucose levels	58	59	26	21	16	20
Have had better family diabetes management	65	57	22	24	13	18

Methods: In a 2-site (Seattle WA, Houston TX USA) clinical trial of a psychosocial intervention targeting stress/resilience, adolescents 13-18 years old with T1D ≥ 1 year and diabetes distress (PAID-T ≥30) were enrolled with a parent. Using a mixed-methods approach, participants enrolled August 2020-June 2021 completed a survey about the pandemic, including an open-ended question about how COVID impacted T1D management. Survey responses were summarized using frequencies and percentages, and associations between variables were assessed by Chi-squared tests. A1C was extracted from clinical records.

Results: Adolescents (n=122) were 56% female, 80% White race, 18% Hispanic, mean A1c = 8.5±2.1%. Parents (n=102) were 79% White, 14% Hispanic, 61% college graduate, 67% reporting annual household income ≥75K USD. 10% of adolescents reported history of COVID-19 infection, 51% had a family member/other important person diagnosed, and 12% had a family member/other important person die from COVID-19 complications. 49% of parents reported loss of job or salary reduction. 29% of adolescents and 33% of parents reported significant struggle to manage T1D during the pandemic (Table 1). Adolescents who reported more difficulty with T1D management were more likely to have A1C ≥ 8%, p<.01. Qualitative themes indicated perceived positive, negative, and neutral effects of the pandemic on: T1D self-care, exercise, food, mental health, telehealth, and motivation.

Conclusions: Discussing how the pandemic impacted families' T1D management may be an important focus for clinicians, especially for adolescents with above-target A1C. Strategies to improve resilience for ongoing and future stress may be of value.

eP008 | Glycaemic control in T1D children and adolescents during Portuguese COVID-19 first lockdown: A family's survey report

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Introduction: From March to May 2020, Portugal was under the first COVID-19 lockdown, which has brought considerable changes to people's lifestyles.

Objectives: To evaluate lockdown impact on glycaemic control in children and adolescents with T1D, and identify its potentially related factors.

Methods: An observational study based on an anonymous questionnaire sent by email to the families with children and adolescents with T1D living in Portugal. Collected variables: demographics, age at onset, insulin treatment, glycaemic control, lifestyle, mental health, SARS-CoV-2 infection, contact with the diabetes team. Data before, during, and after the lockdown was compared.

Results: We enrolled 337 subjects, 50% males, with a median age of 13(2-19)y, and a median T1D duration of 5(0-17)y. 87% were on CSII, and 84% had CGM (42% with real-time connection to the caregivers). Before lockdown, median daily exercise was 1(0-4)h, median HbA1c was 7.4(5.2-14.8)%, and median TIR was 60(20-93)%.

From March to May 2020, physical activity decreased [Δ -0.5(-3 to 2) h/day; p=0.01], 50.9% of subjects put on weight, and 75.3% needed a rise in total daily insulin. There were 16 cases of metabolic decompensation, mainly for pump failure or insulin omission. When compared to the previous period, there were no differences in median HbA1c [Δ 0 (-5.5 to 3.4)%] or median TIR [Δ -2(-24 to 25)%]. From the 32 SARS-CoV-2 positive cases, 11 had difficulties controlling hyperglycaemia, but only 2 needed hospitalization. In 2020, the median number of appointments per subject was 4(0-10), 30% of which by telemedicine. Only 22.4% of families perceived lockdown as a period of glycaemic deterioration.

Conclusions: Glycaemic control did not worsen in our children and adolescents with T1D across the COVID-19 pandemic. Despite being confined at home with scarce exercise and weight increase, the fear of possible higher infection risk, along with family T1D knowledge and supervision, home meals, and telemedicine might have been relevant factors to this shaky balance.

eP009 | The short- and long-term impact of the COVID-19 pandemic on treatment of Belgian pediatric patients with type 1 diabetes

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Introduction:/

Objectives: The aim of this study was to explore the short- and long-term impact of the COVID-19 pandemic on self-reported changes in treatment. The early impact and the impact one year after the start of the pandemic was explored in this study.

Methods: Pediatric patients and their parents in the diabetes center in Leuven were asked to complete an online questionnaire, securely attached to their medical files. They received the questionnaire for the first time (T1) 4 weeks after the first lockdown in Belgium. Exactly one year later (T2), the same questionnaire was sent. The questionnaire covered changes in diabetes treatment, more specifically insulin injections, glycaemia measurements, nutrition, exercise and general diabetes care.

Results: At T1, 33 adolescents (A) and 96 parents (P) of 84 children completed the questionnaire. At T2, 28 adolescents and 95 parents of 83 children completed the questionnaire. At T1, changes in treatment were mostly positive, including extra glycemia measurements (A: 45,5%; P: 40,6%), better adaptation of insulin dosage according to diet and glycemic values (A: 72,7,5%; P: 65,6%), healthier meal choices

(A: 66,7%; P: 52,1%), and improved glycemic control (A: 78,1%; P: 58,4%). Many reported to have a different daily structure. At T2, changes in treatment were variable. 39,5% of the adolescents reported to do more glycemia measurements, insulin doses were better adapted (A: 57,1%; P: 34,4%) and healthier meal choices were made (A: 53,6%; P: 40,9%). Less people reported having better metabolic control (A: T1 = 78,1%, T2 = 42,9%; P: T1 = 58,4%, T2 = 33,3%) and having a different daily structure.

Conclusions: Self-reported changes in treatment were overall positive at T1, indicating resilience in self-management in patients with type 1 diabetes and their parents in the early stage of the international pandemic. Positive effects on self-reported changes in treatment lasted until T2 but their effect waned. Further research is necessary to elucidate the cause of these changes.

eP010 | Increase in blood glucose level and incidence of diabetic ketoacidosis in children with type 1 diabetes in the Daegu-Gyeongbuk area during the COVID-19 pandemic

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Introduction: In Korea, the first imported case of coronavirus disease 2019 (COVID-19) was confirmed on January 20, 2020. After the first case in the Daegu-Gyeongbuk area reported on February 18, 2020, there was a rapid increase in the number of patients, which was the first large outbreak in countries other than China. The COVID-19 outbreak in the Daegu-Gyeongbuk area in 2020 has caused difficulties in the daily life and hospital care of children with type 1 diabetes (T1DM).

Objectives: We detected an increase in overall blood sugar levels compared to the levels before COVID-19 in patients with T1DM in the Daegu-Gyeongbuk area and also encountered new patients who were hospitalized with more severe diabetic ketoacidosis (DKA).

Methods: This study was conducted in a single center, Kyungpook National University Hospital. The following patient groups were included: (1) 45 returning patients diagnosed with T1DM and undergoing insulin treatment for more than 2 years and (2) 20 newly diagnosed T1DM patients were selected by age matching before and after COVID-19. Returning patients before and after the outbreak were selected, and changes in hemoglobin A1c (HbA1c) was retrospectively reviewed. The HbA1c level and the severity of symptoms of newly diagnosed patients during hospitalization were examined.

Results: HbA1c levels in returning patients with T1DM were significantly increased after COVID-19 (before: 7.70%±1.38% vs. after: 8.30%±2.05%, p=0.012). There were 10 and 10 newly diagnosed patients before and after COVID-19. The proportion of patients with drowsiness and dyspnea at the time of admission was higher after COVID-19 than before (before: 2/10 [20%] vs. after: 4/10 [40%]). The HbA1c level was higher in newly diagnosed patients hospitalized after COVID-19 than before (before: 11.15% vs. after: 13.60%, p=0.036).

Conclusions: Due to COVID-19 in the Daegu-Gyeongbuk area, there was an increase in blood sugar level in children with T1DM and in severe DKA incidence in newly diagnosed diabetes patients.

eP011 | Metabolic control and cardiovascular (CV) risk factors in adolescents with T2DM in the pandemic year: a multicentre study

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Introduction: Lockdown due to pandemic has caused an increase in BMI and CV risk factors in obese patients (pts), while pts with T1DM showed greater glucose stability with unchanged HbA1c levels. Obese adolescents with T2DM may have been negatively affected by social restrictions.

Objectives: Primary aim of the study was to compare HbA1c levels between pre-lockdown and first 4 months of 2021 of adolescents with T2DM. Secondary aims were to compare BMI, total and HDL cholesterol, triglycerides between the 2 periods.

Methods: We collected data of 56 pts (23 M, 33 F) from 12 Italian centres of the Italian Society for Pediatric Endocrinology and Diabetology (ISPED). Inclusion criteria were age 10-20 years, T2DM, visit 1 in the 4 months before lock-down and same parameters at visit 2 in the first 4 months of 2021. Age at diagnosis was 13.1±2.7 yrs and 14.7±2.4 yrs at visit 1, family history for T2DM in one or both parents in 57% of cases.

Results: HbA1c levels showed a non significant increase between visit 1 and 2 (7.1±1.8 vs 7.3±2.1%; p=NS). In 22 pts HbA1c increased by more than 0.5%, in 12 decreased (<0.5%). 20 pts showed a HbA1c>7% at visit 1 and 24 at visit 2. There were no significant changes between the 2 visits as for BMI (31.2±5.9 vs 31±6.2), total cholesterol (176±35 vs 178±31 mg/dl), HDL cholesterol (43.6±9 vs 45.5±12 mg/dl), triglycerides (143±198 vs 130±73 mg/dl). There were no differences between the 2 sexes. HbA1c at visit 1 was positively correlated with that of visit 2 only in females (p=0.0001). Treatment at visit 1 was none in 4 pts, metformin in 27 pts, insulin in 8 pts and

metformin+insulin in 17 pts. Pts on insulin were 25 at visit 1 and 22 at visit 2.

Conclusions: The long period of social restrictions does not seem to have affected metabolic control and CV risk factors in our adolescents with T2DM followed in the Italian centres of the ISPED. Metabolic control was apparently more irregular in male patients compared to that of female patients.

ePO12 | Association between COVID exposure, impact, and distress and pediatric diabetes quality of life in youth with type 1 diabetes

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Introduction: The COVID-19 pandemic has caused significant disruption to normal day-to-day life, including physical, mental, and social health. The impact of COVID-19 on quality of life in youth with type 1 diabetes (T1D) is not known.

Objectives: This study utilized the COVID-19 Exposure and Family Impact Survey (CEFIS) to examine COVID exposure/impact and quality of life in a pediatric T1D population over 6 months.

Methods: Parents of youth with T1D (mean age 11.6±4 yrs, mean T1D duration 5.3±3.9yrs, 57.4% male) completed the CEFIS (score ranges: Exposure 0-25, Impact 0-4 with >2.5 indicating negative impact, and Distress 1-10). Parents and youth completed the PedsQL Diabetes Module 3.0, (higher scores indicate better quality of life). Measures were obtained at baseline (Sept to Nov 2020), 3 months (Dec 2020 to Feb 2021), and 6 months (Mar to May 2021). Changes in scores and associations between CEFIS and PedsQL scores were analyzed.

Results: Survey scores indicated a relatively low COVID exposure at all time points (7.7, 7.9, and 8.0). Impact was unchanged throughout the study (2.7 at all times), however, it was above 2.5, indicating negative impact. Overall, distress was significantly lower at 6 months compared to baseline (4.8 to 4.4, p=0.045), yet parents also reported a significant decrease in total child quality of life at 6 months (p=0.021). Increasing CEFIS scores (Exposure, Impact, and Distress) were associated with decreasing PedsQL total scores for both parent proxy and child surveys (p<0.05 for each CEFIS scale) (Table).

Conclusions: Despite relatively low COVID exposure, families of youth with T1D have been negatively impacted by the pandemic. Pediatric quality of life was significantly lower with increased COVID exposure, impact, and distress, highlighting the importance for health care providers to consider the psychosocial impact of the COVID pandemic on this population. Further research is needed to determine the effect on T1D management.

ePO13 | Diabetes related distress in children with type 1 diabetes before and during the COVID-19 lockdown in spring 2020

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Introduction: Diabetes distress (DD) is contributing to psychological burden in children with type 1 diabetes (T1D) and in their parents. DD might be influenced by additional stressors such as COVID-19 pandemic.

Objectives: We aimed to compere DD before and during the national COVID-19-related lockdown when schools operated on-line.

Methods: Problems Areas in Diabetes-Child (PAID-Ch), Teen (PAID-T) and Parent (P-PAID-Ch, P-PAID-T) questionnaires in paper version were used to evaluate DD before COVID-19 pandemic (November 2019-February 2020). During the lockdown (April 2020) the same surveys were performed by phone. Problem areas covered by PAID questionnaires include: emotional burden, diabetes therapy and regimen-specific burden, family and friends-related distress. During the lockdown parents were additionally asked semi-open questions concerning the impact of the pandemic on diabetes care-related difficulties and worries. Between-group

Table. Association between CEFIS and PedsQL Scores*

	Exposure	p-value	Impact	p-value	Distress	p-value
Parent PedsQL Total	-0.9	**0.001**	-7.1	**<0.001**	-1.6	**<0.001**
Child PedsQL Total	-0.6	**0.048**	-4.0	**0.024**	-1.1	**0.013**

*for every 1-point increase in CEFIS score (Exposure, Impact, and Distress), PedsQL score changed by the points shown

comparisons were performed with Mann-Whitney's U test; changes in each score were assessed with Wilcoxon's test for dependent observations.

Results: We enrolled 76 patients (median age [25-75%]: 13.6 [11.8-15.2] years; 21 children, 55 adolescents; T1DM duration 3,7 [1.7- 6.8] years). In teens PAID score decreased during the lockdown (-3.0 [-11.0-3.0], p=0.018); evidently in girls (girls vs boys p=0.028). In children (-3.0 [-14.0-7.0], p=0.131) and parents PAID score did not change (teens' parents: 3.0 [-9.0-10.0], p=0.376; children parents: -5.0 [-9.0-1.0], p=0.227). There was a significant difference in PAID score change between children's parents who did not report COVID-19-related worries (-10.5[-17-(-6)]) compared with those who did report such worries (0 [-7(-8)], p=0.021.

Conclusions: COVID-19-related lockdown was associated with decrease in DD in teens with T1D, while no significant change in DD was observed in children or parents. DD decrease in teens during the pandemic should attract attention to the potential "rebound" of DD related to return to regular on-site school routine.

ePO14 | Impact of pandemic on profile and outcome of patients with new onset Type1 diabetes

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Introduction: The COVID-19 infection which started in Wuhan China in 2019 spread to United Kingdom in 2020. The pandemic had a profound impact on how we deliver care with increased use of virtual platforms for clinics and ward reviews.

Objectives: In this study we sought to study the impact of the pandemic on the profile of patients with new onset Type 1 diabetes (nT1DM) and their glycaemic outcomes.

Methods: In this retrospective cross-sectional study, we have extracted information from case notes and Paediatric Diabetes database of patients attended Sandwell trust diagnosed with (nT1DM) between April 2019-march 2020 (Study year1; SY1) and compared it to those diagnosed between April 2020-march 2021(Study year 2; SY2). Information extracted included in the below table.

Results: We reviewed 63 records (53 diagnosed in SY2 compared 28 in SY1). The differences in profile, outcome and management are shown in Table 1. Patients diagnosed in SY2 had significantly higher HBA1c, lower pH and were more likely to present in DKA than those diagnosed in SY1. There was no difference in glycaemic outcome (HbA1c) at 3 months post diagnosis (55mmol/mol in SY1 vs 54.5mmol/mol in SY2). None the 46/53 pts in SY2 who had COVID -19 PCR swabs done was positive.6/11(54.5%) CYP who had COVID-19 antibody test done in SY2 were positive.100% of patients in both SY1 and SY2 received daily contact from the MDT for the 1st 7 days in line with Trust guideline.

Conclusions: We noted an increase in the number of children presenting to our centre with nT1DM. Although patients with nT1DM were more likely to present in DKA during the pandemic, there appears to be no difference in short term glycaemic outcome as the diabetes team was able to adapt to supporting patients both virtually and in person during the pandemic. Increase in % presenting DKA during the pandemic has been previously reported and may be due to delay in seeking medical help by families.

Table 1: Differences in profile and outcome between the 2 study years.

		SY1 2019-2020	SY2 2020-2021
Total number diagnosed		n=28	n=53
Mean age at Presentation		9.8yr.	8.5 yr.
% of nT1DM age 5yr or less		14.28%	30.1%
Ethnicity	%Caucasian	53.5%	33.96%
	% Asian	21.4%	37.74%
	% Black	25%	16.98%
	%mixed race	0%	7.55%
% with associated autoimmune disorders at presentation	Coeliac disease	14.28%	7.55%
	Thyroid disorder	0%	1.89%
% with family history of autoimmune conditions	Thyroid	10.7%	5.66%
	Coeliac disease	0%	0%
	Type 1 diabetes	32.14%	32.08%
	Other autoimmune conditions.	3.57%	5.67%
Mean pH at diagnosis		7.32	7.22
Mean HBA1C at diagnosis		92.23	103.21
% Presenting in DKA at diagnosis		49.95%	52.82%
% receiving daily contact from MDT in the 1st 7 days following diagnosis		100%	100%
mean HBA1c at 3 months post diagnosis(mmol)		55	54.5
Median HbA1c (mmol)	At diagnosis	95	104
	At 3 months	53	52

eP015 | Has the COVID-19 pandemic second wave affected Diabetes Ketoacidosis (DKA) frequency and ICU admission in newly diagnosed children with Type 1 Diabetes (T1D) in Kuwait?

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Introduction: The COVID-19 pandemic had affected the access to the healthcare facilities across the globe. In Kuwait, first wave of COVID-19 pandemic was announced on February 24th, 2020. Kuwait has implemented public health measures including total lockdowns, unavailability of the diabetes clinics, and limited access to the hospitals. The second wave of COVID-19 pandemic was declared on March 7th, 2021. Virtual visits, clinics availability, and easier access to the hospitals might change DKA at presentation and ICU admission in newly diagnosed children with T1D in the second wave

Objectives: To compare DKA presentation and ICU admission in newly diagnosed children with T1D during the first and second waves of COVID-19 pandemic using data from Childhood Onset Diabetes electronic Registry (CODeR)

Methods: Data were extracted from CODeR. Patients aged less than 14 years at diagnosis during (Feb 24th-May 30th) in 2020 and 2021 were included

Results: Total number of children with T1D between (Feb-May) in 2020 were 54 children compared to 97 in the same period in 2021. There was no significant difference between the HbA1c levels in both periods (11.56±2.1 vs 11.64± 2.2; p=0.84) and the frequency of DKA among both groups as well (53.7% vs 47.47%; p=0.53). However, there was a slight decrease in the frequency of moderate DKA (48.26% in 2020 vs 27.65% in 2021; p=0.08). No significant changes were reported in the frequency of mild or severe DKA presentation in both groups (65.9% vs 72.4%; p=0.61) and requirement of ICU admission (11.11% vs 16.49%; p=0.36)

Conclusions: Although there has been a slight decrease in the number of patients presented with moderate DKA in 2021 compared to the same period in 2020. However, severe DKA rates and requirement of ICU admission didn't differ in both periods. Future studies to explore frequency of DKA, ICU admission, and other possible factors are needed over a longer periods for a better understanding of the impact of COVID-19 pandemic on DKA as they change as the COVID-19 pandemic continues

eP016 | Factors associated with hospitalization in youths and young adults with type 1 diabetes and COVID-19 infection

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Introduction: Numerous studies have investigated the impact and increased severity of coronavirus disease 2019 (COVID-19) in adult patients with diabetes. However, findings from older adult patients cannot be generalized to affected children and young adults.

Objectives: In this nationwide retrospective cohort study, we examine whether race/ethnicity and other factors are associated with hospitalization and diabetic ketoacidosis (DKA) in pediatric and young adult patients with type 1 diabetes (T1D) and COVID-19 infection.

Methods: The de-identified COVID-19 patient dataset from the December 2020 release of *Cerner Real-World Data*™ contains longitudinal data for patients who received care at 87 US-based health systems between December 2019 and September 2020. We used a validated algorithm to identify patients with T1D. Analysis was limited to patients <27 years old with a positive laboratory test or billing code consistent with COVID-19 infection. Generalized linear mixed models were used to examine race/ethnicity, gender, HbA1c, body mass index (BMI), mean blood glucose, age, payer, and Elixhauser comorbidity score (ECS) as correlates of hospital admission and DKA.

Results: In this T1D cohort (n=224), 151 patients (67.4%) were 18-26 years old, and 122 (54.5%) were female. Of these, 41.1% were Hispanic, 30.8% were non-Hispanic White, and 17.4% were non-Hispanic Black. Median HbA1c was 11.1% (IQR 9.0-12.8%). A large majority of patients (65.6%) were hospitalized, and 37.1% of T1D patients were in DKA. In the non-DKA cohort, ECS was associated with hospitalization (OR 1.06 [CI 1.00-1.11], p=0.035), and there was evidence of an association for HbA1c (OR 1.23 [CI 0.99-1.53], p=0.057). Factors associated with DKA included HbA1c (OR 1.41 [CI 1.18-1.69], p<0.001) and public insurance (OR 2.52 [CI 1.01-6.28], p=0.047).

Conclusions: In patients who were not in DKA, higher ECS was associated with hospitalization, while public insurance was significantly associated with DKA for patients who were in DKA.

eP017 | Perception of adaptation of health care for people with type 1 diabetes during the SARS-COV-2 pandemic in Chile

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Introduction: The SARS-CoV-2 pandemic forced health teams to modify their care for patients with T1D. It is unknown if these changes were adequate in Chile.

Objectives: To evaluate the perception of access to treatment for people with T1D in Chile during the first semester of SARS-CoV-2 pandemic.

Methods: A specific survey was created and piloted. It was distributed electronically by a national educational NGO during 2020 July and August. The instrument evaluated the communication and frequency with the health team, as well the frequency of delivery of the medical supplies provided by law.

Results: 776 people with T1D or their parents answered. The median age was 12 years (range 2-68). 44% referred care in child/youth centers. 51% were from public health and 49% from private. The average of last HbA1c recorded was 6.9%.66% were informed about the change in the way of visits of their team. 48% reported had visits, 22% tried without success and 30% did not. 45% had visits with a doctor, 28% with a nurse, 17% with a nutritionist and 9% with a psychologist. In all cases, the modality of greatest use was virtual, such as calls, video calls, email and/or instant messaging (73, 72, 83 and 88% for each professional, respectively). Only 37% reported they received information regarding COVID-19 and T1D. 60% of surveyed report being "satisfied" or "very satisfied" with their diabetes health team. Strips, insulins, and pump/CMG supplies were guarantees and delivered monthly in the centers of care (accessed by 86, 87 and 91% respectively), without restrictions (full delivery for 77, 89 and 99% respectively.

Conclusions: Remote control for people with T1D has been possible during the pandemic but needs to increase. Telemedicine allowed visits with doctors and nurses. The delivery of supplies has been maintained. Despite the satisfaction with the medical care, a low proportion reported received information regarding COVID-19 and diabetes. Communications with the patients and families needs to improve in Chile.

eP018 | Perceptions of lifestyles changes in people with type 1 diabetes during the SARS-COV-2 pandemic in Chile

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Introduction: It is unknown if lifestyles changes forced by SARS-COV-2 interfere with the treatment in people with T1D.

Objectives: To assess the perceptions of lifestyle changes in patients with T1D during the pandemic in Chile.

Methods: A specific survey was created and piloted. It was distributed by a national educational NGO during 2020 July and August. The instrument evaluated changes regarding the pre-pandemic habits in alimentation, sleep, physical activity, and emotionality through a Likert questions

Results: 776 people with T1D or their parents answered. The median age was 12 years (range 2-68). 44% referred care in child/youth centers. 51% were from public health and 49% from private. The average of last HbA1c recorded was 6.9%. 40% referred economic burden during the pandemic and 30% have participated in diabetes support networks.

36% of surveyed reported they maintain pre-pandemic routine, while 51% generated a new routine. 81% reported practicing less physical activity during the period and 9% more. 35% of people believe that they eat more and 12% less, being less healthy for 26% and healthier for 13%. 41% report they modified their sleep "many times" or "always" and 30% report problems falling asleep; 66% refer the change has impacted their treatment.

51% report emotions that interfered with treatment-related behavior. 49% report anger, 46% frustration, 46% sadness and 43% nervousness. Change of routine also generated positives aspects: 46% referred more time with the family, 22% more supervision and 17% restructuring of schedules; 14% reported they do not see any positive aspects.

Conclusions: People with T1D in Chile changed their lifestyle during the SARS-CoV-2 pandemic. Alimentation, physical activity, and sleep have been disadvantaged aspects. Negative emotions are experienced by half of the respondents, interfering with diabetes care. Despite this, there are positive aspects that have emerged. It must be evaluated whether these factors will condition a change in the metabolic control of these persons.

eP019 | How young adults with type 1 diabetes responded to the beginning of the COVID-19 pandemic: A qualitative thematic analysis

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Introduction: The COVID-19 pandemic is an unprecedented stressor that caused a major disruption in social, economic, educational, and health care systems.

Objectives: In the current study, we aimed to better appreciate how young adults (YA) with type 1 diabetes (T1D) perceived their own T1D affecting their response to the beginning of the COVID-19 pandemic.

Methods: As a part of a larger study, we selectively recruited 30 YA with T1D to ensure representation across age, gender, and race/ethnicity (age 18-25, M=21; 60% Female; 63% Non-Hispanic White, 17% Hispanic/Latino, 13% non-Hispanic Black, 3% Asian, 3% Native American) to participate in a private online forum from March 18 to May 13, 2020. The principal investigator (RW) facilitated an online focus group by posting weekly questions to the forum, including one question about COVID-19: "How (if at all) does having T1D affect how you responded/are responding to the COVID pandemic?" Eighteen participants responded to the COVID question, averaging

Table

Theme	Definition	Example Quote
Change/Loss	Something or someone that the young adult expresses as being different than it was before the COVID-19 pandemic	*I rarely go to the store anymore.*
Emotions/Burden	Descriptions of emotions or an emotional reaction during this time, or a description of burdens (time, cognitive, or other) at this time.	*Covid-19! I'm so worried I'm going to get it… I don't know how my body would handle it… so scary.*
Relationships	Descriptions of relationships between the individual and others during this time of the COVID-19 pandemic.	*I'm fortunate to be at home with my parents and my sister.*
Vulnerability	Perceptions about factors about the individual that may increase or decrease his/her vulnerability for contracting the COVID-19 virus or experiencing worse complications of COVID-19 virus.	*I understand that I have a preexisting condition and it may be more difficult for me to recover from COVID than other people so I do take that into account.*
Riskiness of a Situation	A person's evaluation of a situation or environment that puts him/her at greater or lesser risk for contracting the COVID-19 virus.	*I live in New York but as things got rapidly worse there I made a 14 hour drive in one day to stay in FL with my parents.*
Control	Behaviors, thoughts, or decisions that individuals describe that relate to a feeling of more or less control over their risk of exposure to COVID-19.	*I sanitize chip bags now. I mean, it's working, but… who am I?? lol.*
Employment	Any comment related to one's past, present, or future employment, and related topics such as compensation and insurance.	*It is always in my mind that I am more susceptible to it. I really cannot do anything about it though because I am an essential worker*
Diabetes/Medical/Healthcare	Comments that refer specifically to one's diabetes or to their experience and interactions with the healthcare system related to having diabetes.	*I had to use a teladoc because the hospitals where I live won't see me because I am not an established patient.*
Benefit-finding/Resilience	Silver lining and positive impact of the COVID-19 pandemic, and comments related to resilience and/or coping behaviors.	I'm just grateful that if I did get it, I would see my body fighting it in my blood sugars and recognize that I had it earlier than a non-diabetic would.

61 words per response. RW and a senior research coordinator (AT) analyzed transcripts using inductive thematic analyses, as outlined by Braun & Clarke (2008). RW and AT coded the transcripts, generated a code book, and then re-coded the transcripts with the agreed-upon codes. Another research team member (JP) resolved any discrepancies between RW and AT's coding. Finally, research team members (AT and RW) identified and defined overarching themes.

Results: Nine themes emerged specific to change/loss, emotions/burdens, relationships, vulnerability, riskiness of a situation, control, employment, diabetes/medical/healthcare, and benefit-finding/resilience (see Table 1).

Conclusions: Reactions to the COVID-19 pandemic varied widely among YA with T1D. Having a better understanding of the challenges that YA with T1D faced early in the pandemic may assist healthcare providers in providing ongoing support.

ePO20 | **Health-related quality of life and metabolic control in young patients with type 1 diabetes and in their parents before and after the COVID-19 lockdown**

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Introduction: Since the beginning of the COVID-19 pandemic, concerns for consequences in patients with type 1 diabetes (T1D) were raised.

Objectives: To compare the diabetes-specific health-related quality of life (D-HRQOL) of youths with T1D and their parents before and after the COVID-19-related lockdown.

Methods: The Pediatric Quality of Life Inventory™ 3.0 Diabetes Module (PedsQL™ 3.0 DM) was used to evaluate the D-HRQOL. Patients who filled the D-HRQOL before lockdown (Dec-19–Feb-20; T0) were recruited in the study and filled the same survey immediately after the lockdown was stopped (Jun-20; T1) during a routine outpatient or telemedicine visit.

Results: Sixty-two patients (median age: 12.6 [5.25-17.8] yrs; T1D duration 4.23 [0.45- 16.4] yrs) with T1D and their parents (60 mothers, 10 fathers) were enrolled. Patients' scales scores did not significantly change from T0 to T1. Mothers significantly increased their *Diabetes symptoms* scale score (median 67.0 vs. 70.4; p=0.007).

Data were also analyzed according to visit type (outpatient vs. telemedicine), glucose monitoring (SBGM vs. isCGM vs. rtCGM), and insulin therapy (MDI vs. CSII), but D-HRQOL data were longitudinally comparable and no difference was found between groups. During lockdown no DKA, severe hypoglycemic events, and SARS-CoV-2 were recorded. Despite the significant decrease of exercise (median 3.25 vs. 0.50 h/week; p<0.0001), median glycemic control (HbA1c 58.5 vs. 57.9 mmol/mol) and total daily insulin dose (0.86 vs. 0.82 IU/kg/day) were unchanged. At T1, the lower the HbA1c, the better patients' *Diabetes symptoms* (R=-0.41, p<0.001), *Worry* (R=-0.27, p=0.032) scales, and total scores (R=-0.33, p=0.009). Similar results were found in parents.

Conclusions: During COVID-19 pandemic-related lockdown the D-HRQOL did not change in children and adolescents with T1D and their parents. Our data may be possibly related to staying at home, making diabetes managements easier and also allowing the maintenance of good glycemic control without acute complications.

ePO21 | Glycemic status and health-related quality of life of type 1 diabetic children in Kuwait during the COVID-19 pandemic

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Introduction: The alarming spread of the COVID-19 virus caused governments to impose imperative lockdowns and quarantines which negatively impacted vulnerable Type 1 diabetes children.

Objectives: The study aim was to assess glycemic status and health-related quality of life (HRQoL) during the pandemic in a cohort of children with Type 1 diabetes (T1D) in Kuwait.

Methods: Patients (aged 2-18) and their parents were recruited from the Childhood-Onset Diabetes electronic Registry (CODeR) and government hospitals. The Pediatric Quality of Life Inventory (PedsQLTM) 3.0 Diabetes Module was used to evaluate disease specific total HRQoL through parent-proxy and self-reports. HbA1c results between February 24, 2020 and March 24, 2021 were collected from hospital records to assess glycemic status.

Results: A total of 150 patients were included in the study (age 9.5 ±3.5 years, 51% males, diabetes duration 3.4±2.3 years). From the surveyed participants, 119 (84%) were on multiple daily injections, 26 (19%) had T1D family history and 132 (90%) were cared by both parents. Determined from 59 available results, mean HbA1c was 9.78%±1.61. Parent-proxy and patient HRQoL reports were similar in score (73.1±13.9 and 73.3±11.8). Patients reported lower QoL in the diabetes symptoms domain (p=0.04) and a higher QoL in the treatment barriers domain (p=0.002). Gender, nationality, and age did not affect HRQoL. Pump therapy and longer diabetes duration (>3 years) were associated with higher parent-proxy total HRQoL (p=0.01, p=0.03). Patients cared by both parents had slightly better glycemic status (9.6%±1.5 vs 10.9%±2.3) and better QoL scores in the diabetes symptoms domain (p=0.04). No statistical association was found between either HbA1c or COVID-19 history and total HRQoL.

Conclusions: In this study, history of personal or family COVID-19 infection did not affect HRQoL. However, special support needs to be given to patients recently diagnosed with T1D, cared for by single parents, and treated with MDI to have a better HRQoL during the pandemic.

ePO22 | Pulmonary mucormycosis and vascular complications in the setting of new-onset diabetes mellitus and COVID-19

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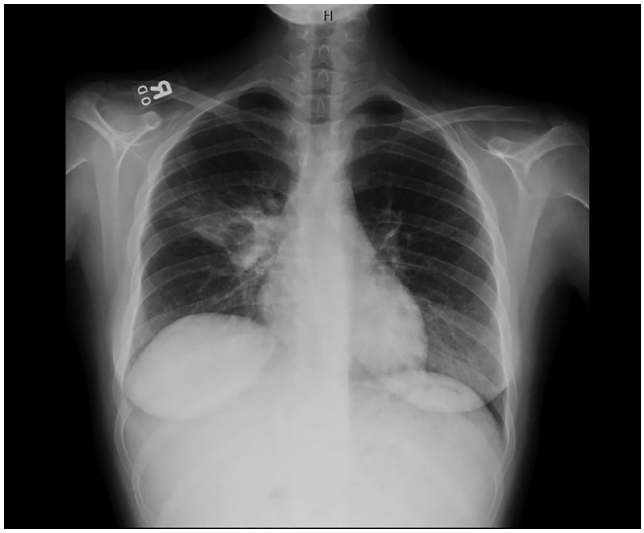
Introduction: We present the case of a 17-year old female who had an unusual course of pulmonary vascular complications in the setting of new onset type 1 diabetes mellitus and Covid-19 infection.

Objectives: Study the course of an unusual case of new onset type 1 diabetes mellitus (T1DM) presenting with diabetic ketoacidosis (DKA) in the setting of COVID-19.

Understand that poorly controlled DM is a pro-inflammatory, procoagulant, and immunosuppressive condition and can synergistically act with SARS-Cov-2 in potentiating endothelial damage.

Methods: A 17-year old previously healthy female was admitted to our institution for management of DKA in the setting of new onset T1DM. COVID test was positive on admission, however, she was afebrile and without respiratory distress at that time. After 2 days, DKA resolved, however, she presented fever. A chest X-ray showed necrotizing multifocal pneumonia with effusion, which was treated with remdesivir and antibiotics. No oxygen supplementation was needed, but course was complicated by right lower pulmonary artery aneurysm, requiring endovascular occlusion. The device eroded into pulmonary artery and a broncho-arterial fistula developed, needing emergent repair and lobectomy.



Results: Histopathology of lung parenchyma showed necrotizing granulomas with hyphae, Mucor was isolated. It was treated with systemic antifungals. Immunologic and rheumatologic workup was negative.
Conclusions: While poorly controlled DM is known to be a pro-inflammatory, pro-coagulant, and immunosuppressive condition, SARS-Cov-2 potentiates endothelial damage, suggesting a possible synergic effect in our patient's unique presentation. While sino-orbital mucormycosis is commonly seen in adults with DM, in children, the infection affects only about 15% with only scarce case reports of pulmonary involvement. Additional studies are needed to understand the synergy of a severe DM presentation with COVID-19 and its potential respiratory and systemic complications.

ePO23 | Our experience of using HbA1c home-testing kits for paediatric type 1 diabetes patients to aid remote consultations during the COVID-19 pandemic

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Introduction: The Reset, Restore & Recover initiative by the Royal College of Paediatricians (RCPCH), encouraged innovations which minimise exposure to and transmission of COVID-19.
Objectives: We introduced a virtual surveillance initiative for Type 1 Diabetic (T1D) children in North West London. This consisted of integrating remote consultations with home HbA1c testing kits to optimise diabetic control.
Methods: An initial telephone survey was conducted of 190 patients to ascertain preference for mode of remote testing.79/190 opted for drive-through HbA1c testing and 106/190 for home testing kits. Home testing kits containing an instruction leaflet and sampling equipment were posted out to patients attending clinics virtually on 4 occasions over a period of 6 months (December 2020-June 2021). The samples were sent to the hospital laboratory for testing via local GP practices with a result ready prior to the next Diabetes clinic appointment. During clinic appointments, parents were asked to provide qualitative feedback on the sampling process.
Results: Out of 35 recruited patients,71.4% had a successfully reported HbA1c result in time for clinic appointment.28.6% of patients failed to receive a result in time for appointment. Within this cohort,30% of samples clotted,10% contained insufficient sample,10% were mis-labelled and 50% of samples were not received by the laboratory. Qualitative feedback highlighted challenges with the sampling process which prompted changes to the instruction leaflet and an alternate lancet device was provided in the packs.
Conclusions: Our experience of using home testing kits was encouraging with a large proportion of patients successfully obtaining HbA1c results. This single method did not, however, work for all patients due to issues with obtaining enough blood and pain. For our large, diverse patient population, both home testing kits and drive-through point of care testing for HbA1c may need to be offered in order to continue with virtual consultations.

ePO24 | The first wave of COVID-19 pandemic on management of type 1 diabetes in pediatric patients

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Introduction: The first wave of COVID-19 pandemic had a great impact on management of many chronic diseases, however, its effect on type 1 diabetes (T1D) has been clear
Objectives: This study attempted to evaluate the glucose control in children and adolescents with T1D during the first wave of COVID-19 pandemic. We focused on three periods in relative to state-imposed restrictions: before, during and after lockdown. Moreover, we assessed the parent's perspective on telehealth care in that period.
Methods: This was an observational, single-centre study. We included patients aged 1-18 treated using both insulin pumps and continuous glucose monitoring (CGM). Data from CGM were collected retrospectively and processed by software to calculate parameters of glycemic variability. In the analysis we included the most complete 30 days of the 2-months periods before, during, and after lockdown. The parents of patients completed a questionnaire regarding the impact of lockdown on T1D treatment as well as satisfaction with telehealth care.
Results: We included 86 patients [median age 11.52 (9.31-14.41) years, T1D duration 3.34 (1.75-5.12) years, yearly-averaged HbA1c 6.94% (6.33-7.45)]. Only coefficient of variation changed significantly over time ($p=0.0213$), decreasing during the lockdown [median change vs baseline -2% (-8% - 3%), post-hoc $p<0.05$], and slightly increasing afterwards [1% (-1% - 3%), post-hoc $p>0.05$]. Mean glucose, TBR<70, TIR70-180, TAR>180 did not change significantly, with mean TIR remaining between 73 and 75% across all timepoints. 47.67% of parents reported increased stress related to caring for their child. However, minority encountered difficulties with childcare (30.23%). Most parents were positive about telehealth care.
Conclusions: In our group, glucose control of T1D did not deteriorate over the analyzed time, despite increased stress and in some cases difficulties in providing care for a child with T1D. Parents also appreciated the physician's extensive assistance in treating T1D.

ePO25 | Health-related quality of life children and adolescents with DM1 from the family support association in lima Peru during COVID-19 pandemic

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Table

Percepción del paciente calidad de vida		
N	Valid	37
	Missing	0
Mean		66,2490
Median		67,8571
Std. Deviation		13,66787
Percentiles	25	58,4821
	50	67,8571
	75	75,0000

Introduction: The care and management of T1D is often stressful for both patient and those responsible for their care. During the COVID-19 pandemic, forced physical isolation could affect health-related quality of life (HRQoL) in these families

Objectives: Determine the HRQL on patients with T1D and their caregivers, in a family support association in Lima, Perú, in the context of the COVID-19 pandemic.

Methods: A descriptive, cross-sectional study was carried out, by means of virtual survey, using PedsQL 3.0, to members of a T1D support association in Lima, Peru, on July 2021. Patients aged 8 to 18 years diagnosed one year earlier were included. Collecting clinical and demographic information: age, sex, family composition, disease duration, HbA1c, type of monitoring, insulin therapy and comorbidity. Data were analyzed with SPSS version 21

Results: 37 patients were surveyed whose mean age was 13.22 $\pm$ 2.51 years (56.8% women) with a time of illness of 3.78 $+$1.76 years. The mean HbA1c in the last year was 7% $\pm$ 1.5. 6% carried out capillary glucose monitoring with test strips (5.22 v/d); 97.3% received MDI and 2.3% by pump. Main person responsible for treatment were mothers (56.8%). An acceptable HRQOL was perceived in group of respondents with a median of 67.9 and the parent's perception of HRQOL was perceived slightly lower with a median of 64.3, in addition, a lower HRQOL was evidenced in females (61 %) in relation to men (31.2%). The group of patients aged 13-18 years perceived a better HRQoL (70.4%) than the group aged 8-12 years (34.8%).

Conclusions: Perception of HRQL was lower in parents than in patients; Female patients perceived lower HRQL than men and those over 13 years of age perceived better HRQoL than those 8-12 years' age. The surveyed patients have not had access to HbA1c control due to the context of Covid -19, however, 56.8% of parents indicate that they had no problems accessing diabetes treatment during Covid-19.

eP026 | Impact of COVID-19 lockdown on glycemic control in Portuguese children and adolescents with Type 1 diabetes

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Introduction: Covid-19 pandemic has forced governments to impose lockdown policies, thus impacting chronic patients who require regular follow-up.

Objectives: The aim of this study was to evaluate the impact of lockdown on glycemic control of type 1 diabetes (T1D) patients

Methods: Retrospective study conducted at the Pediatric Endocrinology Unit of Centro Hospitalar São João in Porto, Portugal. Patients aged 3-18 years with T1D on Continuous Insulin Subcutaneous Perfusion Devices (PCSI) were included. We collected data on the age, gender, BMI, daily insulin dose (DID) and glycemic control of the patients before and after the nationwide lockdown. Telemedicine visits began mid-March 2020 and went on until late May 2020. Patients were included into 3 age groups: 3-9, 10-13 and 14-18 years.

Results: The study included 100 patients, 59 males, mean age of 12.5 years and mean diabetes duration of 7 years. Mean DID was 0,94U/kg for girls and 0,75U/kg for boys. Mean HbA1c was 7.4%, 7.8% and 8.3% for 3-9, 10-13 and 14-18 age groups respectively.

Mean BMI pre and post confinement was 19.8 and 20.2 kg/m2. The lockdown was associated with an increase in all patients' BMI ($p<0.001$), particularly those aged 14-18 ys, in both genders. Difference of glycemic control pre and post lockdown was significant in the 10-13 age group ($p=0.03$), where the baseline and follow-up HbA1c was 7.8% and 8.2%.

Conclusions: An overall increase in BMI may correlate with a lack of physical activity amid confinement. The impaired glucose control in adolescents aged 10-13 years may be explained by the typical insulin resistance of prepubertal and early pubertal children. Metabolic control in older adolescents did not aggravate during the lockdown. This may be due to regular home-cooked meals and close monitoring by parents. In addition, the continuation of health care assistance through telemedicine probably had a significant contribution.

eP027 | Bridging the needs of adolescent diabetes care during coronavirus disease 2019: a nurse-led telehealth initiative

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Introduction: COVID-19 pandemic has changed many lifestyle habits and have been detrimental for children/teenagers with diabetes, including sedentary home-based learning with dietary changes that demanded insulin adjustments. Fear and anxiety to attend clinic visit by parents/child calls for a nurse-led telehealth initiative to ensure an uninterrupted diabetes care for the adolescents.

Objectives: Telehealth as a continuity of care during COVID-19 pandemic

Methods: The APN will send a text message to:

- inform the clinic conversion to telehealth service with verbal consent obtained

- provide instruction for laboratory test for HbA1c (on-site), collection/home delivery of medication, and electronic submission of blood glucose profile.
- start telehealth via phone or video consult with HbA1c result

Results: 35 adolescents attended and 80% T1DM with issues on adjusting insulin doses during school closure and modifying food choices to better stabilize glycemia fluctuations. A user experience survey received a positive response (up to 80%) from both adolescents and parents on telehealth service. Up to 70% felt 'very satisfied' with the administrative processes of telehealth service and will choose APN-led telehealth service. The factors for high satisfaction includes the duration of time spent on APN-led assessment and consultation with at ease to speak, adequate opportunity to ask questions, and being understood over the telehealth session. The adolescents had no emergency visits (diabetes-related events) during the same period. At their next visit to primary physician, the adolescents' glycemia control (HbA1c) remained stable at average of 8.2%. Tis initiative provides an option for pharmacy home delivery service with time saved at hospital waiting for collection of medication.

Conclusions: Pandemics pose unique challenges to health care delivery and while the health systems are re-configured, telehealth has served to bridge the need for continuity of care especially in the management of adolescents with T1DM.

eP028 | Higher rates of diabetic ketoacidosis (DKA) and admission to the pediatric intensive care unit (PICU) among newly diagnosed children with type 1 diabetes in Kuwait during the COVID 19 pandemic

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Introduction: The COVID-19 pandemic might have a multifaceted effect on children with Type 1 Diabetes (T1D), either directly through infection itself or indirectly due to measures implemented by health authorities to control the pandemic.

Objectives: To compare data on children newly diagnosed with T1D in Kuwait during the COVID-19 pandemic to the pre-pandemic period.

Methods: We analyzed data on children aged 12 years or less registered in the Childhood-Onset Diabetes electronic Registry (CODeR) in Kuwait. Data were incidence rate (IR), Diabetic ketoacidosis (DKA) and its severity and admission to the Pediatric Intensive Care unit (PICU).

Results: The IR of T1D was 40.2 per 100,000 (95%CI; 36.0-44.8) during the COVID-19 pandemic period and was not statistically different from pre-pandemic. A higher proportion of incident T1D cases presented with DKA and were admitted to the PICU during the pandemic (52.2% vs 37.8%: p<0.001, 19.8% vs 10.9%; p=0.002 respectively). The COVID-19 pandemic was positively associated with presentation of DKA and admission to PICU (AOR=1.73; 95% CI, 1.13-2.65; p=0.021, AOR=2.04; 95% CI, 1.13-3.67; p=0.018 respectively). Children of families with a positive history for diabetes were less likely to present with DKA and get admitted to the PICU during the COVID-19 pandemic (AOR=0.38; 95% CI, 0.20-0.74; p=0.004, AOR=0.22; 95% CI, 0.08-0.61; p=0.004, respectively).

Conclusions: High rates of DKA at presentation and admission to PICU in incident T1D cases during the COVID-19 pandemic warrant further studies and effective mitigation efforts through increasing awareness, early detection, and timely intervention.

eP029 | Management of diabetic ketoacidosis (DKA) in children during COVID-19 pandemic at a tertiary care center

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Introduction: Covid 19 pandemic significantly influenced the diagnosis of type 1 diabetes which entails a special concern.

Objectives: We aimed to assess the clinical characteristics and severity of diabetic ketoacidosis (DKA) among children and adolescents before and after the coronavirus disease 2019 (COVID-19).

Methods: A retrospective observational study including New-onset T1D patients between March 2020-December 2020 comparing with the same period of the year 2019. Data were collected to evaluate patients' clinical and laboratory characteristics as well as their outcomes.

Results: Nineteen patients were admitted during the study period. The median age was 10,4 (range: 2-18 years). The incidence of DKA was higher by 18% in group 2020 vs. 2019 (62.94% vs 44.38%; p = 0.276). Regarding the DKA severity (2020 vs. 2019) 28,72% vs. 18.54% were severe (p = 0.026). One of the analyzed patients was COVID-19 positive. The mean baseline Hba1c at the diagnosis was: 12.72% (± 1.6). The follow-up was ensured using teleconsultation and the therapeutic adjustment was made daily for 2 weeks after discharge. No episode of decompensation or severe hypoglycemia was noted during follow-up and the mean Hb1Ac at 6 months was 7.2%.

Conclusions: The increased prevalence of severe DKA nowadays, whether partly related to delayed hospital admission or related to the effect of COVID-19 is a real challenge in managing patients. Telemedicine seems to be an effective approach for the management of patients with New-onset T1D

eP030 | Teleconsultation for pediatric patients with type 1 diabetes mellitus during the COVID-19 pandemic: experience of a university hospital in Brazil

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Introduction: The SARS-CoV-2 pandemic expanded rapidly around the world in 2020 and health services needed to be reconfigured to meet the new demand and ensure the care of patients with chronic diseases. For patients with diabetes mellitus, the teleconsultation stood out as a tool for clinical management in this period.

Objectives: Evaluate the impact of teleconsultation on glycemic control and prevention of acute complications related to diabetes mellitus in children and adolescents treated in a reference hospital during the COVID-19 pandemic in 2020.

Methods: Descriptive study of data from pediatric diabetic patients who received teleconsultation between April and September 2020.

Results: During this period, 143 diabetic patients were evaluated, with a median of 3.4 teleconsultations per patient in the studied period; requiring adjustment of insulin doses in 84.6% of cases. The hospital admission rate was 8,4% due to diabetic decompensation. The metabolic control (HbA1c) became worsen in 46% of the sample and improved in 37%.

Conclusions: The teleconsultation promoted health care for patients with diabetes mellitus during the COVID-19 pandemic, but was not able to guarantee adequate glycemic control.

eP031 | COVID-19 and new-onset type 1 diabetes mellitus in a large Portuguese pediatric diabetes center: What changed?

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Introduction: On 12th March 2020, a national lockdown was imposed in Portugal, as a response to rising COVID-19 cases. Since then healthcare access patterns were deeply modified.

Objectives: In this study, we tried to understand what shifted from prior years in new-onset type 1 diabetes mellitus (T1D).

Methods: It was performed a retrospective analysis of patients referred to a level III pediatric hospital from March 2020 until March 2021. Patients admitted during the same period in the 3 previous years were set as control group.

Results: Since lockdown imposition, 44 children and adolescents were diagnosed T1D, contrasting with prior mean incidence of 32 cases/year. Median age was 9,9 years (min. 0,5 – max. 15,8). Children under 2 years-old represented 4,9% of cases, contrasting with only 2,1% in previous years. All subjects were tested for SARS CoV-2 but only 2 were positive. When comparing to prior years, subjects presenting with less than one week of symptoms almost doubled in 2020, (19,5% vs. 10,4%), and a higher rate of diabetic ketoacidosis (DKA) was also observed (53,7%, vs. 38,5%). DKA severity was also higher (40,9% vs. 21,6%; p=0,02 and 14,6% subjects required admission to intensive care unit.

Conclusions: Similarly to other reports, a higher number of new-onset T1D was observed, with a comparable increase in severity. In contrast to what might have been expected, DKA prevalence and severity was not necessarily linked to delayed diagnosis. We estimate that such severity may be related to a higher proportion of younger patients. While the role of SARS CoV-2 exposure in pancreatic islet cells destruction is still under investigation, antibody assessment and detailed contact history could help to explain the increased prevalence and severity of new-onset T1D during the pandemic period.

eP032 | "It just kind of feels like a different world now:" Stress, coping, and resilience for adolescents with type 1 diabetes (T1D) in the era of COVID-19

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Introduction: The COVID-19 pandemic has been a major stressor for adolescents with T1D, a group already at risk for elevated mood concerns.

Objectives: We aimed to describe teens' perspectives on pandemic-related stress and their coping strategies and resilience resources.

Methods: In a 2-site clinical trial of a psychosocial resilience-promotion intervention, enrolled adolescents were 13-18 years old with T1D ≥ 1 year and diabetes distress (PAID-T) ≥30. Participants enrolled August 2020-June 2021 were asked to write responses to 2 open-ended prompts about: 1) how COVID-19 affected their lives and 2) what was helping them through the pandemic. Qualitative analysis included: conventional content analysis by 3 coders to develop code categories and thematic analysis to identify overarching themes reflecting pandemic-related stress and resilience. Themes were subsequently mapped onto 3 domains of resilience.

Results: Adolescents (n=120) were 56% female, 75% White race, 18% Hispanic with mean A1C of 8.5% ± 2.1%. Adolescents described numerous negative effects of COVID-19 cutting across many major domains of life: Family, Social, School, Medical/Physical, and Mental

Table 1. Responses to "What's helping you through the COVID-19 pandemic?" organized by code category and theoretical domain of resilience (n=120)

Domain of Resilience	Code Category	Representative Excerpt
Internal Learned Skills and Behaviors (What Helps)	Stress Relief via Entertainment, Hobbies & Exercise	"Mountain biking regularly helps me to get out of the house and return to a more normal lifestyle"
	Personal Development and Goals	"Learning new things"
	Appreciating Comfort and Flexibility	"The comfort of my home and not worrying about things that are happening in person at school"
	Personal Health and Safety Practices	"Staying home, being sanitary"
External Social Support and Community (Who Helps)	Relationships	"Family, doctors, and teachers"
	School	"Well school is making me have to power through this thing"
	Work Environment	"Since going back to work it has helped me focusing on that besides the pandemic"
Existential Meaning-Making & Faith	Hope/Looking Forward	"Waiting to see a brighter future"
	Religion/Spirituality	"Practicing religion"

Health. They also described numerous resources and strategies consistent with stress, coping and resilience theories.

Note: 6 participants reported nothing was helping them through the pandemic.

Conclusions: Adolescents' responses underscore the pervasive stress impact of COVID-19 across nearly all major life domains. Coping strategies align with theory and suggest likely resilience in the face of pervasive stress. Given the elevated risks for distress in this population, there is a need for interventions to offer diverse stress management tools and resilience resources for adolescents with T1D.

ePO33 | Insulin dependent diabetes associated with pancreatitis induced by infection of Sars Cov2 in a young patient: A case report

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Introduction: COVID-19 has been described as a potential trigger for the development of diabetes in children and young adults. the description of associated pancreatitis has gained interest in the last reports.

Objectives: Here, we report a patient presenting with diabetic ketoacidosis revealing new-onset diabetes associated with pancreatitis and discuss the implication and clinical management of these concomitant conditions

Methods: Case report

Results: An 18-year-old man with no previous medical history was referred to our hospital with complaints of fever, shortness of breath and dry cough since 4 days. A SARS COV-2 Real time polymerase chain reaction (RT-PCR) done at a private laboratory was positive. There was no history of alcohol intake, hypertriglyceridemia, biliary diseases or hypercalcemia. he presented at the admission with diabetic ketoacidosis. His SpO2 was 92% on 2 L of nasal oxygen. His investigations on admission were; hemoglobin, 12.8g/dL, white blood cell count, 18 000/microL, blood glucose: 585mg/dl, HbA1C, 14.3%, normal renal and liver functions. insulin autoantibodies typical for type 1 diabetes were negative. During hospitalization he developed abdominal symptoms consisting of vomiting and diarrhea. . His biochemistry was as follows; amylase 180 U/L (normal 25–115U/L), lipase 1005 U/L (normal 73–160 U/L), serum calcium 8.9 mg/dL (normal 8.5–10.1 mg/dL), and serum albumin 2.4g/dL (normal 3.5–7.2g/dL). A non-contrast computerized tomography scan of abdomen revealed bulky pancreatic tail. the hyperglycemia was managed by high doses of insulin. He was managed conservatively for his pancreatitis

Conclusions: Clinicians need to be aware of the possible association of Sars Cov2 infection with diabetes and pancreatitis. the management of hyperglycemia is proven to reduce the disease severity and mortality.

ePO34 | Usefulness of serological antibodies assays to better evaluate the prevalence of SARS-CoV-2 infection in youths with type 1 diabetes

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Medical and Surgical Sciences for Mothers, Children and Adults - Post-Graduate School of Pediatrics, Modena, Italy, [3]University Hospital Polyclinic, Clinical Microbiology Unit, Modena, Italy

Introduction: In youths with type 1 diabetes (T1D), diabetic ketoacidosis (DKA) at onset increased during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic. In adults, diabetes was identified as risk factor for severe symptoms and hospitalization with the coronavirus disease-2019 (COVID-19)

Objectives: To investigate the prevalence of SARS-CoV-2 infection and clinical characteristics of COVID-19 in children and adolescents with T1D

Methods: SARS-CoV-2 infection was defined according to self-reported SARS-CoV-2 nasal swab PCR results (n=210) during the pandemic and seroprevalence of SARS-CoV-2 antibodies (n=85) from Jan to Jun-21. SARS-CoV-2 IgG were assessed using a chemiluminescent immunoassay (CLIA). Clinical characteristics and glycemic control data were collected before (T0) and 3-months after (T1) infection

Results: SARS-CoV-2 infection was detected in 39 patients [24 males; median age 13.5 yrs (4.74-19.8); T1D duration 5.49 yrs (0.27-12.6)]: 26 (66.6%) based on positive nasal swab PCR and 13 (33.4%) on positive SARS-CoV-2 IgG. Patients detected by CLIA were asymptomatic. Four patients detected by nasal swab PCR were asymptomatic (15.4%), while the others reported ≥1 symptoms lasting a median of 5 days: fever (46.1%), headache (28.2%), anosmia and/or ageusia (25.6%), nasal congestion (15.4%), fatigue/myalgia (10.2%). Dry cough, pharyngeal erythema, nausea/vomiting, diarrhea, abdominal pain, arthralgia were reported by 2.56%. Glycemic control was not impaired from T0 to T1 (median HbA1c 58.5 vs 57.4 mmol/mol; TIR 58.5 vs 56.5%). Hospitalization and DKA were not recorded

Conclusions: Using seroprevalence of antibodies we found an increased prevalence of SARS-CoV-2 infection that had no impact on glycemic control and acute complications. Asymptomatic subjects were 43%, while fever, headache, anosmia/ageusia were the most common clinical characteristics. Our data suggest that serological assay is useful to diagnosing previous SARS-CoV-2 infection and could be used to reconstruct the disease prevalence

eP035 | Review of diabetes control before and during COVID era at District General Hospital

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Introduction: In Paediatrics, there was a significant reduction and delays in patients presenting to the emergency department during the COVID-19 pandemic (1,2). Diabetes Service provision was affected during the pandemic with a move towards virtual clinics and fewer face to face appointments. We studied the nature and severity of presentation of TIDM, the impact of the pandemic on diabetes control in newly diagnosed TIDM patients.

Objectives: To evaluate presentation at diagnosis and effect on subsequent diabetes control due to COVID 19 pandemic's impact on health care provision.

Methods: This retrospective study involved case notes review of 65 newly diagnosed T1DM patients up to the age of 16 years over two years (March 2019 to March 2020: Pre-pandemic cohort, March 2020 to March 2021: Pandemic cohort).

Results: The percentage of patients presenting in severe diabetic ketoacidosis at diagnosis was higher in the pandemic year by 10%. The data showed no differences between the two groups regarding mean age at presentation, antibody status, vitamin D level at the diagnosis and frequency of diabetes-related hospital attendances. In contrast, in the pandemic group, 12% (3) newly diagnosed patients spent more than 72 hours during their first diabetes-related admission compared to 5% (2) in the pre-pandemic year. Interestingly, the HbA1C

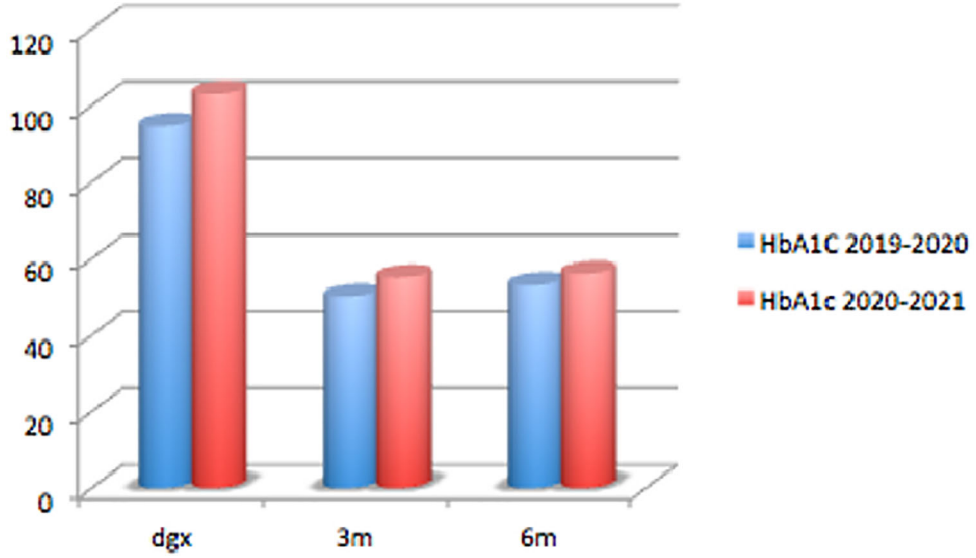

Figure 1: HbA1C levels of newly diagnosed diabetes over one year period in 2019-2020 and those in 2020-2021

control over one year period was similar in the pre-pandemic and pandemic cohorts (figure 1).

Conclusions: Our study suggests that during the pandemic year, more patients presented with severe DKA, higher HbA1C and had a longer length of stay in the hospital during the initial admission. A longitudinal review of HbA1C level over one year suggests that the diabetes control was not adversely affected during the pandemic.

eP036 | Effects of 1-year COVID-19 pandemic on auxological parameters and metabolic control in young patients with type 1 diabetes

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Introduction: Since the beginning of the SARS-CoV-2 infection, concerns for consequences on auxological and glycemic control data in patients with type 1 diabetes (T1D) were raised.

Objectives: To investigate 1-year effects of the COVID-19 pandemic on auxological parameters and metabolic control in youths with T1D.

Methods: Anthropometric (height [Ht], weight, waist circumference [W]) and glycemic control data of patients with T1D were collected during the annual routine outpatient visit between Dec20-Feb21 (1-year after the pandemic) and were compared with the ones of the same period in 2019-20 (before the closure of schools and organized sport activities).

Results: Seventy-eight children and adolescents with T1D (61.5% male; median age 13.7 [5.7-17.8] years; T1D duration 5.96 [2.1-15.4] years) were enrolled. Patients affected by SARS-CoV-2 infection were 15.4% (second wave). In Dec20-Feb21, BMI SDS and WHt ratio remained comparable to the year before lockdown. CGM use increased during the pandemic period (67.9 vs 71.8%, p<0.0001). Annual number of outpatient visits decreased (4 vs 3, p<0.0001), while telemedicine increased because 56.4% of patients had at least one telemedicine visit during pandemic (none before). Rate of DKA remained comparable (1.82 vs 2.56%) and no severe hypoglycemic event was recorder during pandemic (2.56 vs. 0%). Physical activity decreased (2 vs 0 h/week, p<0.001) and insulin TDD increased (0.84 vs 0.94 IU/kg/day, p=0.029). Average annual HbA1c values were comparable (62 vs 60 mmol/mol) and prevalence of patients with the last HbA1c value ≤53 mmol/mol increased (24 vs 28%, p<0.0001).

Conclusions: In our patients with T1D, BMI SDS and glycemic control were maintained during the 1-year pandemic period despite the decrease of physical activity. Our data may be possibly related to the increase of telemedicine visits that allowed us to adjust patients' insulin TDD, to avoid acute complications, and also to continue educational training to start CGM, complying with safety rules to avoid COVID-19 spread.

eP037 | Glycemic control in children with T1D in Kuwait during the COVID-19 pandemic: Data on a convenient sample of Childhood-Onset Diabetes electronic Registry (CODeR)

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Introduction: The COVID-19 pandemic brought forth distressing challenges in numerous countries including Kuwait. To minimize the spread of the virus, lockdowns were imposed through closure of schools and the enforcement of social distancing. T1D children may be critically impacted during this period due to these restrictions. To maintain efficient disease management and outcomes, virtual diabetes clinics were implemented.

Objectives: This study aimed to evaluate glycemic control of T1D children and its association with demographic variables before and during the pandemic.

Methods: A convenient sample of children and their parents were randomly selected from the Childhood-Onset Diabetes electronic Registry (CODeR). Patient demographics and diabetes history were obtained through phone calls and direct interviews. HbA1c results were recorded after reviewing medical charts of 12-month periods before and during the pandemic (Feb 24, 2019–Feb 23, 2020 vs Feb 24, 2020–Feb 24, 2021) and compared to evaluate glycemic control.

Results: Forty-nine children with T1D (age 9.3±3.2 years, 44.9% males, diabetes duration 3.5±1.9 years) participated in the survey. Majority of patients were receiving multiple daily injection therapy (88.9%) compared to continuous subcutaneous insulin infusion therapy (11.1%). No significant changes in HbA1c results prior to and during the pandemic (10.01%±1.72 vs 9.66%±1.59, p>0.05) were observed. Gender, nationality and age did not affect glycemic variations during the two time periods. However, children with a shorter diabetes duration (<5 yrs) showed slightly improved HbA1c results during the pandemic (9.89%±1.71 vs 9.66%±1.68, p=0.04).

Conclusions: Virtual diabetes clinics may have allowed patients frequent contact with their physicians and facilitates communication from home environments which resulted in insignificant improvement of metabolic status. These are preliminary findings on T1D children in Kuwait and future studies are necessary to evaluate glycemic outcomes prior to and during the pandemic.

eP038 | Concomitant presence of COVID-19 infection and inaugural diabetic ketoacidosis in children and adolescents

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Introduction: The COVID-19 pandemic, which has left its mark all over the world, has led to a decrease in the addressability to health

care professionals, due to people's fear of becoming infected with COVID-19. This delays a correct diagnosis that can have life-threatening consequences.

Objectives: To establish if type 1 diabetes is triggered by COVID-19

Methods: We will present 3 cases pf type 1 diabetes at onset with ketoacidosis, triggered by the COVID-19 infection, diagnosed between December 2020 and April 2021. The diagnosis of SARS-CoV2 infection was established based on RT-PCR (a reverse-transcription polymerase-chain-reaction) positive for SARS-CoV2.

Results: Case 1: 14 years old, boy, presented with Kussmaul breathing, abdominal pain, polyuria, polydipsia, weight loss (5 kg in 2 weeks), fever (38 C). The laboratory test showed a bicarbonate: 5 mEq/L, pH: 7.08, alkaline reserve: 6 mmol/l, glucose: 454 mg/dl, HbA1c: 14.5%.

Case 2: 7 years old, boy presented with Kussmaul breathing, shock hypovolemic, hypotensive (Blood pressure 60/30 mmHg), fever, tachypnea, polyuria, polydipsia. The laboratory test showed a bicarbonate: 3 mEq/L, pH: 6,95, alkaline reserve: 2 mmol/l, glucose: 567 mg/dl, HbA1c: 12.6 %.

Case 3: 10 years old, boy presented with similar clinical findings. The laboratory test showed a bicarbonate: 5 mEq/L, pH: 6,90, alkaline reserve: 3 mmol/l, glucose: 457 mg/dl, HbA1c: 16.6 %.

All patients received treatment according to the diabetic ketoacidosis protocol treatment and switched to basal-bolus insulin treatment after an average of 48 hours. In all 3 cases the SARS-CoV2 infection was mild, with no changes in the lungs (lung x-rays being within normal limits).

Conclusions: Due to the general fear of appearing in a hospital during the COVID-19 pandemic, there are delays in the diagnosis of life-threatening conditions, such as ketoacidosis. The link between SARS-CoV2 infection and type 1 diabetes in children and adolescents remains unknown and further studies are needed to gather more data.

eP039 | New onset diabetes in a boy with multi-system inflammatory syndrome in children (MIS-C) following SARS-CoV-2 infection

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Introduction: Case report

Objectives: During the past year, COVID-19 infection was recognized as a potential trigger for new onset diabetes in children. A rare but severe complication of COVID-19 infection in children and adolescents is multisystem inflammatory sindrome in children (MIS-C). We describe a case of newly diagnosed diabetes mellitus (DM) in a ten-year old patient during the course of MIS-C.

Methods: Case report

Results: A ten-year-old previously healthy male presented with vomiting and painful and enlarged lymph nodes. He was febrile to 39.4°C and tachycardic to 124 beats/minute. Initial laboratory evaluation was notable for acute infection, but the child also had hyperglycemia, ketonuria, glycosuria. Empiric antibiotic therapy was started, but he was persistently febrile, had lymphadenopathy with redness of the surrounding skin and developed conjunctival injection and a discrete livid erythema on the trunk. His follow up labs showed leukopenia with lymphocytopenia and neutrophilia, anemia and thrombocytopenia and upsurge of inflammation markers. Other possible causes of his condition were excluded and he tested positive for anti-SARS-CoV-2 IgM and IgG via immunochromatographic assay. Criteria for MIS-C was met, and intravenous immunoglobulin treatment was started which yielded immediate recovery. During the acute course of MIS-C his blood glucose levels were up to 15.5 mmoL/L, with no disturbances in acid-base status. Since high glucose levels and glucosuria persisted beyond resolution of the MIS-C, and HbA1c was elevated (7.8%), the patient was started on intensified therapy with insulin analogues. Islet-cells autoantibodies were only marginally elevated (GAD-65 1.9 and IA-2A 1.8 kIU/L) and C-peptide was normal.

Conclusions: In pediatric population inflammatory syndromes like MIS-C can raise the risk for diabetes development or presentation. Therefore it is important to monitor glycemia during the course of MIS-C and also during post-inflammatory follow-up.

eP040 | Effect of telemedicine on the management of type 1 diabetes during COVID-19 pandemic

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Introduction: Telemedicine is not unusual when treating patients with type 1 diabetes. However, the pandemic has reinforced the healthcare professional on its usage. The study was done with an aim to compare the effect of telemedicine with those of outpatient care on parameters like HbA1c, the incidence of hypoglycemia, lipodystrophy, and SMBG,.

Objectives: Effect of telemedicine on the management of type 1 diabetes during COVID-19 pandemic

Methods: A total of 207 children (1 to 12 years) with type 1 diabetes were randomized and studied for 6 months. They were divided into two groups, a virtual care group (n=91) where all patients were followed up virtually at least 3 times a month, either an audio call or a video call, and a control group (n=96). Their quires were solved promptly. In the control group, all patients underwent routine outpatient follow-up as per their convenience and pandemic situation. In the virtual care group, parameters like HbA1c, glucose monitoring, Lipo, and hypo were continuously emphasized and monitored twice in 6 months.

Results:

A virtual care group (n=51) The mean age of the participants was 9 years, 41 were male and 50 were female. With mean diabetes course of 4 years and mean Hba1c 9.8%. The prevalence of lipo was 10 (10.9%). A control care group (n=56). The mean age of the participants was 10 years, 41 male and 55 female. The mean diabetes course

was 5 years with HbA1c 9.8%. The prevalence of lipo was 5 (5.2%). virtual: HbA1c reduction 9.71 % to 9.5 %, hypo 11.9 % to 7.2%, lipo from 5.3% to 4.6% and mean frequency of glucose 3 times/day control: HbA1c reduction 9.62 % to 9.8 %, hypo 15.9 % to 18.2%, lipo from 8.9% to 11.6% and mean frequency of glucose 3 times/day

Conclusions: The frequent telemedicine system reduces the indexes of HbA1c and rate of hypo and lipo in patients with type 1 diabetes whereas there is an increase in indexes of HbA1c, hypo n lipo. Hence, it can be said that type 1 diabetes is a condition that demands continuous care.

ePoster - 2.a: Pumps and CGM

eP041 | The relationship of target glucose intervals; A Swedish retrospective study

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Introduction: With a large majority of young diabetic patients using continuous glucose monitoring (CGM), *time in target* (TIT) or *time in range* (TIR) have become valuable complements to HbA1c to reach good glycemic control. In Sweden, TIT in pediatrics is defined as 4.0-8.0 mmol/L (72-144 mg/dL). TIR is internationally defined as 3.9-10 mmol/L (70-180 mg/dL).

Objectives: The aim of this study was to compare the relationship between TIT and TIR and to further investigate *time below target* (TBT) and *time below range* (TBR), and to which degree a 0.1 mmol/L (1.8 mg/dL) difference in the lower threshold influenced the percentage in current recommendations.

Methods: Children and adolescents aged 0-18 years with type 1 diabetes were retrospectively identified using visit registration data at the pediatric clinic in Uddevalla, Sweden. They all had at least one visit to the clinic during 2020. Data were collected from subjects with a CGM-time of >80% during the two-week period up to the date of visit.

Results: Of 117 patients identified, 78 met the inclusion criteria. 50% TIT corresponded well with 70% TIR. With 4.0 mmol/L (72 mg/dl) used as lower threshold instead of 3.9 mmol/L (70 mg/dl), the mean difference in TBT and TBR was 0.87%. There was no over-accumulation of readings between 3.9 and 4.0 mmol/L as might have been expected. Mean HbA1c was 46.2 mmol/mol (6.4%). Median time spent <3.9 was 4.0% and <3.0 mmol/L (54 mg/dL) (clinically important or serious hypoglycemia) was 1.0%. The figure shows the relationship between TIT 4-8 mmol/L and TIR 3.9-10 mmol/L.

Conclusions: We can confirm that 70% TIR corresponds well to 50% TIT. The recommendation of 4% TBR corresponds to 5% TBT. The majority of children and adolescents met the Swedish target of 48 mmol/mol (6.5%) without having the proportion of hypoglycemia readings above international recommendations.

eP042 | Glycemic profiles and treatment patterns in 1,464 children and adolescents with type 1 diabetes using the Omnipod DASH® Insulin Management System with continuous glucose monitoring and cloud-based data management

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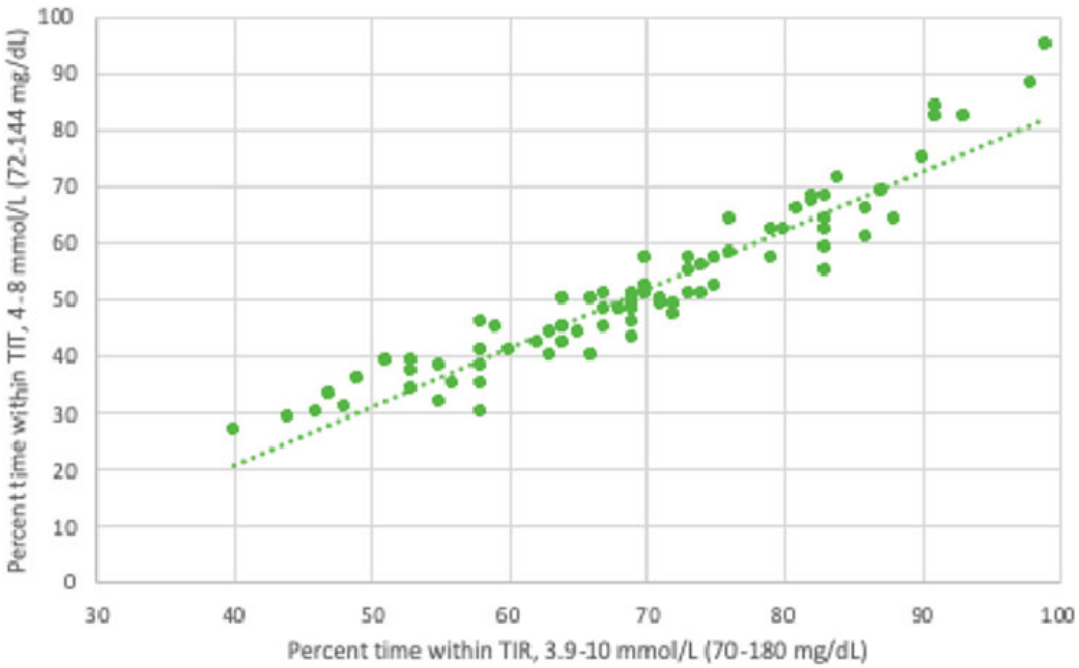

Introduction: Assessment of real-world use of diabetes technology can provide information on clinical outcomes and treatment patterns to help with advancement of care.

Objectives: This analysis evaluated glycemic metrics and treatment patterns for a large cohort of children and adolescents with type 1 diabetes using the Omnipod DASH Insulin Management System (Insulet Corp, Acton, MA), real-time CGM (Dexcom, San Diego, CA) and a data management system (Glooko, Mountain View, CA).

Methods: Usage data uploaded to the data management system from July 2018 through July 2021 were matched via device serial number to a second database of self-reported demographic data and de-identified. Users were included if they had data from ≥3 months of system use, CGM device use ≥15.5% of overall time (minimum of 14 days of a 3-month period), were on the Omnipod DASH System and were <18 years of age.

Results: 1,464 children and adolescents using the Omnipod DASH System with CGM were identified and stratified by age (Table). In this cohort, mean GMI was lowest at 7.4% in the 13 to <18y group and highest at 8.0% in those under 2 years. Similarly, percentage of time spent in the target range (70-180 mg/dL; 3.9-10 mmol/L) was the highest with 60.7 ± 18.1% in the 13 to <18y group. In all age groups, median time below range (<70mg/dL; <3.9 mmol/L) was below 1.5%. Total daily insulin dose ranged from 7.7 units/day for children <2y to 47.3 units/day for adolescents, and mean bolus frequency ranged from 5.2 times per day in adolescents to 7.5 times per day in the 2 to <6y age group.

Conclusions: These data provide valuable insights to treatment patterns and glycemic outcomes and provide evidence for favorable glycemic control in children and adolescents using the Omnipod DASH System with CGM when compared to large national registries such as the T1D Exchange. In contrast to previous reports, adolescents in this cohort achieved higher time in range compared with their younger peers.

eP043 | Disengagement from advanced technologies in pediatric type 1 diabetes: implications for glycemic control and DKA risk

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Introduction: The use of continuous glucose monitors (CGM), insulin pumps (PUMP) and hybrid closed loop systems has been associated with improved outcomes in pediatric type 1 diabetes (T1D) care.

Objectives: We sought to characterize near-term outcomes occurring after disengagement from diabetes devices.

Methods: We conducted a retrospective cohort study on youth, ages 0-21 years, in our diabetes clinics from 1/1/2018 through 12/1/2020. Using an IRB-approved data repository, we identified patients on a CGM or PUMP in two subsequent clinical encounters (E1 and E2, respectively). We defined four engagement categories. For each, we estimated the percent of DKA events and patients with an increase in glycated hemoglobin (A1c) of >0.3% between visits in the 180 days following E2.

Results: We identified a total of 519 patients that disengaged from pump or CGM. Compared to patients who are engaged with diabetes devices, we observed a higher DKA rate in patients that disengaged (5.3% vs 3.3 %, p=0.01). Furthermore, we identified four engagement categories that are shown in the table below

Conclusions: CGM and PUMP engagement support two of the seven pillars of diabetes self-management. This study highlights that disengagement from these devices associates with increased prevalence of rising A1c and DKA in the near term. Future studies identifying predictors of disengagement may offer novel intervention opportunities

Table. Glycemic Profiles and Insulin Use Patterns of Youth with Type 1 Diabetes Using the Omnipod DASH System and CGM

						Percent time in range, %			Insulin use			
Age	N	Age, yr	Female, %	Mean glucose, mg/dL (mmol/L)	GMI, %*	<70 mg/dL (<3.9 mmol/L)	70-180 mg/dL (3.9-10 mmol/L)	>180 mg/dL (>10.0 mmol/L)	TDD, U	TDD from Basal, %	Bolus Amount, U	Bolus Frequency, x/d
<2y	16	0.9±0.3	44	197±33 (10.9±1.8)	8.0	0.8 [0.3, 1.6]	44.4±15.8	54.3±16.8	7.7±3.4	44	0.8±0.7	6.3±2.1
2 to <6y	269	3.8±1.1	41	181±33 (10.1±1.8)	7.6	1.4 [0.7, 2.6]	54.0±17.2	43.9±18.2	11.2±4.4	39	1.0±0.6	7.5±2.6
6 to <13y	782	9.2±2.0	53	178±30 (9.9±1.7)	7.6	1.1 [0.5, 2.1]	56.3±16.4	42.0±17.0	27.9±15.5	41	2.8±1.9	6.4±2.1
13 to <18y	397	14.5±1.4	46	172±31 (9.6±1.7)	7.4	0.9 [0.4, 1.9]	60.7±18.1	37.8±18.3	47.3±20.5	44	5.4±2.9	5.2±1.8
Total	1,464	9.6±4.0	49	177±31 (9.8±1.7)	7.5	1.1 [0.5, 2.1]	57.0±17.2	41.4±17.7	29.9±20.0	42	3.2±2.6	6.3±2.3

Results are mean±SD or median [IQR] unless otherwise indicated

*GMI: https://www.jaeb.org/gmi/

Table

Device	category	E1	E2	OBSERVATIONS	N	A1c ± STDEV	ΔA1c > 0.3	DKA
CGM	Non-engagement	No	No	4537	1322	9.2 ± 1.9	38%	8.2%
	Disengagement	Yes	No	969	810	8.5 ± 1.7	39%	3.2%
	New engagement	No	Yes	419	364	8.9 ± 1.7	32%	3.6%
	Continued engagement	Yes	Yes	3701	1073	8.0 ± 1.3	34%	2.4%
PUMP	Non-engagement	No	No	3118	938	8.9 ± 2.0	40%	7.5%
	Disengagement	Yes	No	385	373	8.3 ± 1.7	44%	4.7%
	New engagement	No	Yes	213	206	9.1 ± 2.0	36%	8.5%
	Continued engagement	Yes	Yes	3754	1184	8.5 ± 1.5	35%	3.4%

to forecast device disengagement and to develop interventions to prevent it.

ePO44 | Continuous glucose monitor (CGM) use with or without insulin pump use is associated with lower A1c in pediatric patients with type 1 diabetes (T1D)

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Introduction: Diabetes technologies, including CGM and insulin pumps, are improving and being used more commonly. The use of insulin pumps, CGM, and hybrid closed loop (HCL; combining pumps, CGM, and algorithms that automatically adjust insulin delivery), are associated with lower A1c trends.

Objectives: We evaluated the use of pump, CGM, and HCL technology and their impact on glycemic control among pediatric patients with T1D.

Methods: Medical records at the Barbara Davis Center (BDC) were examined to identify patients with T1D at BDC between 1/2018 and 12/2020 who at their last visit were <22 years old; had diabetes duration >3 months; and had available A1c, pump usage, and CGM data. Data were analyzed by age and technology-use groups: multiple daily injection with blood glucose meter (MDI/BGM), pump with BGM

Table 1. Comparison of mean A1c [SD] and percent with A1c <7.0% by age and technology use.[a,b]

	Total n = 4003	MDI/BGM n = 817 (20.4%)	Pump/BGM n = 577 (14.4%)	MDI/CGM n = 616 (15.4%)	Pump/CGM n = 1993 (49.8%)
Age Group (n) Mean [SD] Met Goal A1c %	8.8 [2.2] 17.6	10.0 [2.6] 8.9	10.0 [2.3] 4.9	8.6 [2.2]**** 22.9***	8.1 [1.6]**** 23.1***
< 6 (185)	7.8 [1.4] 25.4	9.0 [1.8] 7.4	8.9 [0.8] 0.0	7.7 [1.5]* 23.4	7.4 [1.1]**** 32.1
6 - < 12 (921)	8.2 [1.7] 20.2%	9.3 [2.2] 12.2	9.2 [1.7] 4.6	8.2 [1.8]**** 21.1	7.8 [1.3]**** 23.6*
12 - <18 (1897)	9.0 [2.3] 16.5	10.2 [2.7] 9.7	10.4 [2.4] 2.9	8.7 [2.3]**** 25.0***	8.2 [1.7]**** 20.9***
18 - < 22 (1000)	9.2 [2.5] 15.7	10.2 [2.7] 6.3	9.8 [2.3] 7.3	9.2 [2.8]* 20.3**	8.2 [2.0]**** 25.4***

a. Controlling for diabetes duration, race, insurance (Medicaid vs other)
b. Significantly different from the reference group (MDI/BGM) at a P-value of <0.05*, <0.01**, <0.001***, or < 0.0001****

(pump/BGM), MDI with CGM (MDI/CGM), and pump with CGM (pump/CGM). A1c was compared using ANCOVA and controlling for diabetes duration, race, and insurance.

Results: Among 4003 eligible patients, Table 1 shows comparisons of mean A1c and percent of patients with A1c <7.0% by technology use and age groups. Patients in the pump/CGM group had the lowest A1c in each of the age categories. In patients without CGM, pump/BGM users had similar A1c to MDI/BGM users (10.0 vs 10.0, p=1.000). The pump/CGM users had a significantly lower A1c than MDI/CGM users (8.1 vs 8.6, p<0.001). MDI/CGM users had lower A1c than pump/BGM users (8.6 vs 10.0, p<0.001). Patients who used HCL had significantly lower A1c compared to those who used pump/CGM without HCL (7.6 vs 8.3, p<0.001).

Conclusions: Approximately half of patients are using both CGM and pump, which is associated with lower A1c. While CGM use is associated with a lower A1c regardless of pump use, pump use is only associated with a lower A1c if used with CGM. HCL technology was associated with the lowest A1c.

eP045 | Lack of diversity in advertisements for diabetes technology

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Introduction: Diabetes is a chronic disease affecting the lives of an estimated 1.2 million Australians. Diabetes technology in the form of insulin pumps and continuous glucose monitors are increasingly used for disease management. Advertising of such technologies can potentially portray unrealistic ideals of identity.

Objectives: We assessed the representation and diversity of patients depicted through diabetes technologies advertising.

Methods: A content analysis of the advertisements for the ten diabetes technologies available to Australian consumers was performed. The consumer-targeted webpage for each device was accessed by two authors who independently extracted data and assessed gender, age, skin tone and body habitus, with a third author acting as adjudicator. The data was compared to the Australian population with all forms of diabetes.

Results: There were 47 unique individuals identified. There was equal representation of gender, over half were adults, 85% of individuals were identified as normal body weight, and 83% had Fitzpatrick skin phototype 1-2 (pale white or white skin). There were no representations of people with darker skin tones. This severe underrepresentation of different body weights, ages and skin tones excludes a large portion of the population with diabetes and illustrates a stereotyped bias that many will not be able to identify with.

Conclusions: Diabetes technology is one of few medical technologies exempt from government regulations and approved to be advertised directly to the consumer. Children are more vulnerable to the effects of advertising due to less developed critical thinking skills and cognitive abilities.

Through this content analysis we aim to raise greater awareness about the lack of diversity and limited physical profiles in advertisements for diabetes technology, and the detrimental impact this could have upon physical and mental health. Diabetes is a disease that does not discern from one identity to another – nor should diabetes technology advertising.

eP046 | Patient Reported Outcomes (PROs) associated with starting continuous glucose monitoring (CGM) soon after diagnosis of type 1 diabetes (T1D)

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Introduction: A clinical initiative to start youth with T1D on CGM within 1 month of diagnosis is underway and both glycemia and patient reported outcomes (PROs) are tracked as part of the 4T study.

Objectives: Report on PROs of parents and youth associated with the clinical implementation of CGM soon after diagnosis, and follow up 1 and 3 months later.

Methods: Of the 77 families enrolled in the 4T study as of July 2021, 55 provided parent PROs data. Of the 55 families who provided parent PROs data, 39 youth aged ≥11 years were eligible for youth PROs, and 23 provided youth data. Baseline, 1 month, and 3 month PROs were collected for parents and youth. PROs included the 20-item diabetes distress scale (DDS-P) for parents, and the 2-item diabetes distress scale (DDS), PROMIS global health (PGH), diabetes technology attitudes (DTA), and CGM benefits/burden (BenCGM and BurCGM) measures for youth. As part of this new program, elevated scores on the PROs resulted in referral to psychology.

Results: Parents (n=55, 42.9±7.7 years, 17% non-English speakers, 59% non-Hispanic White, 33% publicly insured, youth age 2-21 years) reported low diabetes distress across all three time points (**Table**). Youth (n=23, 14.0±2.1 years, 61% non-Hispanic White, 17% publicly insured, CGM started 16±9 days post-diagnosis) reported DDS and PGH scores in the normal range as well as stable DTA, BenCGM and BurCGM scores (**Table**). We evaluated parent-youth dyads with complete PROs data for each time period and demonstrated an inverse correlation between parental diabetes distress and youth global health at baseline (n=22, R=-0.16, p=0.47), 1 month (n=19, R=-0.59, p=0.008), and 3 months (n=16, R=-0.59, p=0.016).

Conclusions: Parents and youth reported low levels of diabetes distress when starting CGM soon after diagnosis of T1D. Findings are limited by the lack of a comparison group, however, these preliminary data are supportive of feasibility and acceptability of early CGM initiation in youth with T1D.

Table

	Baseline	Month 1	Month 3
Parent/Guardian	**n=55**	**n=46**	**n=42**
Diabetes Distress, Parent Mean (SD) Median [Min, Max]	0.87 (0.57) 0.80 [0, 2.40]	0.87 (0.64) 0.73 [0.10, 2.43]	0.85 (0.68) 0.58 [0, 2.5]
Youth	**n=22**	**n=19**	**n=16**
Diabetes Distress, Youth Mean (SD) Median [Min, Max]	1.96 (1.04) 1.50 [1.00, 5.50]	1.92 (1.03) 1.50 [1.00, 4.00]	1.66 (0.944) 1.50 [1.00, 5.00]
PROMIS Global Health Mean (SD) Median [Min, Max]	25.1 (3.05) 25.0 [20.0, 32.0]	25.2 (4.64) 26.0 [12.0, 31.0]	24.8 (3.53) 24.0 [18.0, 30.0]
Diabetes Technology Attitudes* Mean (SD) Median [Min, Max]	18.9 (2.40) 19.0 [15.0, 23.0]	18.7 (2.38) 19.0 [14.0, 22.0]	19.6 (2.56) 20.0 [14.0, 25.0]
CGM Benefits * Mean (SD) Median [Min, Max]	4.41 (0.54) 4.56 [3.25, 5.00]	4.18 (0.92) 4.50 [1.00, 5.00]	4.51 (0.49) 4.63 [3.63, 5.00]
CGM Burden * Mean (SD) Median [Min, Max]	1.77 (0.49) 1.75 [1.00, 2.50]	1.86 (0.51) 1.88 [1.13, 2.63]	1.80 (0.47) 1.88 [1.00, 2.38]

*Missing baseline PROs for 1 youth

eP047 | Overcoming barriers to diabetes technology in youth with type 1 diabetes and public insurance in the United States: Cases and call to action

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Introduction: Continuous glucose monitoring (CGM), insulin pumps, and automated insulin delivery (AID) can improve glycemic control for youth with type 1 diabetes (T1D). However, technology use is lower in youth on public insurance, a marker of lower socioeconomic status in the United States, and the technology use gap is widening. Youth with public insurance in California are required to check glucoses 4 times/day for 1 month prior to CGM approval, a requirement that does not exist for those on private insurance. In addition, the process to obtain ongoing CGM supplies is challenging, and disruptions in CGM access result in worsening outcomes.

Objectives: The purpose of this case series is to 1) describe successes of the CGM Time in Range Program (CGM TIPs), which removed barriers for initiating CGM and provided remote data review for youth on public insurance, and 2) advocate for improving CGM coverage by public insurance.

Methods: Youth with T1D on public insurance who did not meet public insurance criteria for CGM or had gaps in CGM coverage were provided CGM and monthly remote data review. We describe a series of six youths who obtained and sustained CGM use.

Results: Three youths had improved engagement with the care team, and three youths leveraged CGM wear to obtain coverage for AID systems. These youths achieved lower HbA1c by 3.4%±0.96% (n=6) after 199±49 days of enrollment. Two patients with frequent DKA admissions previously have had no admissions since enrollment.

Conclusions: Youth with public insurance started on CGM and provided support for glucose management and supply management as part of the CGM TIPs program experienced improved engagement with their diabetes care and HbA1c. However, stringent barriers for CGM approval by public insurance and difficult post-approval patient workflows continue to hamper CGM use in youth with public insurance. These cases highlight the need to develop effective interventions and policies to promote equitable care.

eP048 | Glycemic improvement in 1,020 pediatric and adolescent patients with type 1 diabetes (T1D) using the Omnipod DASH® Insulin Management System over first 90 days of use

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Introduction: There is increasing recognition of the importance of real-world data to better understand the impact of diabetes technology on treatment outcomes.

Objectives: This retrospective study characterized patient-reported clinical outcomes in paediatric and adolescent patients in the

Table 1: Characteristics and outcomes of youth with T1DM before and 90 days after initiating Omnipod System

				Prior Treatment (%)			HbA1c (%)			TDD of Insulin (U/d)			Hypoglycaemic events (HE)		
	N (%)	Age (y)	Female (%)	MDI	CSII	Unknown	Baseline	Follow-up	Change[T]	Baseline	Follow-up	Change[T]	Baseline	Follow-up	Change[T]
Young Children <6y	169 (16.6)	3.4±1.4	40.5	83.4	4.7	11.8	8.6±1.5	7.9±1.1	-0.7±1.4**	9.8±6.2	11.3±6.9	+1.5±5.4	3.1±3.3	1.7±2.7	-1.4 ± 3.0*
Children 6 to <13y	542 (53.1)	9.5±2.0	49.4	81.7	9.4	8.9	8.5±2.1	7.8±1.3	-0.7±2.0**	27.8±16.3	28.1±16.4	+0.4±9.4	2.8±2.7	1.5±1.6	-1.3 ± 2.5**
Adolescents 13 to <18y	309 (30.3)	14.8±1.4	50.8	74.4	13.9	11.7	8.7±2.3	7.6±1.5	-1.1±2.1**	50.9±27.0	46.8±24.3	-4.1±14.8*	2.7±2.8	1.2±1.2	-1.5 ± 2.8**
Total <18y	1,020	10.1±4.2	48.4	79.8	10.0	10.2	8.6±2.1	7.7±1.3	-0.8±1.9**	32.4±24.4	31.5±22.2	-0.9±11.3	2.8±2.8	1.4±1.8	-1.4 ± 2.7**

[T]post-Omnipod initiation
*p<0.01, **p<0.0001 for changes from baseline to follow-up. (Paired t-test)

United States with T1D before (baseline) and 90 days after (follow-up) the initiation of a tubeless insulin pump (Omnipod DASH® Insulin Management System).

Methods: The primary outcome was change in self-reported HbA1c from baseline to follow-up. Secondary outcomes were change in self-reported total daily dose (TDD) of insulin and frequency of hypoglycaemic events (HE) per week (#/week <70 mg/dL; <3.9 mmol/L). Outcomes were assessed overall and stratified by prior treatment modality (MDI or CSII) and age group (<6y, 6 to <13y, 13 to <18y).

Results: Patients (n=1,020) were aged 10.1±4.2y (mean ± SD) and 48.4% were female (Table 1). The overall change in HbA1c at follow-up was -0.8±1.9% (p<0.0001). The change in HbA1c was -0.9±2.0% for prior MDI users (p<0.0001), while it was non-significant for prior CSII users (-0.3±1.2%; p>0.05). Significant HbA1c reductions were seen for all age groups (p<0.0001). There was a reduction in TDD of insulin of -4.1±14.8 U/d (p<0.01) in the adolescent group, while for all other groups TDD remained statistically similar. The self-reported hypoglycaemic events decreased by 1.4±2.7 episodes per week (p<0.0001).

Conclusions: In this large cohort of paediatric and adolescent patients with T1D, initiation of a tubeless insulin pump was associated with significant reductions in HbA1c and number of hypoglycaemic events.

eP049 | Type 1 diabetes mellitus – population characterization and metabolic control outcomes in a Portuguese patient sample

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Introduction: Type 1 Diabetes Mellitus (T1D) is the most frequent endocrine disease and one of the most common chronic diseases among pediatric patients. Achieving adequate metabolic control and simultaneously preventing complications are the main goals of intensive insulin treatment.

Objectives: This study aims to characterize a cohort of T1D patients followed at a Pediatric Endocrinology Unit between January 1st and June 31st, 2021.

Methods: Several clinical and demographically variables were analysed, including insulin regime and glycemic control.

Results: A total of 208 patients were included, mostly (56.7%) males, with an average age of 12.7± 4.6 years. Most patients (76,0%) had T1D for over 2 years.

The median HbA1c (%) was 7.3 IQ 6.8-7.8. About one third had optimal HbA1c, <7.0% (31.2%). In the group of children with ages 6 to 10 years, 60% (21) had HbA1c within target.

Obesity was identified in 20/166 (12.0%) of patients aged between 5 and 19.

Regarding acute complications in the last year, 2 patients suffered severe hypoglycemia and other 2, diabetic ketoacidosis.

The majority of patients (164, 78,8%) were under treatment with continuous subcutaneous insulin infusion (CSII).

Most patients used some kind of glucose monitoring technology (81.3%). Twenty-seven of these (16,0%) used continuous monitoring and the rest flash monitoring.

Analysing the last 28 days of the ambulatory glucose profile we found that 73,6% (117/159) had an active time >70%. The median glucose management indicator was 7.2 % IQ 6.9-7.7 and the average glucose variability was 39.7% ± 8.0. Variability at or below 36% was found on 43/159 (37,4%).

Conclusions: In our study, the median HbA1c was 7.3% and in about one third of patients <7.0%, very close to the diabetes care entities recommendations.

Most patients are under CSII (78,8%). This is much higher than others international studies and this is explained by the fact that, in Portugal, since 2019, all children and young people have access to CSII by national health service.

We also identified a high percentage (81.3%) of use of glucose monitoring systems, which is in accordance with the literature, describing an increased use over the years.

eP050 | Modifiable factors related to use of advanced diabetes technology in youth of color with type 1 diabetes: a qualitative study

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Introduction: Racial/ethnic disparities abound in the use of advanced diabetes technologies (ADT) for youth with type 1 diabetes (T1D), but what causes these disparities is poorly understood.

Objectives: Researchers interviewed healthcare providers, youth of color with T1D and their families to gather their perspectives on barriers and facilitators to ADT use.

Methods: Providers (n=4, APRN, n=5, MD/DO) in two U.S. pediatric endocrinology clinics, youth of color with T1D (n=19) and their caregivers (n=22) completed semi-structured qualitative interviews. A racially/ethnically diverse team interviewed participants in English (n=35) or Spanish (n=6). Researchers used thematic content analysis to summarize provider, youth and caregiver perspectives. Three raters independently coded interviews and resolved discrepancies via group discussion to consensus.

Results: Participants identified both modifiable and harder-to-modify factors affecting ADT use in youth of color with T1D. Factors that may be modified by clinic-based interventions included: families' attitudes towards ADT, family dynamics, families' capacity for health advocacy, providers' algorithms to prescribe ADT, patient education resources, and clinic use of family-centered care. Two harder-to-modify factors were device cost/insurance coverage and complex approval processes. However, participants identified sources of support from the diabetes community, their diabetes care teams, and diabetes companies to help families advocate for their child to use ADT and help healthcare providers and families navigate approval processes. Participants described how these same sources of support also shaped families' attitudes towards ADT, patient education opportunities, and providers' algorithms to prescribe ADT.

Conclusions: Results identified several modifiable and a few harder-to-modify factors related to use of ADT among youth of color with T1D. Findings can inform multi-level interventions aimed at promoting equity in ADT use.

eP051 | The Early Start Study (TESS): Continuous glucose monitoring in stage 2 type 1 diabetes to guide early education and insulin therapy

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Introduction: Multiple studies are screening general population children for early-stage type 1 diabetes (T1D) using islet autoantibodies with the goal of eventual universal screening for presymptomatic T1D. Early identification and monitoring can prevent presentation in diabetic ketoacidosis at onset. There are currently no clinical guidelines for education and management of presymptomatic T1D.

Objectives: We sought to explore use of continuous glucose monitoring (CGM) for management of stage 2 type 1 diabetes (T1D) via a randomized controlled trial (2:1 intervention to control) using CGM to characterize evolving dysglycemia, educate families and initiate well-timed insulin therapy.

Methods: 16 of planned 36 participants were recruited from individuals 2 to 20 years old with confirmed multiple islet autoantibodies or single high-affinity autoantibody and documented dysglycemia, defined by standard ADA criteria for stage 2 T1D: prediabetic HbA1c, impaired fasting glucose, and impaired glucose tolerance by OGTT. Additionally, we included those with indeterminate glycemia (intermediate OGTT values >200 mg/dL) and dysglycemia on 7-day CGM (≥15% time >140 mg/dL OR average sensor glucose ≥120 mg/dL OR peaks ≥200 mg/dL on ≥2 days). Intervention includes unblinded CGM wear and 6 months of structured education followed by 6 months of observation; insulin therapy is initiated upon observation of prolonged hyperglycemia. Controls are monitored with blinded CGM and intermittent SMBG. Outcome measures include assessment of glycemia,

Table

*p<0.05	Controls (n=6)	Intervention (n=10)
Age	13.8 ± 2.7	10.1 ± 4.3
Male*	4 (67%)	4 (40%)
First-degree relative*	3 (50%)	6 (60%)
HbA1c	5.3 ± 0.2	5.5 ± 0.4
CGM: % time >140 mg/dL	14.6 ±16.0	14.4 ± 8.0
CGM: average SG (mg/dL)	117.3 ±17.0	116.7 ± 7.1
OGTT: Fasting glucose (mg/dL)	88.4 ± 11.2	83.0 ± 9.9
OGTT: 2h glucose (mg/dL)	113.8 ± 29.7	159.3 ±73.3

beta-cell function, diabetes knowledge, quality of life, and cost analysis.

Results: Baseline characteristics of participants are shown in the table. To date, 17% of control and 30% of intervention participants have been diagnosed with stage 3 T1D and started on insulin.

Conclusions: Our ongoing study seeks to determine if use of unblinded CGM for structured education and monitoring of youth with presymptomatic type 1 diabetes improves outcomes.

ePoster - 2.b: Automated Insulin Delivery, Closed loop

eP052 | Predicting success with a first-generation hybrid closed loop artificial pancreas system among children, adolescents, and young adults with type 1 diabetes: a model development and validation study

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Introduction: Hybrid Closed Loop (HCL) systems aid individuals with type 1 diabetes in improving glycemic control, however, sustained use over time has not been consistent for all users.

Objectives: This study developed and validated prognostic models for successful 12-month use of the first commercial HCL system based on baseline and 1-month or 3-month data.

Methods: Data from participants at the Barbara Davis Center (N=85) who began use of the MiniMed 670G HCL were used to develop prognostic models using logistic regression and Lasso model selection. Candidate factors included sex, age, duration of type 1 diabetes, baseline HbA1c, race, ethnicity, insurance status, history of insulin pump and continuous glucose monitor use, 1-month or 3-month Auto Mode use, boluses per day, and time in range (70-180 mg/dL; TIR), and scores on behavioral questionnaires. Successful use of HCL was predefined as Auto Mode use ≥60%. The 3-month model was then externally validated against a sample from Stanford University (N=55).

Results: Factors in the final model included baseline HbA1c, sex, ethnicity, 1-month or 3-month Auto Mode use, Boluses per Day, and TIR. The 1-month and 3-month prognostic models had very good predictive ability with area under the curve values of 0.894 and 0.900, respectively (Figure 1.A and 1.B). External validity was acceptable with an area under the curve of 0.717.

Conclusions: Our prognostic models use clinically accessible baseline and early device-use factors to identify risk for failure to succeed with 670G HCL technology. These models may be useful to develop targeted interventions to promote success with new technologies.

eP053 | Optimized carb ratio formula for pediatric type 1 diabetes

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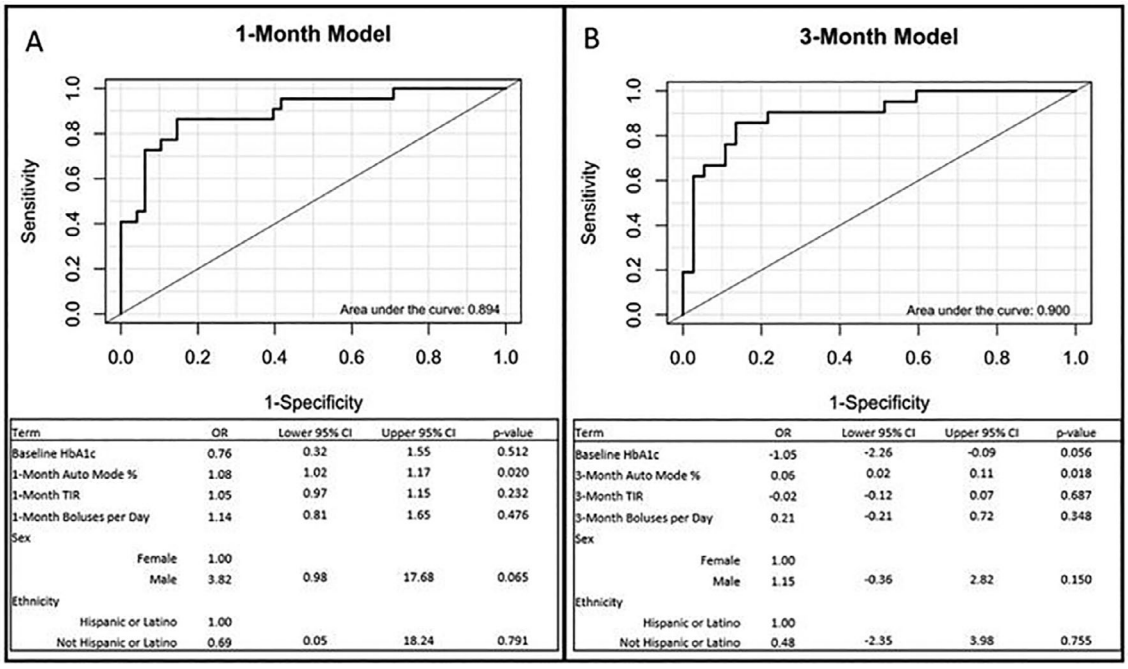
Introduction: Formulas that approximate basal insulin requirements, carbohydrate-to-insulin (CIR) ratio and insulin sensitivity factor (ISF) are frequently derived from adults meeting glycemic targets. Consensus equations express these physiologic settings only in terms of



Term	OR	Lower 95% CI	Upper 95% CI	p-value
Baseline HbA1c	0.76	0.32	1.55	0.512
1-Month Auto Mode %	1.08	1.02	1.17	0.020
1-Month TIR	1.05	0.97	1.15	0.232
1-Month Boluses per Day	1.14	0.81	1.65	0.476
Sex				
Female	1.00			
Male	3.82	0.98	17.68	0.065
Ethnicity				
Hispanic or Latino	1.00			
Not Hispanic or Latino	0.69	0.05	18.24	0.791

Term	OR	Lower 95% CI	Upper 95% CI	p-value
Baseline HbA1c	-1.05	-2.26	-0.09	0.056
3-Month Auto Mode %	0.06	0.02	0.11	0.018
3-Month TIR	-0.02	-0.12	0.07	0.687
3-Month Boluses per Day	0.21	-0.21	0.72	0.348
Sex				
Female	1.00			
Male	1.15	-0.36	2.82	0.150
Ethnicity				
Hispanic or Latino	1.00			
Not Hispanic or Latino	0.48	-2.35	3.98	0.755

direct or inverse proportionality to total daily dose (TDD). These consensus formulas are known to produce a relatively weak CIR in the younger population with type 1 diabetes.

Objectives: To determine if an optimized formula for CIR can address the limitations of the current formula for the pediatric population with type 1 diabetes.

Methods: Utilizing data from the Loop observational study we define an "aspirational" cohort of individuals who provide complete data (≥90% CGM availability, daily insulin and carbohydrate data), meeting the international consensus on Time in Range clinical targets, and normal BMI. We then developed formulas that included median TDD, median daily carbohydrates and BMI as inputs. We compare the results of the new CIR formula to the prior consensus formulas.

Results: The "aspirational" cohort included 323 settings from 85 participants <18 years old and 847 settings from 143 participants ≥18 years old. Greater deviation from the optimized CIR was significantly correlated with lower TIR in the non-"aspirational" pediatric group. In agreement with past literature, the new CIR formulas provided consistently more aggressive recommendations than consensus equations.

Conclusions: The new equation form provides a better starting point for the geometric mean of daily CIR. This new formula is of particular benefit to children using prediction-based automated insulin dosing.

ePO54 | What do the patients with type 1 diabetes gain by using advanced hybrid closed loop system?

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Introduction: The Advanced Hybrid Closed-Loop system (AHCL) is designed to keep glucose levels at a predetermined threshold by combining information from real time continuous glucose monitoring (rtCGM) with an algorithm that allows automatic insulin delivery. The Medtronic Minimed 780G pump is the first officially available AHCL pump in Poland.

Objectives: The goal was to perform a comprehensive comparative analysis of glycemic control parameters in patients with type 1 diabetes (T1D) treated with the AHCL in relation to previous pump therapy.

Methods: 52 patients, mean age 11.81 ± 5.45 years with T1D duration 4.94 ± 3.39 years, used a personal insulin pump PIP integrated with rt-CGM before connecting to AHCL. Rt-CGM and pump's records for two weeks preceding the AHCL connection were compared to the records of the first four weeks (after the initial training) in the automatic insulin dose adjustment system to current blood glucose levels (SmartGuard) in two two-week periods.

Results: Both sensor glucose average and standard deviation decreased significantly between PIP and AHCL ($p<0.0005$), while CV and TDI remained unchanged. The sensor glucose profile shifted significantly toward 70–140 mg/dL range, resulting in lower frequencies of measurements in the higher ranges of sensor glucose ($p<0.001$). There are no significant differences in the frequency of events linked to the low sensor glucose (<70 mg/dL). There were also no significant differences observed between the glucose profile in the first and second two-week periods of AHCL usage.

Conclusions: AHCL system significantly improves metabolic control by increasing the time spent in the range of 70-140 mg/dL and decreasing the average glucose concentration. The time spent below 70 mg/dL and the coefficient of variation remain unchanged during the first four weeks of using the SmartGuard function.

The work was partially supported by SUT grant BK-218/RAU4/2021.

ePO55 | Successful use of a hybrid closed loop system using dilute insulin in an infant with type 1 diabetes mellitus

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Table

	PIP +rtCGM	AHCL The first two weeks	AHCL The second two weeks
Avg SG [mg/dL]	138.13 ± 16.58	129.75 ± 10.8	129.9 ± 11.42
CV [%]	34.73 ± 5.35	34.05 ± 5.61	33.70 ± 5.01
TDI [U]	28.18 ± 14.68	26.34 ± 13.7	27.45 ± 14.26
Percent of sensor glucose values in range >250 mg/dL [%]	3.38 ± 3,6	2.03 ± 2.49	1.88 ± 2.10
180 - 250 mg/dL [%]	15.29 ± 7.23	11.60 ± 5.36	11.78 ± 5.52
140 - 180 mg/dL [%]	22.27 ± 5.03	19.77 ± 3.38	19.95 ± 4.07
70 - 140 mg/dL [%]	54.34 ± 12.52	62.03 ± 8.47	61.86 ± 9.03
54 - 70 mg/dL [%]	3.6 ± 2.71	3.56 ± 2.26	3.49 ± 2.29
<54 mg/dL [%]	1.12 ± 1.58	1.01 ± 1.07	1.04 ± 1.22

Avg SG - Average sensor glucose, CV - Coefficient of variation, TDI - Total Daily Insulin

Introduction: Diabetes technologies, including hybrid closed loop systems, have transformed management of diabetes. However, there are additional challenges in adapting these technologies to suit young children and infants, including incompatibility of low total daily insulin doses with the insulin pump algorithms.

Objectives: This abstract describes the safe and effective use of a hybrid closed loop system with diluted insulin in an infant with type 1 diabetes.

Methods: There are many additional challenges of managing insulin dependent diabetes in infants. This manuscript outlines the case of a 9-month-old 8kg female infant with type 1 diabetes who was managed with the Medtronic (®) 670G and 770G systems (Auto Mode) with diluted insulin (1:5) with monitoring of glycemic control before and after commencing the Auto Mode system. To our knowledge, there have been no studies looking at hybrid closed loop systems in infants under 12 months of age or with total daily insulin doses lower than 8 units.

Results: With the use of this hybrid closed loop system, we saw significant improvements in time in range and coefficient of variation, minimal hypoglycaemia and improved overall satisfaction of the family. Table below demonstrates the improvements seen over time with this management.

Conclusions: This case demonstrates the novel use of dilute insulin with hybrid loop technologies in an individual child, suggesting these systems may be used safely and effectively in this age group. Additional research in this area is required to further establish safety and efficacy.

eP056 | Real-world outcomes of the MiniMed™ 780G system in pediatrics patients

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Introduction: Real-world MiniMed™ 780G system data showed that, after AHCL initiation, overall users (N=4,120) spent 76.2% of the time at 70-180 mg/dL (TIR), 2.5% below 70 mg/dL (TBR) and 21.3% above 180 mg/dL (TAR), and achieved a glucose management indicator (GMI) of 6.8% (Da Silva J, et al. *Diabetes Technol Ther*. 2021;23:A79-A80).

Objectives: The glycemic control achieved by individuals aged ≤15 years was evaluated.

Methods: MiniMed™ 780G system data of users self-reporting to be 15 years and under, living in Belgium, Finland, Italy, Netherlands, Qatar, South Africa, Sweden, Switzerland and the United Kingdom, and providing consent were voluntarily uploaded between 27 August 2020 and 03 March 2021 in CareLink™ Personal. Data were aggregated, retrospectively analyzed and compared to the overall users. For those users with ≥10 days of SG data post-AHCL initiation, the GMI, TIR, TBR and TAR were determined. The impact of initiating AHCL in this population was evaluated in a sub-group of users also having ≥10 days of SG data, before AHCL initiation.

Results: Glycemic outcomes after AHCL initiation of overall users (N=4,120) and those ≤15 years of age (N=1,061) are shown (Figure).

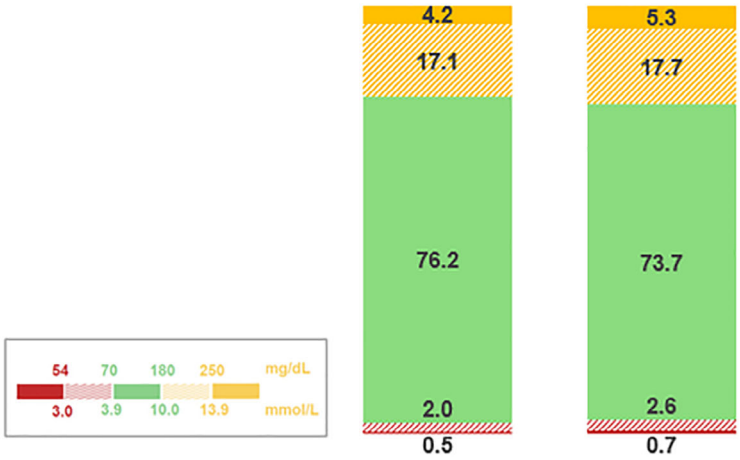
Table

Age (months)	7*	9	9.5	10	10.5	11	17
Weight (Kg) [SD]	6.8 [-1.3]	NA	NA	8.2 [-0.9]	NA	9.4 [-0.3]	10.6 [-0.1]
Insulin dilution	Nil	1:5	1:5	1:5	1:5	1:5	1:2.5
TDD[a] (actual units) [units/kg]	5.5–>2.5** [0.8–>0.4]	2.5	3.1	3.4 [0.4]	3	4 [0.4]	6.5 [0.6]
Insulin Therapy	MDI[b]	MDI[b]	Insulin Pump, Manual Mode Weeks 1-2	Insulin Pump, Manual Mode Weeks 3-4	Insulin Pump, HCL[c] (670G) Weeks 1-2	Insulin Pump, HCL[c] (670G) Weeks 6-8	Insulin Pump, HCT[c] (770G) > 6 months
TIR[d] (%)	39	31	32	45	64	70	78
Time <3.9 (%)	2	1	0	1	1	0	3
CV[e] (%)	37.6	33.9	29.2	32.2	29.1	26.3	33.2
GMI[f] (%)	8.7	9.2	8.4	7.9	7.2	7.1	6.7
Time in auto mode (%)	-	-	0	0	96	97	99

[a]Total Daily Insulin, [b] multiple daily injections, [C] hybrid closed loop, [d] time in range, [e] coefficient of variation, [f]glucose management indicator, *at diagnosis, **on reducing insulin doses over this time, NA: weight not available

Figure. Real-world MiniMed™ 780G system performance and glycemic outcomes in overall users and users ≤15 years, after Advanced Hybrid Closed-Loop (AHCL) initiation.

	Overall	≤15 Years
Number of users, n	4120	1061
AHCL control, %	94.1	93.7
Mean SG, mg/dL	144.4	136.2
GMI, %	6.8	6.6
% of users with GMI <7%	79.0	78.7
% of users with TIR >70%	77.3	70.8
% of users with TB70 <4% TB54 <1%	78.9	67.1



There were 70.8% and 78.7% of users aged ≤15 years who achieved a TIR >70% and a GMI of <7.0%, respectively. Users for which comparison with pre-AHCL was possible (N=188) reduced their GMI by 0.5±0.2% (from 7.3±0.6% to 6.8±0.4%, p<0.0001) and increased their TIR by 12.7±5.9% (from 60.7±15.3% to 73.4±9.4%, p<0.0001) post-AHCL initiation. Compared to pre-AHCL initiation, more users achieved treatment goals of GMI <7.0% (34.0% vs 73.9%) and TIR >70% (29.8% vs 69.7%).

Conclusions: Most MiniMed™ 780G system users aged ≤15 years achieved TIR >70% and GMI <7% while keeping hypoglycemia levels low, in a real-world condition. These findings, like those from the overall users, show improved glycemic control in a population that often faces challenges with diabetes management.

ePO57 | A 10-day initiation protocol of advanced hybrid closed loop system in children and adolescents with type 1 diabetes, previously treated with multiple daily injections

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Introduction: Advanced Hybrid Closed Loop (AHCL) systems provide superior glycemic control in children and adolescents with Type 1 Diabetes (T1D). Current studies included participants with previous pump and Continuous Glucose Monitoring (CGM) experience.

Objectives: We aimed to study transitioning these patients on Multiple Daily Injections (MDI) without prior pump experience to AHCL systems within a short period, utilizing a structured initiation protocol and the glycemic control they achieved with the MiniMed 780G system.

Methods: Children and adolescents (aged 7-17 years) with T1D on MDI therapy and HbA1c below 12.5% were recruited in this prospective open label single-arm, single-center study. All participants followed a structured initiation protocol including 4 steps: step 1: AHCL system assessment (1 hour discussion with educator); step 2: AHCL system training (2-hours sessions in 4 consecutive days with groups of 2 to 3 participants and caregivers); step 3: SAP use for 3 days; step 4: AHCL system use for 12 weeks, cumulating in 10 days from MDI to AHCL initiation. The primary outcome of the study was the change in the time spent in the target in range (TIR) of 70-180 mg/dl and HbA1c from baseline (MDI + CGM, 1 week) to study phase (AHCL, 12 weeks).

Results: 34 participants were recruited and all of them completed the 12 weeks study. TIR increased from 42.1±18.7% at baseline to 78.8 ±6.1% in the study phase (p<0.001). HbA1c decreased from 8.6±1.7% (70±18.6 mmol/mol) at baseline, to 6.5±0.7% (48±7.7 mmol/mol) at the end of the study (p=0.001). The participants used the sensor for a median of 96% of the time and spent a median of 90% in AHCL during

the 12 weeks. No episodes of severe hypoglycemia or DKA were reported.

Conclusions: Children and adolescents with T1D on MDI therapy who initiated the AHCL system following a 10-days structured protocol achieved the internationally recommended goals of glycemic control with TIR >70% and a HbA1c of <7%.

eP058 | Metabolic control in type 1 diabetes patients switching to advanced hybrid closed loop

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Introduction: Advanced Hybrid Closed Loop (AHCL) systems are the newest tool to improve metabolic control in type 1 diabetes (T1D).

Objectives: Metabolic control in patients switching to Medtronic MiniMed® 780G was described.

Methods: 37 T1D patients (19 M, age 15±7.4y, T1D duration 8.7±5.9y, HbA1c 7.2±0.8%, 10 multiple daily injections, 27 pump) switching to AHCL were evaluated for time in range (TIR 70-180 mg/dl), in different glucose ranges, coefficient of variation (CV), estimated HbA1c (GMI) in: manual mode (M), automode (A1= first 2 weeks; A2= last 2 weeks; A1month= first month; A3months= first 3 months). HbA1c before and 3 months after AHCL was evaluated. T-test for paired samples was used to compare means with SPSS Statistics.

Results: TIR increased from M to A1 (67.9±11% vs 75.3±9.3%; p 0.0001), time >180 mg/dl decreased (23.9±8.7% vs 18.9±7.0%; p 0.0001), as well as >250 mg/dl (5.5±3.5% vs 3.7±3%; p 0.001), with no difference in time <70 e 54 mg/dl and CV. GMI was 7±0.4% in M vs 6.8±0.3% in A1 (p 0.0001). TIR improvement was consistent in all automode periods, reaching 78.7±7.6% in A2. In A2 46% of patients showed TIR >80% (vs 30% of patients in A1) and TIR was greater with active insulin 2 hours and target 100 mg/dl compared to less strict settings (86±4% vs 77.5±7.4%; p 0.004). HbA1c after 3 months of AHCL (24/37 patients) improved (7.2±0.8% vs 6.7±0.5%; p 0.001). No difference in TIR among different periods was observed between patients on MDI vs pump before AHCL. TIR was greater in teenagers vs children <13y in M (73±11.5% vs 62.5±7.6%; p 0.003) and A3months (79.6±6.7% vs 73.1±6.7%; p 0.02).

Conclusions: AHCL allowed quick achievement of target TIR and its maintenance over time, as shown by HbA1c after 3 months. Metabolic control was optimal (TIR >80%), without hypoglycemia increase, when AHCL settings were stricter. Patients with low T1D technology confidence showed an improved metabolic control, not inferior to patients already on pump. Teenagers showed good technology adherence with optimal TIR maintained better over time compared to children.

eP059 | Improved quality of life, usability, and satisfaction with the Omnipod® 5 Automated Insulin Delivery System reported by caregivers of very young children with type 1 diabetes

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Table. Questionnaire score results (mean±SD) from caregivers of very young children aged 2 to <6y (N=80) in the Omnipod 5 Automated Insulin Delivery System preschool pivotal study for various quality of life, usability, and satisfaction measures

Measure	Scale (Optimal Score)	Baseline	End of Study	Change†
Problem Areas in Diabetes (PAID)	16 to 96 (16)	47.1 ± 14.2	37.3 ± 10.1	-9.4 ± 14.1*
Hypoglycemic Confidence Scale (HCS)	1 to 4 (4.0)	3.40 ± 0.51	3.57 ± 0.44	0.17 ± 0.50*
Pittsburgh Sleep Quality Index (PSQI)	0 to 21 (0.0)	6.61 ± 4.03	5.44 ± 3.00	-1.34 ± 3.73*
World Health Organization 5 Well-Being Index (WHO-5)	0 to 100 (100.0)	63.9 ± 18.8	73.1 ± 15.0	9.1 ± 17.8*
System Usability Scale (SUS)	0 to 100 (100.0)	78.3 ± 13.5	91.3 ± 10.1	13.1 ± 14.4*
Insulin Delivery Satisfaction Survey (IDSS)	1 to 5 (5.0)	3.88 ± 0.57	4.33 ± 0.45	0.45 ± 0.65*

*Significant change assessed by two-sided Wilcoxon signed rank test or paired t-test, p-value <0.01

†For most measures, sample size differed slightly for baseline versus the end of study due to variable response rates at each time point. Change was calculated as end of study minus baseline score only for those who responded at both time points. Due to the difference in sample size, the listed change value may differ slightly from the difference between the listed baseline and end of study values. Percentage of total sample size completing each questionnaire at both baseline and end of study was over 98% except for PAID at 88% and PSQI at 80%.

Introduction: Automated insulin delivery (AID) systems have demonstrated improved glycemic outcomes in people with type 1 diabetes (T1D), yet little data exist on use of these systems by the very young and the resulting impact on their caregivers.

Objectives: To better understand the effects of AID beyond positive glycemic outcomes, we evaluated quality of life (QOL), system usability, and satisfaction among caregivers of children with T1D aged 2 to <6y before and after 3mo of use with the Omnipod 5 System, a tubeless, on-body AID system.

Methods: Caregivers completed validated patient-reported outcome surveys evaluating diabetes-related distress (Problem Areas in Diabetes, PAID), hypoglycemia concerns (Hypoglycemic Confidence Scale, HCS), sleep quality (Pittsburgh Sleep Quality Index, PSQI), well-being (World Health Organization 5, WHO-5), usability (System Usability Scale, SUS), and satisfaction (Insulin Delivery Satisfaction Survey, IDSS and Diabetes Treatment Satisfaction Questionnaire, DTSQ).

Results: Children using AID (N=80) were aged 4.7±1y (mean±SD) with T1D duration 2.3±1.1y and A1C 7.4±1.0% (57±10.9mmol/mol). Their caregivers reported significant improvements across all evaluated measures ($p<0.01$, Table), indicating enhanced well-being, reduced diabetes-related concerns, greater perceived usability, and increased satisfaction with the study system compared to prior therapy. DTSQ change scores also demonstrated significant ($p<0.0001$) improvement: 23.9±5.2 (out of 30.0) for treatment satisfaction and 3.4±2.0 (out of 6.0) for perceived diabetes control (score of 0.0 indicates no change).

Conclusions: Caregivers face unique challenges when managing T1D in very young children. While glycemic efficacy and safety are unquestioned in their importance, these results evaluating QOL, usability, and satisfaction reveal equally meaningful improvements. These data suggest that this system alleviates some of the burdens caregivers face with existing treatment options.

eP060 | Significant reductions in adverse events and hospitalizations with Control-IQ™ technology in pediatric users with type 1 diabetes: Results from the CLIO Study

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Introduction: Efforts to meet glycemic targets without suitable technology and education may present risk of severe hypoglycemia (SH), diabetic ketoacidosis (DKA), and related hospitalizations (H).

Objectives: The t:slim X2™ insulin pump with Control-IQ™ technology has demonstrated positive glycemic outcomes for people with diabetes. To-date, however, there is no published real-world data evaluating adverse events (AE) in pediatric users of this technology.

Methods: The Control-IQ Observational (CLIO) Study is an ongoing, single-arm, longitudinal study evaluating real-world use of Control-IQ technology in people with type 1 diabetes (T1D) (age≥6). Participants reported 3-month AEs (SH, DKA, and H) at baseline (before using Control-IQ technology) and then monthly (via online surveys). We analyzed preliminary data including average annual AE rates for pediatric participants (6-17 years) between study start (August 2020) and June 2021. Individual AE counts were annualized, and the mean compared across cohorts.

Results: 779 pediatric participants used Control-IQ technology for 158 days [median, 111.5-211] days. At baseline, the 6-12 group reported more AEs (DKA=1.32, SH=8.34) vs. the 13-17 group (DKA=1.27, SH=3.93). Using Control-IQ technology, both groups reported significant reductions in AEs (6-12:DKA=0.72, SH=7.04; 13-17:DKA=0.38, SH=3.24). Overall, a 61% reduction in DKA and 15% reduction in SH was reported. AE-related hospitalizations also dropped significantly overall post Control-IQ technology (DKA=0.31 vs 0.11; SH=0.12 vs 0.03). Differences in AE reduction rates at post also emerged while comparing other subgroups. Greater reductions in DKA were reported for HbA1c≥8.5% group (-72%) vs. HbA1c<8.5% (-49%). Prior MDI users reported greater reductions in AEs (-63% DKA, -32% SH) vs. prior pump users (-60% DKA, -4% SH).

Conclusions: Use of Control-IQ technology demonstrated a clinically significant reduction in self-reported AEs for pediatric participants from the CLIO study.

eP061 | Safe and effective use of hybrid closed loop from diagnosis of type 1 diabetes mellitus (T1DM) in infants – a regional collaboration

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Introduction: Management of type 1 diabetes (T1D) in infancy presents challenges which may be mitigated by closed loop therapy and the use of diluted insulin. Expertise within diabetes teams may limit equitable access to novel technology. Low total daily doses (TDD) in infancy are difficult to deliver with standard strength insulin (U100). CamAPS FX™ is licensed from the age of 12 months, with a minimum TDD of 5 units and can adapt to non standard strength insulin (unlicensed).

Objectives: We report outcomes from four infants (7-18 months) commenced on hybrid closed-loop using CamAPS FX™ at diagnosis of T1D. MDT members from a primary regional centre supported a second centre until the MDT were confident, to enable equitable access to technology.

Table 1: Details of patient characteristics and outcomes

Infants and follow up period	Age (in months at diagnosis)	Diluted Insulin	TDD (units/kg)		TIR (3.9-10 mmol/L)		TBR (<3.5 mmol/L)		Time in severe hypoglycaemia (<3.0 mmol/L)		HbA1c (mmol/mmol)		Average BG (in mmol/L) (SD)	
			Start	Follow up	Start	Follow up	Start	Follow up	Start	Follow up	Start	Follow up	Start	Follow up
Infant 1 Follow up: 10m	18m	no	6units (0.65)	10units (0.74)	54%	75%	2%	1%	0%	0%	141	49	10 (4.1)	8.3 (2.7)
Infant 2 Follow up: 6m	7m	U10	3.3 units (0.53)	6.5 units (0.71)	62%	81%	1%	1%	0%	0%	57	52	9.2 (3.2)	8.1 (2.7)
Infant 3 Follow up: 4m	18m	U10	7.5 units (0.58)	7.6 units (0.55)	84%	73%	3%	1%	0%	0%	100	56	7.3 (2.2)	8.4 (2.9)
Infant 4 Follow up: 3m	13m	U10	5.0 units (0.56)	5.5 units (0.54)	53%	55%	1%	1%	0%	0%	133	72	9.9 (3.1)	9.8 (2.9)

Methods: Infants 1 and 3 were from the primary centre, and 2 and 4 from centre 2. Three started CamAPS FX™ as inpatients and one (infant 3) as an outpatient. Diluted insulin (U10) was used in 3 infants. Parental education including insulin dilution was delivered face-to-face initially with frequent virtual reviews and adjustment of insulin to carbohydrate ratios. Care at centre 2 was supported by MDT members (diabetes educator and consultant) from the primary centre at commencement of therapy, follow up appointments and provided consultant out of hours support until the second centre were confident to take on care (6 months).

Results: None of the infants have been readmitted to hospital. Diabetes control is excellent with minimal hypoglycaemia (Table 1). Parents report overall satisfaction although there is still a significant burden of care, related to the use of diluted insulin and technology failure.

Conclusions: Hybrid closed loop therapy, using U10 where total daily dose is below 10 units can be safe and effective in children under 2 years of age. Regional collaboration enabled a second centre to become competent in the use of the system enabling equitable access to novel technology.

ePO62 | Comparison of glycemic control between remote and in clinic initiation of advanced hybrid closed loop system MiniMed 780G in children and adolescents with type 1 diabetes

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Introduction: The COVID-19 pandemic has prompted the consideration of alternative methods to provide consultations such as telephone, e-mail, and video conferencing. Sidra Diabetes Team developed remote pump training program using video conferencing.

Objectives: The aim of the study was to evaluate glycemic control between Remote Initiation and In Clinic Initiation of Advanced Hybrid Closed Loop (AHCL) System MiniMed 780G (Medtronic, Northridge, US) in patients with Type 1 Diabetes (T1D).

Methods: Prospective observational study of children aged 7 to 18 years with T1D who were offered to start the MiniMed 780G system either following the remote initiation program (Remote group) or the traditional in clinic initiation program (In Clinic group). Both programs followed same structured education protocol over four consecutive days, two hours per days. Remote program was performed using Skype "Meet Now" or Zoom Conferencing, while in clinic program was performed at the hospital. HbA1c, Time in Range, AHCL system characteristics were analyzed three months after AHCL initiation.

Results: 13 patients (age 12.6±2.8 years, female:7) were included in the Remote group and 34 patients (age 11.7±2.1 years, female:18) in the In Clinic group. HbA1c of the Remote group decreased from 8.5 ±1.2% (69±13.1 mmol/mol) at baseline to 7.1±0.9% (54±9.8 mmol/mol) at the end of the study (p=0.002), compared to the In Clinic group for which HbA1c decreased from 8.6±1.3% (70±14.2 mmol/mol) to 7.0±1.1% (53±12.0 mmol/mol), (p=0.001), respectively). No significant difference of HbA1c levels, TIRs and SmartGuard use between groups was found at the end of the study. No DKA events and severe hypoglycemia in both groups was observed during the study. No severe hypoglycemia was observed in both groups.

Conclusions: Remote Initiation Program for AHCL system should be offered to people with T1D as alternative to In-Clinic Initiation Program. Both programs can improve glycemic control in a safe manner without severe hypoglycemia and hyperglycemia.

ePO63 | Improved glycemic outcomes over 9 months with the Omnipod® 5 Automated Insulin Delivery System in children with type 1 diabetes

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Introduction: Automated insulin delivery (AID) systems aim to transform the treatment paradigm for type 1 diabetes (T1D). The Omnipod 5 System is a novel AID system with on-body operation and customizable glucose targets from 110-150mg/dL (6.1-8.3mmol/L) in 10mg/dL (0.55mmol/L) increments. Safe and effective use of the Omnipod 5 System was demonstrated in children with T1D during a 3-month pivotal study.

Objectives: We present results from the first 6 months of an ongoing 12-month extension phase after the pivotal study, for a total of 9 months AID use, to evaluate durability of glycemic benefit.

Methods: Following pivotal study completion, participants were invited to continue system use with A1C assessed after each 3-month extension period. Participants aged 6 to <14y with T1D≥6 months and A1C<10% (86mmol/mol) used the system at home for a total of 9 months after 14 days of their standard therapy (pump or multiple daily injections). Safety endpoints included occurrence of severe hypoglycemia (SH) and diabetic ketoacidosis (DKA). The primary efficacy endpoint was change in A1C compared with baseline.

Results: Most (98%) study participants continued into the extension phase. Children (N=110) were aged 10±2y (mean±SD) with T1D duration 5±3y. Mean A1C was lower after 3, 6, and 9 months of AID use than at baseline (p<0.0001, Table). The A1C achieved at the end of the pivotal study (6.99%, 53mmol/mol) was maintained for an additional 6 months of system use, with no significant difference between each subsequent measurement (p>0.05). During that 6-month extension period, there was 1 DKA episode and no SH episodes. All participants have chosen to continue system use into the next 3-month period in the 12-month extension phase.

Conclusions: The safety and improved glycemic outcomes observed in the 3-month pivotal study persisted for an additional 6 months of system use. Sustained reduction of A1C demonstrates the potential long-term benefit of the Omnipod 5 System.

eP064 | Psychosocial impacts of the t:slim X2 pump with Control-IQ Technology (CIQ) in a clinical population of youth with type 1 diabetes (T1D) after 6 months of use

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Introduction: Hybrid Closed Loop (HCL) systems automate insulin delivery to reduce hyper- and hypoglycemia and may improve psychosocial impacts of T1D.

Objectives: To examine psychosocial impacts for youth using the CIQ Hybrid Closed Loop (HCL) system.

Methods: 183 youth with T1D starting the CIQ HCL system for their diabetes care were enrolled in a prospective observational study. Participants completed the following psychosocial measures: 1) Hypoglycemia Fear Survey (HFS: worry subscale, behavior subscale), a measure of worry related to hypoglycemia and behaviors to avoid hypoglycemia, with higher scores indicating more fear of hypoglycemia, 2) the Problem Areas in Diabetes (PAID) scale, a measure of diabetes burden, with higher scores indicating more burden, 3) the INsulin delivery Systems: Perceptions, Ideas, Reflections, and Expectations (INSPIRE) survey, a measure of the impact of HCL systems on the psychosocial functioning and quality of life, with higher scores

Table. Number of children (N=110) aged 6 to <14y with A1C<7.0% (53mmol/mol), A1C, and change in A1C from baseline and previous 3-month period after 3, 6, and 9 months of Omnipod 5 Automated Insulin Delivery System use

Measurement	Baseline (Pivotal start)	3 months † (Pivotal end)	6 months † (1st 3-month extension period)	9 months (2nd 3-month extension period)
A1C <7.0% (<53mmol/mol), n (%)	25 (23%)	57 (53%)	58 (54%)	60 (55%)
A1C, % (mmol/mol)	7.68 ± 0.94 (60 ± 10.3)	6.99 ± 0.63 (53 ± 6.9)	6.91 ± 0.63 (52 ± 6.9)	6.99 ± 0.66 (53 ± 7.2)
Change in A1C from baseline, % (mmol/mol)		-0.71 ± 0.63* (-7.8 ± 6.9)	-0.76 ± 0.69* (-8.3 ± 7.5)	-0.69 ± 0.65* (-7.5 ± 7.1)
Change in A1C from previous 3-mo period, % (mmol/mol)			-0.07 ± 0.39 (-0.8 ± 4.3)	0.06 ± 0.36 (0.7 ± 3.9)

Data are mean ± SD or n (%)

*Significant change assessed by linear mixed effects model, p<0.0001

†Of the 110 children, 2 did not have an A1C available at pivotal end and another 2 did not have an A1C available at the end of the first 3-month extension period. Changes are calculated only for those who had an A1C available at both time points.

Table: Psychosocial Outcomes for 153 Youth Using the CIQ HCL System

	Baseline	3 Months of CIQ Use	p-value*	6 Months of CIQ Use	p-value*
HFS Total (Range: 0-100)	39.3 ± 1.2	35.7 ± 1.2	**0.002**	35.3 ± 1.3	**0.003**
HFS Worry Subscale (Range: 0-60)	20.0 ± 0.5	18.6 ± 0.5	**0.009**	18.8 ± 0.6	0.08
HFS Behavior Subscale (Range: 0-40)	17.9 ± 0.9	15.8 ± 0.9	**0.04**	15.2 ± 1.0	**0.01**
INSPIRE (Range: 0-100)	81.5 ± 1.3	77.9 ± 1.1	**0.01**	77.9 ± 1.3	**0.02**
PAID (Range: 0-100)	52.0 ± 2.1	60.0 ± 2.1	0.40	49.5 ± 2.2	0.30

*p-value represents change from baseline

indicating more positive experiences. These were completed at baseline, 3-, and 6-months after starting the system. Descriptive statistics are reported as median (IQR). Changes in psychosocial outcomes across time were analyzed by mixed models and reported as mean ± SE.

Results: Participants were aged 14(10,16) yrs., 47.5% female, with baseline HbA1c 7.4% (6.7,8.3). HFS total scores and behavior subscale scores decreased significantly after 6 months CIQ use. INSPIRE scores also significantly decreased from baseline to 6 months. There were no changes in PAID scores (Table)

Conclusions: CIQ may reduce hypoglycemia fear for youth with T1D. The decrease in the INSPIRE score over 6 months indicates youth had high expectations when starting CIQ, some of which may not have been met, though 6 month experience scores remained high. This highlights the importance of setting realistic expectations when starting HCL systems. This study is ongoing to examine these psychosocial outcomes and CIQ system use across one year.

eP065 | Improved HbA1c, time-in-range, hypoglycaemia frequency, sleep and quality of life measures with hybrid closed-loop in children and young people with type 1 diabetes and their carers

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Introduction: Hybrid closed-loop (HCL) systems are characterised by integrating continuous glucose monitoring (CGM) with insulin pumps which automate insulin delivery via specific algorithms and user-initiated insulin delivery.

Objectives: The aim of the study was to evaluate effectiveness of HCLs on Hba1c, time-in-range (TIR), hypoglycaemia frequency, fear of hypoglycaemia, sleep and quality of life measure in children and young people (CYP) with T1D and their carers.

Methods: Data on HbA1c, TIR and hypoglycaemia frequency was reviewed 3 months prior to starting HCL and 3 months after. As part of clinical care, all patients and carers were provided with key education on the use of the HCL system by trained diabetes healthcare professionals. CYP aged 12 years and above independently completed the validated Hypoglycaemia Fear Survey (HFS). Parents of patients <12 were asked to complete a modified version of the HFS-Parent survey. A structured questionnaire to assess the quality of life (QOL) impact was also used.

Results: There were 39 CYP (22 males) with T1D included with a mean age of 11.8 ± 4.4 SD (range 2.6-18.0) at commencement of HCL. Mean duration of diabetes was 3.8 years ± 2.8 SD. There were 55% of patients who were prepubertal. 91% were on the Tandem Control-IQ system and 25% on the CamAPS FX system.

HCL use demonstrated significant improvements at 3 months prior compared to 3 months after commencement in the following: HbA1c (63.0 vs 56.6, p=0.03), TIR (50.5 vs 67.0, p=0.001) and frequency of hypoglycaemia (4.3% vs 2.8%, p=0.004). HFS scores showed improved behaviour (34.0 vs 27.5.9, p=0.02), worry (40.2 vs 31.6, p=0.03) and HFS-P scores also showed improved behaviour (p<0.001) and worry (p=0.01). 76% of carers strongly agreed or agreed that they slept better, 97% felt that the diabetes management had improved and 95% felt they had a better quality of life with the HCL.

Conclusions: Our study shows that HCL at 3 months improves glucose control, diabetes management and quality of life measures for CYP and carers.

eP066 | A hybrid closed-loop system for very young children with type 1 diabetes: qualitative study on parents' experience

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Introduction: The perspectives of parents with very young children with type 1 diabetes, who use hybrid closed loop systems, are currently absent.

Objectives: To explore parents' experiences of using a hybrid closed-loop system (CamAPS FX) for a very young child with type 1 diabetes.

Methods: Interviews were conducted with parents of 30 children (aged 1-7 years) who participated in the KidsAP02 study, (randomised controlled trial comparing closed-loop insulin delivery with sensor-augmented pump therapy).

Results: Parents reported major clinical benefits to using the closed-loop system, including more time being spent in target range. After initial training and transition, they felt at ease using the system's different functions and needed less health professional input.

Parents described wide-ranging quality-of-life benefits including better sleep, worrying less about their child's safety and feeling more confident entrusting their child's care to others. Parents also described how their child felt more normal and experienced better sleep, mood and concentration and less distress. Siblings also benefitted from parents' time and attention being less focused on diabetes management. While parents highlighted multiple benefits to being able to administer insulin using a smartphone, difficulties were reported carrying this device on a very young child's body.

Conclusions: Using a hybrid closed-loop system in very young children can have potentially life-changing consequences and may result in a lessened demand for health professionals' input. Systems may need to be customised for use in very young children.

eP067 | Effectiveness and security of advanced hybrid closed loop system

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Introduction: Automated insulin delivery systems have led to an improvement in quality of life and metabolic control in patients with type 1 diabetes mellitus. One of those is the "Minimed780G®", which is an Advanced Hybrid Closed Loop (AHCL) system approved in Europe for children from 7 years old, and distributed in the market in Spain since October 2020.

Objectives: Initial analysis of the effectiveness and security of "Minimed780G®" system.

Methods: Descriptive, observational, retrospective study of metabolic control in all patients using "Minimed780G®" system who are currently being followed in a Pediatric Endocrinology Unit.

Metabolic control data were collected before the 2-weeks intervention period and after the mentioned 2-weeks and 8-weeks intervention periods.

A database was created which the following variables were recorded in and analysed afterwards: time in range (TIR) and in hypoglycemia, mean sensor glucosa (MSG), coefficient of variation (CV), glucose management indicator (GMI) and insulin basal/bolus ratio.

Results: 23 patients, 9 men (39%) and 14 women (61%), were included in the study.

The portion of time when glucose concentration was within the target range was significantly higher after 2 weeks intervention period (77.45 ± 7.70 mg/dl).

Reductions in time under hypoglycemia condition were significantly higher: from 3.64% ± 2.7 (before) to 2% ± 3 after 8-weeks intervention period.

Regarding the basal/bolus ratio, it has been observed that, prior to intervention, patients have a predominance of basal insulin over boluses (1.04 ± 0.6), result which reverses significantly after the first 2 weeks intervention period (0.75 ± 0.28).

Results are shown in Table 1.

Conclusions: AHCL has been demonstrated to be effective and safe despite the short time it has been in use. Our study is a preliminary observation and it is necessary to expand the number of patients and the follow-up period to confirm the accuracy and long lasting in time of the results.

eP068 | Emotional and physical health impact in children, adolescents and their caregivers using open-source automated insulin delivery: qualitative analysis of lived experiences

Table 1

	Before 2-weeks	After 2-weeks	After 8 weeks	P (*2-weeks*)	P (*8-weeks*)
TIR (%)	70.73 ± 10.62	77.45 ± 7.70	76.7 ± 9.56	**0.001**	**0.04**
Time in hypoglycemia (%)	3.64 ± 2.7	3.64 ± 1.98	2 ± 3	0.477	**0.019**
MSG (mg/dl)	154 ±32	140 ± 12	154 ±29	**0.001**	0.140
CV (mg/dl)	34.37 ± 7.94	34.66 ± 3.85	34.11 ± 3.9	0.417	0.313
Basal/Bolus Ratio	1.04 ± 0.6	0.75 ± 0.28	0.75 ± 0.26	**0.068**	0.095
GMI	6.75 ± 0.57	6.6 ± 0.21	6.6 ± 0.3	0.176	0.096
Patient with TIR >70% (%)	58	87.5	83.4	-	-

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Introduction: Given the limitations in access and license status of commercially developed automated insulin delivery (AID) systems, open-source AID systems are becoming increasingly popular amongst people with diabetes, including children and adolescents.

Objectives: This qualitative study focused on lived experiences, physical and emotional health implications of children and their caregivers following the initiation of open-source AID, their perceived challenges, and sources of support, which have not been explored by the existing literature.

Methods: By utilizing an abductive approach, a coding framework was identified through an iterative process after the alignment discussions among the three coders. Specifically, we thematically analyzed narratives collected through two sets of open-ended questions of an anonymous online survey, the participants of which were 60 caregivers from 16 countries. The inter-rater reliability has been evaluated to ensure rigor and trustworthiness.

Results: A range of emotions, improvements of quality of life, physical health, and a reduced disease burden were reported as open-source AID enabled the families to shift focus away from diabetes therapy. Caregivers were less worried about hypoglycemia at night-time and outside of their family home, which led to more independence of the children. Simultaneously, glycemic outcomes and sleep quality of both child and caregiver improved. Meanwhile, the acquisition of suitable hardware and technical set-up could be quite challenging. The #WeAreNotWaiting community was the primary source of practical but also emotional support.

Conclusions: Our findings show the benefits and transformative impact open-source AID and peer-support can have on children with diabetes, their caregivers, and families, where commercial AID systems are not available or suitable. Further efforts are required to improve effectiveness and usability and facilitate access for children with diabetes worldwide to benefit from this innovative treatment.

eP069 | Does treatment with an insulin pump improve glycaemic control in children and adolescents with type 1 diabetes? A retrospective study

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Introduction: The insulin pump therapy is a therapeutic improvement and it is more and more recommended in patients with type 1 diabetes, in order to achieve an optimal glycemic control.

Objectives: The aim of this study is to determine the impact of insulin pump therapy on glycaemic control, and the rate of hypoglycemia among children and adolescents with type 1 diabetes.

Methods: Retrospective and descriptive study including children and adolescents with type 1 diabetes treated with insulin pump therapy followed up in the Department of Endocrinology-Diabetology and Nutrition of Mohammed VI University, Hospital Center, Oujda, in the eastern of Morrocco, between 2017 and 2021. Data were collected from patients' chart. The statistical analysis was done by SPSS version 21.

Results: Nine patients were enrolled in this study. The mean age was 10.8 ± 5.8 years old, 7 girls and 2 boys. The duration of diabetes was less than 3 years for 66 % of patients, with a mean duration of 5.1 years. No statural or ponderal abnormalities were noted. The mean Hba1C has increased between M0, M3, from, 7.4 ± 0.5 % to 7.6 ± 0.6 and we note that it has decreased at M6 by 0,4%, at M12 it were unchanged. The frequency of hypoglycemia decreased from 7.13 ± 3 episodes/week to 3 ± 2 episodes/week at 3 months (P=0,07), and to 0,5 ± 0,7 episodes/week at 1 year (p=0,02). No severe hypoglycemia was noted during this period.

Conclusions: Insulin pump therapy offers flexible and safe management of diabetes, when used appropriately, combined with intensive therapy education and continuous monitoring. This study suggests that insulin pump therapy is effective, safe and superior in children, adolescents and young adults with type 1 diabetes

ePoster - 2.c: Telemedicine, Digital Health, Decision Support and Artificial Intelligence Applications

eP070 | Social determinants of health linked with patient portal use in pediatric diabetes

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Introduction: Disparities amongst youth with type 1 diabetes (T1D) are associated with health outcomes. Patient portals (PP) can improve care quality, but equitable PP access is essential. Associations between social determinants of health (SDH) and PP access have not been reported in T1D.

Objectives: Determine if PP access and use are associated with SDH in T1D pediatric patients.

Methods: Retrospective chart review of T1D patients <18 years seen in the last year. Patient postal code, PP activation status and use were collected on April 1, 2021, along with patient characteristics. Degree of deprivation was determined by postal code on the Ontario-

Marginalization Index (ON-Marg) across four dimensions. Statistical analysis assessed for association between PP activation status and ON-Marg quintile.

Results: Data was obtained for 634 patients with mean age 12.8 ± 3.8 years, 53% male, mean HbA1C 8.4 ± 2.0%. 334 patients (53%) were active on PP and 332 (52%) used PP in the last year. Inactive PP account status was more likely in those with the highest degree of deprivation for residential instability (OR 3.49, 95% CI 1.86, 6.70) and material deprivation (OR 2.91, 95% CI 1.62, 5.36). PP activation status was not associated with dependency or ethnic concentration.

Conclusions: In our pediatric T1D population, inactive PP status is associated with greater residential instability and material deprivation. How these factors impact PP activation and how to improve equitable access requires further study.

ePP071 | Population-level management of Type 1 diabetes via continuous glucose monitoring and algorithm-enabled patient prioritization: Precision health meets population health

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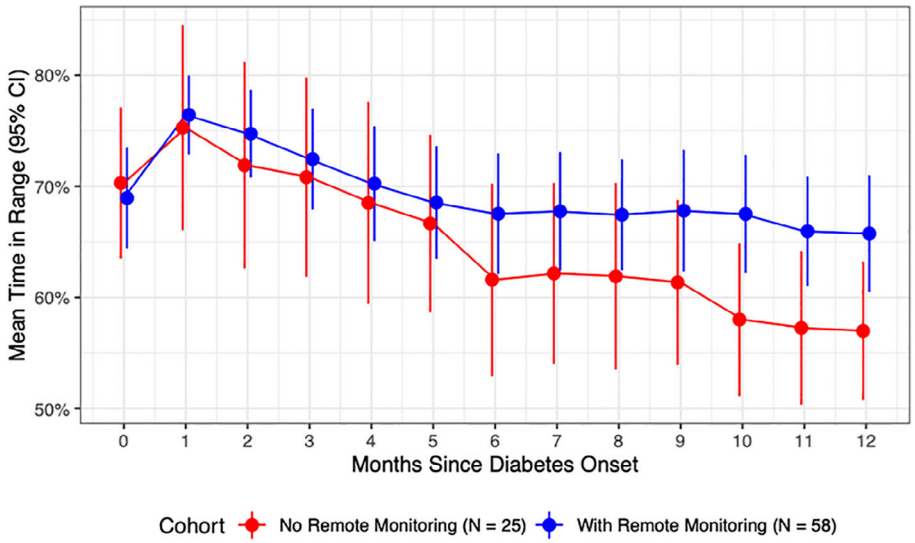
Introduction: Continuous glucose monitoring (CGM) and data-driven care tools improve diabetes outcomes. CGM-enabled telemedicine could expand specialized type 1 diabetes (T1D) care to underserved areas. In order to facilitate efficient care delivery for patients using CGM, clinics need help analyzing large amounts of CGM data

Objectives: To develop and scale algorithm-enabled patient prioritization to improve population-level management of type 1 diabetes (T1D) in a pediatric clinic with fixed resources, using telemedicine and remote monitoring of patients via continuous glucose monitor (CGM) data review.

Methods: We adapted consensus glucose targets for T1D patients using CGM to identify interpretable clinical criteria to prioritize patients for weekly provider review. The criteria were constructed to manage the number of patients reviewed weekly and identify patients who most needed provider contact. We developed an interactive dashboard to display CGM data relevant for the patients prioritized for review.

Results: The introduction of the new criteria and interactive dashboard was associated with a 60% reduction in the mean time spent by



Effects of remote contacts on the odds that TIR improves by >= 5pp from one week to the next

Model	Estimated effect of Contact (Odds ratio)	95% CI	Pr (>|z|)
Logistic regression with patient-level random effects	1.292	1.020–1.637	0.0329
Logistic regression with patient-level fixed effects	1.341	1.051–1.712	0.0182

diabetes team members who remotely and asynchronously reviewed patient data and contacted patients, from 3.2±0.20 to 1.3 ±0.24 minutes per patient per week. Given fixed resources for review, this corresponded to an estimated 147% increase in weekly clinic capacity. Patients who qualified for and received remote review (n=58) have associated 8.8 percentage points (pp) (95% CI = 0.6–16.9pp) greater time-in-range (70-180 mg/dL) glucoses compared to 25 control patients who did not qualify, at twelve months after T1D onset.

Conclusions: An algorithm-enabled prioritization of T1D patients with CGM for asynchronous remote review reduced provider time spent per patient and was associated with improved time-in-range.

eP072 | InPen™ Smart Insulin Pen use in pediatric and young adults demonstrates improved outcomes for MDI: A comparison with T1Dx registry

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Introduction: Smart insulin pens are used to track the timing and amount of insulin administration, provide dose recommendations, and integrate with continuous glucose monitors (CGM) and are emerging as an important technology for users of multiple daily injections (MDI) therapy.

Objectives: To describe real-world glycemic outcomes in pediatric and young adult patients with type 1 diabetes (T1D) using InPen™ smart insulin pens when compared to MDI and pump therapy outcomes reported by the national T1D Exchange (T1Dx) registry.

Methods: An exploratory descriptive analysis of deidentified real-world data compared glycemic outcomes in pediatric and young adults using InPen+CGM to MDI+CGM and pump+CGM outcomes reported by the T1Dx registry from 2017-2018. InPen users were aged 0 to 25 years, used CGM, started using InPen Jan to Dec 2020 and logged rapid-acting insulin doses on >50% of the days of InPen use. The HbA1c of T1Dx subjects and the glucose management indicator (GMI) of InPen users were compared using Mann–Whitney-Wilcoxon (MWW) for difference, and 'Two-one-sided Welch's t-tests (TOST)' for equivalence. Equivalence was defined as a change in mean HbA1c of ±0.4.

Results: InPen+CGM users aged 13-17 and 18-25 years had significantly lower GMI when compared to HbA1c outcomes reported by the T1Dx for patients on MDI+CGM therapy. Children and young adults aged 6-25 years using InPen+CGM had glycemic outcomes that were indistinguishable from those on pump+CGM therapy.

Conclusions: While we recognize that this comparison uses different surrogate metrics to represent mean glucose and that the data come from different sources, the results suggest that InPen smart insulin pen+CGM may improve glycemic outcomes for pediatric and young adults who choose to use MDI as their method of insulin delivery. In addition, the InPen + CGM smart pen users appear to have similar glycemic outcomes as those on pump+CGM therapy.

InPen vs. MDI (T1Dx)				
Age Ranges (N=InPen; T1Dx)	**InPen + CGM (GMI)**	**MDI + CGM (HbA1c)**	**Difference (pp)**	**MWW for Difference**
0-5 years (N=94; 43)	7.96	7.98	-0.02	ns
6-12 years (N=475; 180)	8.00	8.05	-0.05	ns
13-17 years (N=562; 232)	8.37	8.92	-0.55	p<0.001
18-25 years (N=481; 179)	8.19	8.56	-0.37	p<0.05
InPen vs. Pump (T1Dx)				
Age Ranges (N=InPen; T1Dx)	**InPen + CGM (GMI)**	**Pump + CGM (HbA1c)**	**Difference (pp)**	**TOST for Equivalence**
0-5 years (N=94; 156)	7.96	7.66	+0.30	ns
6-12 years (N=475; 1,130)	8.00	7.99	+0.01	p<0.001
13-17 years (N=562; 1,337)	8.37	8.40	-0.03	p<0.001
18-25 years (N=481; 727)	8.15	8.23	-0.08	p<0.001

Abbreviations: CGM, continuous glucose monitor; GMI, glucose management indicator; MDI, multiple daily injections; MWW, Mann–Whitney-Wilcoxon; pp, percentage point; T1Dx, Type 1 Diabetes Exchange; TOST, two-one-sided Welch's t-tests.

ePO73 | Efficacy and acceptability of OptimAAPP, a novel smartphone insulin dose calculator for carbohydrate, fat and protein: A randomised cross-over trial in children and adults with type 1 diabetes using multiple daily injection therapy

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Introduction: OptimAAPP is a smartphone insulin dose calculator that supports implementation of international guidelines on fat and protein insulin dosing by providing personalised insulin dose recommendations based on the meal carbohydrate, fat and protein content.

Objectives: To 1) assess the efficacy of OptimAAPP in managing glycaemia under free-living conditions compared to usual care, carbohydrate counting and 2) determine the acceptability of OptimAAPP to children and adults with type 1 diabetes using flexible multiple daily injection therapy (≥4 injections/day).

Methods: This trial was conducted at 2 Australian sites. Participants were randomised to use carbohydrate counting or OptimAAPP for 12-weeks and then cross-over to the alternate arm for a further 12-weeks. Each arm was preceded by a 2-week insulin optimisation period. The primary outcome, time in glucose range; 3.9-10.0 mmol/L was assessed using sensor glucose data collected over 2-consecutive weeks. The acceptability of OptimAAPP was assessed using a questionnaire.

Results: Presented are the results of an initial 21 participants; mean age 32±13 years, diabetes duration 14±11 years and HbA1c 7.0% ±1.0 (57±11 mmol/mol). Compared to carbohydrate counting, OptimAAPP achieved similar glycaemic outcomes without severe hypoglycaemia. The mean proportion of time in range was 66% (carbohydrate counting) vs 67% (OptimAAPP), above range; 30% vs 28% and below range; 4% vs 5% respectively. The mean coefficient of variation of sensor glucose was 34.8% vs 36.1% and change in HbA1c from baseline; +0.2% vs +0.1%. The majority of participants were confident giving the doses that OptimAAPP recommended (85%) and felt it was easy to use (77%) however, less than half (46%) preferred OptimAAPP with the limited number of foods in the in-built database cited as a key barrier to use.

Conclusions: Preliminary data indicates that OptimAAPP is a safe, effective tool for managing glycaemia similar to carbohydrate counting. The OptimAAPP food database may require further attention.

ePO74 | Identifying and addressing barriers to smart insulin pen use: a T1D exchange qualitative study of diabetes providers

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Introduction: The use of smart insulin pens (SIPs) in clinical practice has the potential to improve medication adherence, glycemic management, dose accuracy, and virtual care opportunities for patients living with diabetes. However, barriers to successful use exist, and these must be identified and addressed in order to be alleviated.

Objectives: The purpose of this study was to identify barriers and operational challenges to successful SIP use by assessing diabetes care team perceptions at participating pediatric clinics within the T1D Exchange Quality Improvement Collaborative.

Methods: The study was conducted by a phased mixed-methods approach. Focus groups were conducted among four pediatric clinics during the first phase, and an online survey was completed by 17 pediatric clinics in the second phase. Focus groups were transcribed, coded, and analyzed for common themes using NVivo qualitative analysis software. Summary statistics, including frequency and rate for categorical variables, were calculated for all clinical characteristics.

Results: The highest impact barriers were cost, insurance coverage, the prescription process, sufficient training and education for both clinicians and patients, technological difficulties, and language barriers. In addition, medium and low impact barriers included care team prescribing comfort level, smart phone access and functionality, and battery life of smart pens. Additional barriers include multiple caregivers, children losing pens at school, not having access to smart pens, and being responsible for translating for parents or guardians. All participating clinics report that the benefits from SIPs outweigh these barriers.

Conclusions: Findings highlight the need for increased provider and diabetes care team education and training on SIP features, use, and prescription process to support smart pen use in youth with T1D. Majority of the barriers can be addressed with locally available resources including free provider training, product demonstration etc.

ePO75 | Telemedicine and COVID-19 pandemic: the perfect storm to mark a change in diabetes care; results from a world-wide cross-sectional web-based survey

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Introduction: Telemedicine for routine care of pediatric patients with diabetes during the COVID-19 pandemic rapidly increased in many countries, helping to address the many barriers usually seen.
Objectives: This study aimed to describe healthcare professionals (HCPs) experience on telemedicine use in diabetes care and to investigate the changes and challenges associated with its implementation.
Methods: A cross-sectional electronic survey was distributed to the global network of Jenious members of ISPAD. Respondents' professional and practice profiles, clinic sizes, their country of practice, and the impact of COVID-19 on telemedicine were investigated.
Results: Answers from 209 HCPs from 33 countries were analyzed. During the COVID-19 pandemic, the proportion of youth receiving telemedicine visits increased from <10% (65.1% of responders) to >50% (66.5%). An increase in specific privacy rules for remote visits was introduced (37.3% to 75.6%), as well as data protection policies (from 42.6% to 74.2%) and reimbursements for remote care (from 41.1% to 76.6%). In 83.3%, HCPs reported to be satisfied with the use of telemedicine. Some concerns (17.5%) about the complexity and heterogeneity of the digital platforms to be managed in everyday practice remain, feeding the need for unifying and making interoperable the tools for remote care. Also, 45.5% of professionals reported to feel stressed by the need for extra-time for telemedicine consultations.
Conclusions: Telemedicine was rapidly and broadly adopted during the COVID-19 pandemic globally. Some issues related to its use were promptly resolved by local institutions. Challenges with the use of different platforms and for the need of extra-time still remain to be addressed.

eP076 | Classification of hypoglycemic events in type 1 diabetes using machine learning algorithms

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Introduction: Studies have shown that that 6-10% of all deaths among patients with type 1 diabetes (T1D) is caused by hypoglycemia. With FGM/CGM we now have access to detailed glucose data but the amount of data has become a challenge for the healthcare system.
Objectives: In order to improve the utilization of CGM data we have tested the hypothesis that a machine learning (ML) model can be trained to identify the most likely root causes for hypoglycemic events.
Methods: FGM/CGM data was collected from 449 T1D patients. 46561 hypoglycemic events were identified and 5041 events were randomly selected for manual classification by two clinicians. Three main causes of hypoglycemia were deemed possible to interpret and later validate by clinical recordings of insulin doses and carbohydrate intake; *1)* overestimated bolus, *2)* overcorrection of hyperglycemia and *3)* basal insulin pressure. The dataset was split into a training (n=4026 events) and an internal validation dataset (n=1015 events). A number of different ML model architectures were applied and evaluated. Separate data was collected from 22 patients which had manually registered insulin dosages and carbohydrate intake. Hypoglycemic events from this dataset was also interpreted by five clinicians independently of each other.
Results: Of the evaluated ML models we found that our custom built convolutional neural network model (HypoCNN) performed best. We found that masking the time series, adding time features, as well as using class weights improved the overall performance. Hence, we included these modifications into our primary model setup and based on that we obtained an average AUC of 0.924 in the original train/test split of the data (10 repetitions). Next, the best model was evaluated on the external validation dataset with an average AUC of 0.919.
Conclusions: Our findings support the notion that ML models can be used to identify root causes for glycemic excursions and in extension become a valuable tool for automated analysis of FGM/CGM data.

eP077 | Does telemedicine work well to support adolescents with type 1 diabetes?: A qualitative study with parents and diabetes care team members

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Introduction: Diabetes clinics have rapidly adopted the use of telemedicine to support ambulatory diabetes care during the COVID-19 pandemic.
Objectives: The aim of this study was to explore barriers to and facilitators of the integration of telemedicine in ambulatory diabetes care for adolescents with type 1 diabetes (T1D).
Methods: Eight focus groups of parents (n=19) and diabetes care team members (n=18) were conducted in the Seattle, WA metropolitan area. Semi-structured questions were used to elicit views about their experience with telemedicine diabetes clinic visits during the COVID-19 pandemic. Analysis was conducted using an iteratively developed codebook and themes were mapped onto the technology acceptance model (TAM).

Table

TAM Domain	Theme	Parent Quote	Diabetes Care Team Quote
Perceived Usefulness	*Facilitator*: **Clinic visit accessibility aligns with adolescent lifestyle**	"It's so much quicker and more efficient to be able to log on and be done and…we haven't had to leave our house. I think that's by far the best, especially with a busy teenager schedule, for sure. It was different when she was 9 and she didn't have much to do, but now it's hard to carve out those times to find a time that works."	"They're going to have to wake up at the crack of dawn, get in the car, perhaps against their will, and hop across the mountain to come to see us. [With telemedicine] they can sit in the comfort of their own PJs and wake up [at] the scheduled time and then see us."
	Facilitator: **Patient in home-setting provides real-world context to support practical diabetes management**		"Someone can take me on their phone, into their kitchen and we can look at their food and we can look at a food label together and go through that step-by-step with whatever they have available. We can go through a kitchen and do that. I can show people how to use measuring cups and a food scale, which I don't really have [in the clinic]."
	Barrier: **Inability to conduct a physical exam and incorporate findings**	"I like that [the provider] checks [my daughter's insulin pump] sites. So when we're doing [an appointment] over Zoom or over the phone she can't look at those and make sure that there isn't scar tissue. So [my daughter] just kind of has to guess herself whether, okay, this spot just isn't reacting very well, probably should move."	"As a physician, you [utilize information from] physical exams, when you're looking at their vitals and when you're looking at their growth."
Perceived Ease of Use	*Facilitator*: **Adolescent literacy with videoconferencing technology**	"I think with the remote learning nowadays that they've gotten used to this kind of setup, so it actually works really good."	"I think that the demographic, it seems like really is thriving on telemedicine are my really tech savvy pretty, usually fairly affluent adolescents who are away at college or something like that."
	Barrier: **Inconsistent availability of glucose monitoring and insulin administration data**	"I have no idea how to upload [pump] data [from home]. She's 16. She's got seven things going on in her mind. She'll show up [on Zoom] the morning of the appointment and go, 'I haven't uploaded my data yet.' Since you're not there [in-person], you can't give them your PDM or anything like that."	"I think it requires a lot of coordination between the medical assistant and our nurses and ourselves to have all the information ready to go [and available for review] when the patient's supposed to be seen. And that's a challenge even in-person and trying to do all that over the phone slash through Zoom, I think is another layer of difficulty. I sometimes feel like it's somewhat of a miracle when it actually happens."
	Barrier: **Inability to ensure confidential communication with adolescent (without parent)**	"Mom is all over the house and mom has eyes in the back of her head. While in the doctor visit, there is the isolation [where you can meet with a diabetes care team privately]."	"I didn't really think about this ahead of time how hard it is to ensure confidentiality. Even if just the teenager is on the screen, potentially, you're assuming the parents out of the room and then you hear the parent's voice or you see them sort of looking over and then you realize is the parent in the visit or not?"

(Continued)

TAM Domain	Theme	Parent Quote	Diabetes Care Team Quote
Attitude Toward Ongoing Use	*Facilitator & Barrier*: **Level of adolescent engagement in virtual setting**	"I think she feels compelled to say something [on a telemedicine visit]. It feels more interactive and supportive at the same time."	"Especially if we're trying to get them to really pay attention to their data and trying to teach them how to successfully manage [aspects of their diabetes self-care]. It's harder to do that through Zoom as opposed to being in person."
	Facilitator & Barrier: **Health equity for low resource families**		"You have families that perhaps are working six days a week. If they are working…they really can't take off work. And the time that it takes to get over to us, they're the ones that we really should see." "What are we doing to ensure equity in our care for families who are rural? For families who don't have access to reliable technology… [telemedicine use may] exacerbate [some] inequities in our patients."

Results: Barriers (n=5) and facilitators (n=5) were mapped to TAM domains (Table). Facilitators of perceived usefulness and perceived ease of use domains included (1) clinic visit accessibility that aligned with adolescent lifestyle, (2) access to context of daily life at home, and (3) adolescent literacy with videoconferencing technology. Barriers included (1) inability to conduct a physical exam and incorporate findings, (2) inconsistent availability of diabetes technology data, and (3) inability to ensure confidential communication with adolescent. Participant attitudes toward ongoing use of telemedicine were informed by the anticipated level of adolescent engagement in a virtual setting and equity determinants, including the challenges related to attending clinic visits. All participants, especially parents, saw the value in a hybrid model of telemedicine/in-person visits as beneficial for future ambulatory diabetes care.

Conclusions: Parents and diabetes care team members report that telemedicine visits are useful and align well with communication and lifestyle needs of adolescents. However, diabetes clinics need to address accessibility issues, improve appointment preparation, and develop techniques for confidential communication.

ePO78 | Using artificial intelligence decision support to enhance care for type 1 diabetes

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Introduction: Artificial intelligence (AI) can augment benefit from diabetes devices.

Objectives: Examine feasibility, acceptability, and efficacy of an enhanced care intervention (ECI) co-designed with families that uses AI decision support tool Advisor Pro, to guide insulin dose adjustment and health behavior recommendations delivered between visits for youth with type 1 diabetes (T1D).

Methods: Through virtual participatory design sessions, families shared preferred frequency and mode of communication between visits. After 4 sessions, we reached thematic saturation on a communication plan which included a baseline visit, 3 and 6 month routine visits, and monthly reminders to upload diabetes devices for review and generation of AI guided recommendations between visits. Eligibility criteria for prospective study: T1D for ≥6 months, use of Omnipod pump and Dexcom continuous glucose monitor (CGM), age 7-24 years and baseline HbA1c or glucose management indicator 7-13%. Outcome measures include: HbA1c, time in range, time below range, family and staff surveys of acceptability and feasibility.

Results: Over 7 months, 43 patients recruited to date; mean age 12.9 years (range7.1-20.8); 20 have completed 3-month follow-up visits, and of these 80% (n=16) have successfully completed interim dose adjustment. Of families not completing reviews, 1 was no longer using CGM, others reported technical issues. At 3 months general feedback and quantitative surveys on Likert scale were collected. Free response feedback was coded into themes: better diabetes control, improved communication, tech challenges. Survey responses and glycemic results to date in table.

Conclusions: Thus far, families report monthly interval delivery of insulin dose adjustment supported by AI guided decision support tool as helpful, although no significant change in glycemic outcomes is

Results for the 20 participants completing the 3-month visit of Enhanced Care Intervention (ECI)			
	Baseline Visit	3 Month Visit	p
General Patient/Family Feedback, n=17 Were recommendations helpful? Select free text responses based on themes: -Better diabetes control -Improved communication -Tech challenges	-	17 "yes" response, 0 "no" "able to lower the amount of lows, while also lowering my blood sugar when above 180" "We enjoy getting more frequent feedback and input" "Difficulties with use of technology...may be helpful at start to address any misunderstandings or old habits with technology"	-
Acceptability of Intervention Measure, n=14 The ECI meets my approval The ECI is appealing to me I like the ECI I welcome the ECI	-	Response options: completely agree (CA), somewhat agree (SA), neutral (N), somewhat disagree (SD), completely disagree (CD) 9 "CA", 4, "SA", 1 "N", 0 "SD or CD" 9 "CA", 4, "SA", 1 "N", 0 "SD or CD" 9 "CA", 4, "SA", 1 "N", 0 "SD or CD" 10 "CA", 3, "SA", 1 "N", 0 "SD or CD"	-
Hemoglobin A1c*, n=20 *mean (standard deviation)	7.8 (0.86)	7.7 (0.90)	0.64
Time in Range (%)*, n=20 2 weeks	43.1 (14.8)	45.8 (15.2)	0.60
Percentage of Hypoglycemia*, n=20 2 weeks	1.30 (1.98)	2.02 (1.38)	0.16

observed yet. Planned longitudinal follow-up in full sample is designed to determine efficacy in progressing towards glycemic targets.

ePO79 | Telemedicine experience for diabetes care in a Brazilian referral center during COVID19 pandemic

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Introduction: The COVID-19 pandemic has imposed crucial changes to healthcare systems, which had to adapt to the new reality of social distancing with maintenance of care, especially for patients with chronic medical conditions such as diabetes. In that way, telemedicine has become a new standard of care.

Objectives: To compare the number and rate of scheduled, completed and no-show medical visits prior to the COVID19 outbreak in Brazil, when visits were exclusively in person, and during the pandemic, when both in person and telehealth visits were conducted.

Methods: From January 2019 to June 2021, statistical analysis of electronic health record data for all patients from an outpatient clinic of a Brazilian diabetes referral center were collected.

Results: Before the COVID19 outbreak, there was an average of 100 scheduled visits, 82 completed appointments and 18 no-show visits per month. In the months following the outbreak there was a 50% reduction in the outpatient clinic's capacity, due to health restrictions imposed by local authorities. Therefore, in these months (in which the outpatient clinic used telehealth via mobile app), there was an average of 51 scheduled visits, 40 completed appointments and 11 no-show visits per month. Telehealth consultations replaced 12.5% of the in-person appointments, with a 350% increase in the number of online consultations between the first and the last month analyzed by the study. Moreover, regarding the communication between patients and health center, there was a 65% reduction in the number of emails exchanged and a 64% increase in the number of messages exchanged through mobile telehealth app.

Conclusions: Despite the poor infrastructure and technology access in a low-income country like Brazil, our service was able to replace 12.5% of in-person care with telemedicine, which allowed the patients safety during medical care in the context of the pandemic.

ePO80 | Does a telemedicine approach improve glycaemic control and quality of life in children and adolescents with type 1 diabetes?

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Introduction: With the recent shift in healthcare towards virtual clinics and online contact, particularly brought on by the pandemic, more diabetes care has been done virtually. The increasing use of technology in diabetes lends itself towards a virtual approach, and as young people are adept at technology, this could also make healthcare more accessible for this population. Currently there is variable evidence in the adult setting of the potential improvement in glycaemic control and psychological outcomes by using telemedicine, there are no current reviews in the paediatric setting.
Objectives: To review the evidence around telemedical approaches in children and adolescents with type 1 diabetes, and how it affects glycaemic control and quality of life.
Methods: MEDLINE, Embase and Cochrane library databases were searched to identify controlled trials which compared telemedical approaches to standard care in children and adolescents (age 0-20 years) with type 1 diabetes. Data extracted: Specific telemedical intervention, HbA1c, patient satisfaction and QoL measurements. Bias was assessed using Cochrane Risk of Bias 2 tool.
Results: Six controlled trials were included in the review, 5 of which were RCT, 1 quasi-RCT. There was a total study population of 513. Most studies had a trial period of 6 months, 2 extended for 12-24 months as a cohort study. Interventions studied ranged from phone-based SMS service to video consultations and school-based telemedicine system. Glycaemic control results were variable: 3 studies showed significant improvement in HbA1c, 2 studies showed no significant improvement, 1 study showed improvement in both intervention and control groups. There was a significant improvement in psychosocial outcomes in all 3 studies who reported. There was at least some concerns of bias with all studies included.
Conclusions: There is no definitive evidence of improvement in glycaemic control with the use of telemedicine, but it has been proved to be acceptable to patients and improve quality of life.

ePO81 | Improving the use of digital technology in optimising diabetic care in children and young people

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Introduction: The COVID-19 pandemic highlighted poor engagement with home uploading to the Diasend platform among the paediatric diabetes population at Darent Valley Hospital, UK. The repercussions of this became apparent when in-person appointments were switched to telephone consultations, meaning that clinic staff were unable to review patients' blood glucose trends and provide management advice. Thus, it became more pertinent than ever to ensure patients and their parents were engaging with home uploads. Consequently, a quality improvement project was necessary to identify how home uploading could be improved, which was conducted as part of a medical student-led project at King's College London.
Objectives: To increase the number of blood glucose readings uploaded to Diasend from a baseline of 2 uploads per week to a target of 15 uploads a week between October 2020 and February 2021.
Methods: A questionnaire was used to identify the barriers to uploading data to Diasend. Thematic analysis highlighted the most relevant themes which formed the basis of the plan-do-study-act (PDSA) cycles that drove the quality improvement methods. In PDSA1, an educational email containing information about how to upload blood glucose readings to Diasend was sent to patients. In PDSA2, email reminders were sent out to patients on a weekly basis for 6 weeks.
Results: The number of uploads in each week was greater than the median baseline of 2 uploads per week. Our aim of 15 uploads per week was achieved during week 10; this was sustained for the remaining 2 weeks of the project. Finally, PDSA2 had a greater number of total uploads compared to PDSA1, with 92 uploads versus 45 uploads respectively.
Conclusions: The clear synergistic effect of the changes implemented in the PDSA cycles were likely pivotal in promoting positive behavioural changes. Empowering patients and carers to be more active in their diabetes management will improve patient-centred care and reduce future hospital admissions.

ePO82 | "The Smart Insulin Pen": A great tool for those who want the benefit of a pump but don't want to wear an insulin pump! A Qualitative Study on Facilitators to Smart Insulin Pump Use

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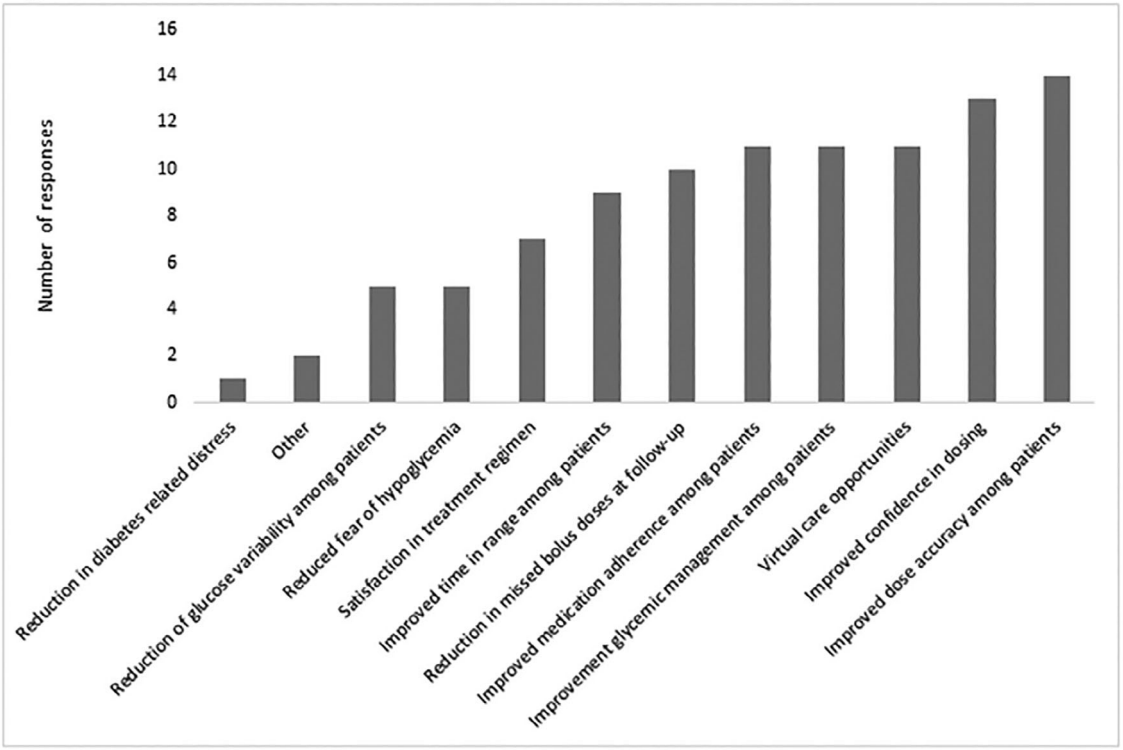
Introduction: The use of smart insulin pens has the potential to improve glucose stability, medication adherence, glycemic management, time in range, dose accuracy, quality of visits, and virtual care opportunities for patients living with diabetes.
Objectives: The purpose of this study was to identify facilitators to smart insulin pen use by assessing provider and care team perceptions.
Methods: The study was conducted using a mixed-methods approach. Participating endocrinology clinics within the T1D Exchange Quality Improvement Collaborative (T1Dx-QI) were recruited for this study. Four pediatric centers participated in focus group sessions while 17 clinics completed an online survey. Focus groups were transcribed, coded, and

Figure 1: Benefits observed as a result of prescribing smart insulin pens



analyzed for common themes using NVivo qualitative analysis software. The online survey responses were summarized using R software.

Results: Smart insulin pens (SIPs) were seen as a tool to engage patients in their diabetes self-management and increase accountability for insulin administration. Improvements were noted in patient engagement. SIPs were viewed as an acceptable alternative to pump therapy. Major facilitators for smart insulin pen use are shown in Figure 1. Majority of participants reported improvement in medication adherence and glycemic management in patients using SIPs. Testimonials from providers include *"Especially for the kids who didn't want to go on a pump, that they can still have a lot [benefits of dose calculator] without using a pump." "I've had a couple of teenagers really take ownership of their diabetes in sending in those reports." "It can really help to structure the clinic visits and make them more productive."*

Conclusions: All respondents saw SIPs as a beneficial tool with provider-reported benefits to the patient, caregivers, provider, and clinic. Reports from smart insulin pens were seen as useful tools for both patients and providers.

ePO83 | Pediatric type 1 diabetes [OO1] caregiver's technology use: African American Perspective

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Introduction: Previous studies have shown that Black children with Type 1 diabetes (T1D) tend to have less use of diabetes technology compared with white subjects[OO1] . Increased use of technology has been associated with improved glycemic control.

Objectives: The objective of the study is to obtain a better understanding of the barriers that keep Black patients from using advanced technology including glucose sensors and insulin pumps.

[OO1]Children

Methods: A qualitative study design to understand barriers to technology use in Black patients. We completed semi-structured interviews and 1 focus group with a sample group of parents of T1D patients who identified as Black. All interviews were conducted by a pediatric endocrinology fellow. Four topic areas were the focus of the interview: sensor usage, pump vs smartpen vs MDI, training via video conference vs in-person visits, and overall suggestions to improve care. The interviews were transcribed, annotated, and analyzed for common themes.

Results: We gathered data from 7 Black parents of T1D patients. 85% of caregivers were female and interviewed via video conferencing. One parent was interviewed by phone. 66% of the patients are using a sensor regularly. 57% are using an insulin pump and 32% using a smart pen. All caregivers were taught how to download devices before clinic visits but only 42% downloaded regularly at home. Key barriers to technology use in blacks were identified as; feeling different from peers, needing a relatable diabetes community, insurance obstacles, fear/intimidation of devices, prior providers who did not encourage technology, and embarrassment when don't understand something.

Conclusions: The focus group provided an opportunity for caregivers to discuss freely ways to increase technology usage, benefits of technology, insurance issues, and other recommendations for treatment. The

study provided insights that would further help increase the use of diabetes technology in the African American population in our clinic.

eP084 | Use of telemedicine in the care of pediatric patients with type 1 diabetes during COVID-19 pandemic in a Public University Hospital in Brazil

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Introduction: In March 2020 diabetes outpatient clinics were closed and consultations suspended due to the restrictions imposed by authorities in the context of the COVID-19 pandemic. Telemedicine in Brazil was then urgently officialized. Considering that the majority of our patients come from a low socioeconomic background, the only alternative of communication was through a free mobile app via cell phone.

Objectives: The aim of this study was to evaluate patient satisfaction and the effectiveness of care delivered by teleconsultations via cell phone in this population.

Methods: This was a questionnaire-based cross-sectional study, completed using Google forms, offered to every patient/carer from the Pediatric Diabetes Outpatient Clinic of Santa Casa de São Paulo who received telemedicine care during this period. Complementary data were obtained from patients' electronic medical records.

Results: In 12 weeks (between March and June 2020), from a total of 154 appointments, 83%(n=88) of patients were attended via asynchronous teleconsultations using a mobile app, 16%(n=17) were in-person and 31.2%(n=48) did not attend the consultation. The great majority of patients had their insulin dose adjusted (87.6%; n=85). From those who answered the questionnaire (87%; n=77), 93%(n=72) approved the telemedicine consultation and 59% said that glycemic control improved afterward. There were also economic benefits and less waste of time reported. Only 3 patients declared that they did not feel safe without face-to-face care. 60% declared they would like to continue alternating presential with online consultations after the end of the pandemic.

Conclusions: During COVID-19 pandemics, the transition to telemedicine was associated with patients' satisfaction and efficacy in treatment adjustments. Considering the socioeconomic characteristics of this population, telemedicine via mobile app was a good option for offering diabetes care during a period of isolation.

eP085 | Telemedicine program in a population of children and adolescent with type 1 diabetes

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Introduction: In the last years, telemedicine has been integrated into the treatment of different diseases. During the COVID-19 global pandemic, medical examinations for patients with type 1 diabetes (T1DM) have suffered a setback, causing an increase of ketoacidosis cases and worsening of the quality of care.

Objectives: Evaluate glucose values and satisfaction of a telemedicine program in a population of children and adolescents with T1DM.

Methods: We created an ad hoc assistance for children and adolescents affected by T1DM and we examined changes compared to main glycemic targets, which are HbA1c, Glucose Management Indicator (GMI), coefficient of variation (CV), time below range (TBR), in range (TIR) and above range (TAR) between the period before the visit and the following one. A number of aspects of teleconsultation was also evaluated through a questionnaire (score 1-4), including the utility and ease of use, the quality of the interface and interaction, reliability, satisfaction and the possibility of future use. Means were compared via paired-samples T-tests.

Results: The questionnaire was proposed to all patients who received a teleconsultation between December 2020 and March 2021. 64 of 87 patients replied to the questionnaire (87%), 50% female, average age 11,6 years. The average disease duration was 4,4±3,58 years. 88.7% of the respondents were parents, in other cases the minor was assisted. Regarding metabolic data no significant differences were observed compared to GMI (57±9 vs. 56±8 mmol/mol), CV (34.1±6.9 vs 35.2±5.9%), TBR (2.5±2.3 vs. 2.7±2.8%), TIR (60.8±18.7 vs. 61.5 ±18.0%), and the TAR (36.6±19.6 vs. 35.4±19%). A significant difference was observed for HbA1c (from 60±12 to 57±11 mmol/mol, p <0.001). The median of the individual domain scores on the questionnaire was 4, with no score lower than 3.5.

Conclusions: Telemedicine service for children and adolescents with T1DM followed in our Centre has not shown a worsening of the clinical parameters, while it has shown a high satisfaction of use.

eP086 | Making diabetes EHR data actionable: T1D exchange QI portal (T1Dx-QI portal) an innovative tool for collaborative diabetes care improvement

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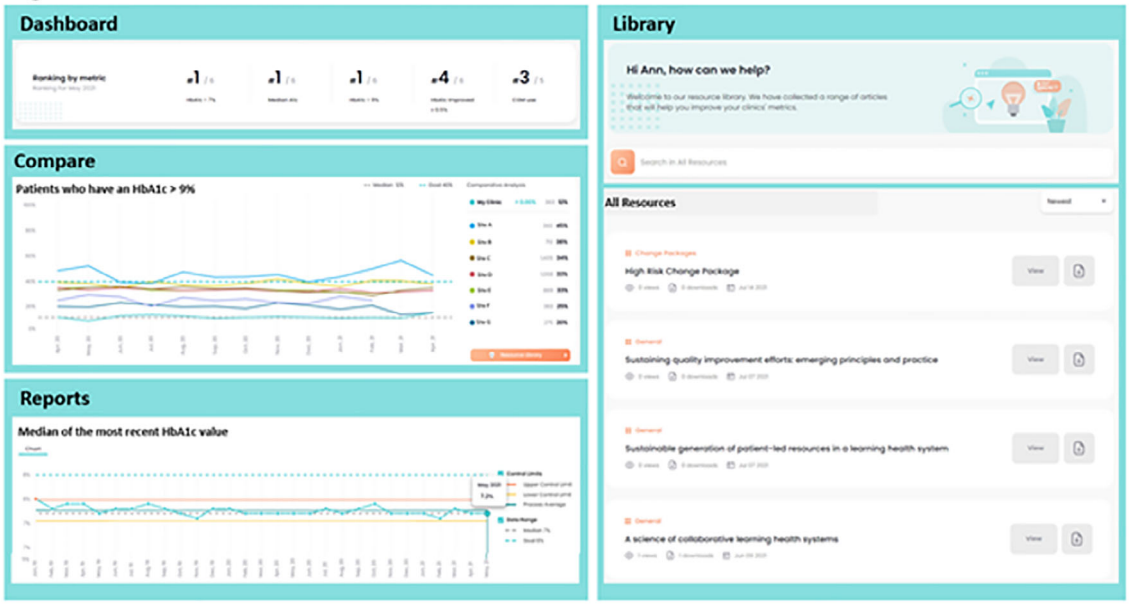
Introduction: Electronic Health Records (EHRs) allow aggregated insights on population-based health outcomes; however, these are available only to the host institution.

Figure 1: Screenshots of the four available tabs in the T1Dx-QI Portal



Objectives: To describe an innovative EHR-based QI web portal; a tool to which supports sharing of best practices and clinical innovations for improvement of outcomes in patients with diabetes across nine US-based pediatric endocrinology clinics in the T1Dx-QI collaborative.

Methods: T1Dx-QI is an online platform developed with Tableau business intelligence software that launched in 2019. Participating clinics securely share patient-level de-identified data monthly to a central data warehouse that is then transmitted to the Portal. T1Dx-QI clinics can assess and benchmark their EHR data with other clinics using the same improvement metric definitions.

Clinics have access to four tabs (Figure 1): 1. The *Dashboard Tab* with clinic to clinic ranking on quality metrics; 2. The *Compare Tab* with fully customizable benchmarking features; 3. The *Reports Tab* with built-in statistical process control charts to identify improvement trends and filter data by demographic indicators; 4. The *Library Tab* where users can access case studies, QI publications, and other related improvement stories.

Effectiveness of the QI Portal is measured by 1. User Engagement, the percent of participating sites accessing the Portal at least once a month, and 2. Improvement in customized QI Metrics. Examples of QI metrics are the percent of patients using a continuous glucose monitor and mean A1c.

Results: From December 2019 through June 2021, there has been a sustained increase of 83% in portal engagement. All T1Dx-QI sites in the Portal have demonstrated sustained improvement in at least two quality metrics, with 50% sustaining improved results across four metrics.

Conclusions: The T1Dx-QI Portal is a novel platform to collaborate using real-world EHR-based data to improve health outcomes among youths with diabetes.

eP087 | 6 months of a virtual diabetes education programme for children, adolescents with type 1 diabetes, their families and caregivers during the Covid-19 pandemic: What did we learn?

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Introduction: In the Covid-19 pandemic context, the measures imposed for more than a year have limited the ability to carry out face-to-face diabetes education group programmes. Initially, the programmes were postponed and then cancelled.

Objectives: However, during the second lockdown, it seemed to us essential to maintain them via virtual modality since November2020.

Methods: To do this, we reviewed and adapted our programmes at each stage of their construction and implementation: families' needs, educative skills and objectives' prioritisations according to the achievable remotely, targeting digital tools inspired from ICTE (Information and Communication Technologies for Education) and adapted to the diabetes care objectives and finally adaptation of the evaluation methods. Moreover team's training in the use of connection platforms and digital tool was necessary in this adaptation process.

Results: To date, 19 workshops have been held for 93 children, 12 adolescents, 30 parents, 14 carers and 22 health professionals. This led us to reflect on the contributions and needs of the practice of group diabetes education in a virtual modality: feasibility, necessary structure, skills and objectives to be prioritised, effective educational

strategies according to the target audience and objectives, modalities of animation essential in Visio.

Conclusions: In general, the evaluations from families and health professionals in terms of satisfaction and knowledge acquired are positive. Moreover, this experience has allowed a progression in the adaptability of our team. Sharing our experience and learning from it can be useful for other teams. The remote group diabetes education modality enriches our practice by providing new ideas and recommendations for development, organisation and evaluation of diabetes care and education. In the near future, we will include hybrid programmes (face-to-face and remote) to respond to our territorial needs particularly in relation to the geographical distance of families and health teams.

eP088 | GlyCulator 3.0: a web-based platform for continuous glucose monitoring analysis and center benchmarking

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Introduction: Joint efforts of the research community resulted in CGM incorporation into the standards of clinical care and recognition as potential endpoints in clinical trials. However, most analyses of glycemic variability (GV) quantified by CGM rely on proprietary or programming-intensive tools, often resulting in functional discrepancies between manufacturers and studies.

Objectives: To develop an open-access, easy-to-use, continuously updated web-based platform for CGM records quality assurance and GV analysis.

Methods: GlyCulator 3.0 platform was developed by the joined team of IT specialists and experts in CGM analysis from the Medical University of Lodz, Poland. Key software functions for CGM analysis were identified through the review of *Standards of Medical Care in Diabetes*. Python was used for the back-end and PostgreSQL for database management. Application services are containerized with Docker allowing for further inclusion of additional features and facilitation of reproducible science.

Results: GlyCulator 3.0 is available on https://glyculator.btm.umed.pl/. Upload of bulk CGM data is provided for Medtronic, Dexcom, Abbott and Senseonics sensors. Data uploaded by the user is stored anonymized in the database, accessible only by the user. For each patient, visualization of CGM completeness is provided to guide the date-range selection for GV analysis. Calculation of GV indices includes: mean, median, SD, CV, time-in-ranges (with user-defined thresholds), LBGI, HBGI, GMI and others, as defined by the *Standards of Medical Care in Diabetes*. Analysis report (in PDF) includes patients' daily CGM graphs and multi-patient time-in-range visualization. Computed GVs are accessible as CSV files for their further analysis in the external software. GlyCulator is compliant with the FDA Title 21 CFR Part 11 Audit Trial. For functionality requests please contact the team via glyculator@umed.lodz.pl.

Conclusions: By providing continuously updated high fidelity software we hope to facilitate the best practices for CGM analysis.

ePoster - 3: Diabetes Pathogenesis, Epidemiology and Etiology

eP089 | Type 1 diabetes, obesity and the gut microbiome

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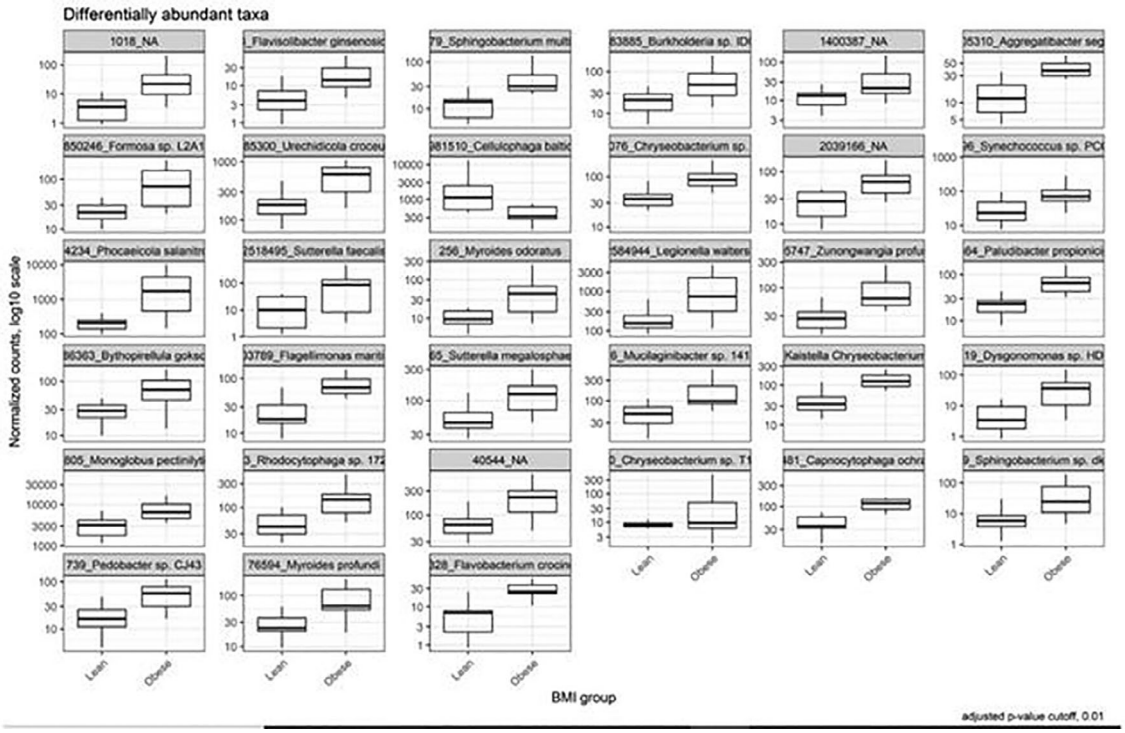
Introduction: Obesity is increasingly prevalent among children with Type 1 diabetes (T1D). Notably, obese children progress faster to T1D with reduced insulin sensitivity compared to their lean counterparts. Reduced insulin sensitivity is associated with higher exogenous insulin needs, chronic inflammation as well as higher risk for hypoglycemia, dyslipidemia and long-term diabetes complications. Emerging evidence suggests that T1D risk and progression are associated with gut bacterial imbalance. Gut microbiome differences are also associated with and thought to contribute to obesity. However, it is unknown to what extent the gut microbiome plays a role in obesity in T1D youth and their worse outcomes.

Objectives: Here, we aimed to determine the differences in the gut microbiome profile in T1D youth who are lean vs. obese (lean: ≤84th % vs. obese: ≥95th%).

Methods: We collected stool samples from 11 obese individuals and 12 lean. The mean (±SD) for age in the entire cohort was 15.5 ±2.3 years, diabetes duration 59.3±61.3 months, while A1c was 8.0 ±1.2%. There were 10 females, 3 African Americans, 1 Hispanic White and the remaining were non-Hispanic Whites. We used Negative binomial models (DESEq2 R package) for differential abundance testing of taxonomic and subsystem level 3 features. We looked for differences between BMI groups. P-values were calculated with LRT test. Adjusted p-value = 0.01.

Results: We found 33 species with significantly different abundance between the BMI groups, Figure 1.

Conclusions: In summary, our preliminary analysis suggests that there are identifiable differences in the microbiome profile consistent with our hypothesis. Additional samples are being collected and analyzed for further confirmation. It has yet to be determined if there are differences in the functional microbial profiles between the two BMI groups.



eP090 | Inflammatory parameters and chemokine network in children with type 1 diabetes

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Introduction: There is growing evidence that diabetes represents a state of low-grade chronic systemic inflammation mediating endothelial damage and diabetic vascular complications. It is driven by hyperglycemia and AGE production and perpetuated by the accumulation and activation of immune cells secreting proinflammatory molecules such as chemokines

Objectives: We aimed to investigate clinical, metabolic, and inflammatory parameters in children with type 1 diabetes by analyzing laboratory data and peripheral blood chemokine and chemokine receptor profiles.

Methods: Mononuclear cells were isolated from peripheral blood of healthy controls (n=29, 14 M, age 15.46+/-1.51 years) and diabetic children (N=31, 19 M, age 15.54+/-1.61 years). B-cell (CD19+), T-cell (CD3+), and monocyte (CD14+) frequencies were determined in regard to chemokine receptor expression (CCR2, CCR4, CXCR3, and CXCR4) by flow cytometry. Chemokines (CCL2, CCL5, CXCL10, CXCL11) were determined by LEGENDplex™ and CXCL12 by ELISA. Data were compared between the groups and correlated with clinical and laboratory parameters (diabetes duration, HbA1c, insulin dose, CRP).

Results: Diabetic children have higher concentrations of CRP, larger monocyte population and CCR4 expressing T-cells, lower CCR2 expressing monocyte subpopulation, and lower CXCL12 concentration. CRP showed a negative correlation with CCR2 and CCR4 expressing B-cells, and CCR2 expressing monocytes. HbA1c correlated positively with CCL2 concentration and T-cell population and negatively with CXCR4 expressing B-cells. Diabetes duration showed a correlation with CXCR3 expressing monocytes and CCR4 expressing monocytes, B-cells, and T-cells.

Conclusions: Our results suggest an association of pediatric diabetes and low-grade systemic inflammation, with significant chemokines and chemokine receptors profile changes. Identifying and targeting involved inflammatory molecules might be a potent therapeutic option for preventing diabetes-related morbidity and mortality.

eP091 | Incidence of type 1 diabetes among children and adolescents during peace and war times in Yemen

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Introduction: Type 1 diabetes (T1D) is predominantly a disease of children, adolescents and young adults. It is generally believed to be due to an immune-destruction of pancreatic β-cells in genetically susceptible individuals exposed to environmental risk factors.

An update on worldwide trends in occurrence of childhood T1D indicates that the vast majority of incidence data are from high-income

and upper-middle income countries. Very sparse incidence data are available from low- and lower-middle income countries .

Objectives: To calculate a 30-year incidence rates of type 1 diabetes (T1D) in Sana'a city, Yemen during peace and war times.

Methods: A total of 461 patients aged between 8 months and 18 years (yr) with newly-diagnosed diabetes were registered between1989-2018. We used a standardized protocol for counting cases over time. The annual incidence rates (cases/100,000/yr) were calculated from the number of new reported cases for each year divided by the estimated number of person-years 'at risk' resident in Sana'a city, Yemen according to age and sex of the participants of that year.

Results: The mean annual incidence rate of T1D in children aged 0-14 yr was 1.83/100,000/yr. With the use of 3-yr time periods, the mean annual incidence rate was (5/100,000/yr) in the first time-period, fluctuated between 1.2-2.3 during subsequent 7 time-periods, and declined to (0.5/100,000/yr) during the conflict years. The age-specific mean annual incidence rates for age-groups 0-4 yr, 5-9 yr, 10-14 yr, and 15-18 yr were 0.83, 1.82, 3.14, and 2.31/100,000/yr, respectively. The ratio of mean annual incidence rate of 15-18 yr old group compared to 0-14 yr old group was 1.26.

Conclusions: The mean annual incidence rate of T1D in children and adolescents over the observation period in Sana'a city was low. In children aged 0-14 yrs in particular, the incidence declined to a very low rate during war time.

eP092 | Gut microbial metabolites, type 1 diabetes and obesity

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Introduction: Obesity is prevalent among children with Type 1 diabetes (T1D) and this is associated with increased risk of long-term diabetes complications. Evidence suggests that T1D risk and progression are associated with gut bacterial imbalance. More importantly, bacterial metabolites, such as short chain fatty acids (SCFAs), influence health. Further, the gut microbiome and SCFA profiles are associated with and thought to contribute to obesity. In addition, SCFAs regulate the secretion of incretin hormones, which enhance insulin secretion. However, it is unknown to what extent the gut microbiome and their metabolites play a role in obesity in T1D youth and their worse outcomes.

Objectives: Here, we aimed to determine the differences in the SCFA profile in T1D youth who are lean vs. obese (lean: ≤84th% vs. obese: ≥95th%).

Methods: We collected stool samples from 11 obese individuals and 12 lean. The mean (±SD) for age in the entire cohort was 15.5±2.3 years, diabetes duration 59.3±61.3 months, while A1c was 8.0±1.2%. There were 10 females, 3 African Americans, 1 Hispanic White and the remaining were non-Hispanic whites. SCFA data was analyzed on a GC-FID.

Results: The median (range) SCFA levels (in mmol SCFA/kg Fecal material) in obese vs. lean youth with T1D was significantly higher for both acetate and propionate [acetate: 92.0 (63.0-219.7) vs. 60.5 (13.6-85.9), p=0.03; propionate: 25.2 (0.0-39.5) vs. 16.8 (1.2-27.7), p=0.02). Although the difference in butyrate levels were not statistically significant, the median level in obese individuals was notably lower [3.7 (10.0-53.1) vs. 12.4 (2.9-21.3), p=0.68].

Conclusions: These results suggest differences in the gut microbiome profile in lean vs. obese youth with T1D and raises intriguing questions as to why butyrate showed an opposite trend in obese versus lean individuals compared to acetate and propionate. In light of these findings, studies to assess both fecal and circulating SCFAs are needed to examine the association of fecal SCFA concentrations with obesity.

eP093 | Diabetes-associated autoantibodies positivity in Korean children and adolescents with diabetes

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Introduction: Autoantibodies against glutamic acid decarboxylase (GADA), insulinoma antigen-2 (IA-2A), insulin (INSA) and islet cell (ICA) are critical to determine diabetes type and management strategy in new-onset diabetes (NODM). The prevalence of diabetes-associated autoantibodies (DAA) positivity has been known to be low in Korean pediatric patients with diabetes.

Objectives: This study aims to identify the positivity rate of DAA and to determine the effectiveness of DAA to classify diabetes type in pediatric patients with NODM in Korea.

Methods: This was a retrospective study of patients with NODM aged 0-18 years (n=193, 48.2% female) followed at two tertiary centers in Korea from March 2016 to March 2021. We analyzed the positivity rate of DAA by diabetes type. Data for patients with type 1 diabetes (T1D) and type 2 diabetes (T2D) were compared using Student's t test or Chi-squared tests.

Results: Of 193 patients, those with T1D and T2D were 93 (48.2%) and 100 (51.8%), respectively. Age at diagnosis was 9.99 ± 4.36 years in T1D and 13.41 ± 2.48 years in T2D. In T1D patients, positivity rate of DAA was 94.6% and the prevalence of GADA, IA-2A, INSA and ICA was 71.0%, 71.0%, 31.2% and 10.8%, respectively. Among T1D patients, IA-2A adds 10.7% point autoantibody positivity (83.9% for GADA+INSA +ICA and 94.6% for GADA+INSA+ICA+IA-2A). Of 100 patients with T2D, 12 (12.0%) were positive for DAA and only INSA was positive. There were no significant differences in clinical characteristics between DAA-positive and-negative patients in both type of diabetes.

Conclusions: The positivity of DAA was significantly higher in T1D than in T2D. The positivity of DAA among T1D patients in Korea were similar to those in Western countries. Only INSA was positive for DAA in T2D patients. These findings suggest that DAA at diagnosis,

especially GADA and IA-2A, are useful for classifying diabetes type in Korean children and adolescents. Long-term follow-up for clinical course of DAA-negative T1D and DAA-positive T2D is warranted.

eP094 | Factors of the partial and complete remission in children and adolescents with Type 1 diabetes mellitus

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Introduction: Partial remission is frequent in people with newly diagnosed type 1 diabetes mellitus (T1D). However, little is known about complete remission with stop of insulin treatment for a period of time.

Objectives: We analyzed the frequency, factors of onset and duration of complete and partial remission in children and adolescents with T1D.

Methods: To the study were included 531 children and adolescents aged < 19 years (8.49±4.29 years) at the T1D onset. Remission criteria included HbA1c <7.0% and insulin daily dose <0.5 IU/kg for partial and 0 IU/kg for the complete remission.

Results: Remission occurred in 212 (39.9%) children and adolescents; 197 (37.1%) had partial and 15 (2.8%) complete remission. Total duration of the remission was 241.68±248.03 days in partial and 365±253.71 days in complete remission group (p=0.065). Time without insulin treatment in the complete remission was 294.6±240.42 days. Occurrence of the remission was associated in forward logistic regression with the age at T1D onset (ΔR^2=0.087, p<0.001), HbA1c (ΔR^2=0.057, p=0.001) sex (ΔR^2=0.021, p=0.001), and C-peptide (ΔR^2=0.013, p=0.016). Complete remission was associated with C-peptide (R^2=0.169, p<0.001). Duration of the remission in forward linear multiple regression analysis was associated with age at T1D onset (ΔR^2=0.050, p=0.001) and C-peptide (ΔR^2 =0.020, p=0.001), and duration of the complete remission was associated with HbA1c (ΔR^2=0.238, p=0.032).

Conclusions: Complete remission was a rare condition occurring in 2.8% of children and adolescents with T1D. Complete remitters with interrupting of insulin therapy did not have shorter total duration of the remission compared to partial remitters.

eP095 | The prevalence of diabetes related antibodies in children with type 1 diabetes and their unaffected siblings – the utility of a new screening assay

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Introduction: The rising incidence of childhood type 1 diabetes (TID) is a concern. Its prevalence is unknown in Sri Lanka, and T1D related antibodies (Ab) have not been used to characterize T1D children or their siblings.

Objectives: To assess - (1) the prevalence of glutamic acid decarboxylase (GAD_{65}Ab), insulinoma associated antigen-2 (IA-2Ab) and zinc T8 (ZnT8Ab) Ab in T1D children and their unaffected siblings, using the "3-Screen" antibody assay (3-Screen) confirmed by individual antibody assays; (2) the prevalence of insulin antibodies (InsAb) in them using a specific individual assay.

Methods: We enrolled (a) T1D children, (b) unaffected siblings, (c) of both genders (d) all ages, from the T1D Registry, Lady Ridgeway Hospital.

Results: We studied 235 T1D children [median age (IQR) 11 years 4 months (8.4,13.2); median duration of T1D - 23 months (7,54 months)] and 252 unaffected siblings [9 years 10 months (5.9,14.9)].

(1) *T1D children*– (a) total Ab prevalence using 3-Screen assay was 79.1% (GAD_{65}Ab74%; IA2Ab 31.1%; ZnT8Ab 38.7%); (b) all 3-Screen positive subjects were single specific assay Ab+ve; (c) They were younger compared to Ab-ve subjects (p=0.01) with no gender predominance; (d) multiple Abs were present in 18.3% (3Ab) and 26.8% (2Ab) subjects; (e) IA-2Ab and ZnT8Ab prevalence decreased with T1D duration (p=0.002,0.006 respectively). (2) *Unaffected siblings*– (a) 6.3% were 3-Screen Ab+ve (p=0.001 vs T1D), with a similar prevalence using specific Ab assays. (b) Four had 2 T1D Abs and 1 developed impaired glucose tolerance. (c) InsAb were present in 2.4% of subjects.

Conclusions: We have shown for the first time in Sri Lanka, a significantly higher T1D related Ab prevalence using the 3-Screen assay in T1D subjects compared to their unaffected siblings, and a high correlation with individual assays. The prevalence of IA2Ab and ZnT8Ab declined as disease duration increased. The 3-Screen assay is useful in screening unaffected siblings for future T1D risk.

eP096 | Risk factors for diabetic ketoacidosis through eight years of new-onset type 1 diabetes mellitus in a large Portuguese pediatric diabetes center: A shift towards younger age

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Introduction: The rate of diabetic ketoacidosis (DKA) in new-onset type 1 diabetes mellitus (T1D) is multifactorial. There seems to be an inverse relationship between T1D's incidence and DKA's frequency. DKA has been reported to be more common among young children. Recently, the COVID-19 pandemic has posed additional challenges as to diagnosing T1D.

Objectives: We aimed to assess the rate of DKA and associated risk factors in pediatric new-onset T1D in a large pediatric diabetes center in Portugal.

Methods: Retrospective analysis of data of patients referred to a level III pediatric hospital between January 1st, 2013 and December 31th, 2020 (8 years).

Results: We included 276 children and adolescents with a median age of 9,6 years, 20,1% under 5 years old. A mean incidence of 35 new cases/year was observed, with an upward trend. New-onset T1D cases under 5 years old raised progressively, having more than tripled throughout the study period (n=3 in 2013 vs. n=10 in 2020). In total, 38% children and adolescents presented with DKA, ranging from 23,3% in 2013 to 43,2% in 2020, while remaining stable (37,2%-40,9%) in the period in-between. Overall, DKA was considered severe in 24,8% of cases, ranging from 6% in 2017 to 47% in 2020. 20 (7,2%) patients were admitted to the intensive care unit. DKA at presentation was more frequent in the age group under 2 years old (p=0,016), in which 80% of patients presented with DKA. Non-DKA presentation was associated with family history of T1D (p=0,005).

Conclusions: Our study shows an upward trend in T1D's incidence in children under 5 years old and a high DKA rate at disease onset, which was more frequent in patients under 2 years of age. In the first year of COVID-19 pandemic, 43% of DKA was considered severe. It is urgent to implement educational programs to promote earlier diagnosis. Broader studies are required to provide a representative national landscape of the epidemiology of T1D in pediatric population in Portugal.

ePO97 | Evolution of the epidemiological profile of type 1 diabetes (T1D) in a specialized center

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Introduction: The average annual incidence of childhood diabetes between 2013-2017 in Oran is 31.12 ± 3.60 per 100,000 children under 15 years old.

Objectives: study the epidemiological profile of T1D in a specialized center

Methods: This is a retrospective study on files relating to T1D patients followed in a specialized center from 1999 to 2020. Inclusion age: under 15 years old.

Results: 1020 new cases were identified during this period. The annual evolution of new registered cases shows a rapid increase over the past 10 years. We went from an average of 20 new cases per year between 1999 - 2007 to almost 80-90 new cases during the period 2018-2020. A significant part 44% of our recruitment is represented by children aged less than 5 years old at the time of diagnosis. The number of T1D patients from the neighboring provinces exceeded that of T1D from our province until 2008, the year in which this proportion was reversed to reach 80% during 2014-2018

Conclusions: the activity of T1D in this specialized center has continued to increase in recent years; thus increasing the workload, hence the benefit of improving the care system.

ePO98 | Insulin sensitivity in the partial remission phase of pediatric type 1 diabetes; A longitudinal cohort study

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Introduction: Studies suggest that Type 1 Diabetes (T1D) contributes to impaired insulin sensitivity. Most children with T1D experience partial remission but the knowledge regarding the magnitude and implications of impaired IS in this phase is limited.

Objectives: We investigate the impact of IS on duration and character of the partial remission phase and how it associates with stimulated c-peptide.

Methods: In a longitudinal study of children and adolescents, participants were seen at three clinical visits during the first 14.5 months after diagnosis of T1D. Partial remission was defined as IDAA1c (HbA1c (%)+4*daily insulin dose) ≤ 9. Beta-cell function was considered significant by a stimulated c-peptide >300 pmol/L. Participants were characterized by (i) remission or non-remission and (ii) stimulated c-peptide levels above or below 300 pmol/L. IS, body mass index (BMI), total body fat, sex, age, pubertal status and ketoacidosis at onset were compared.

Results: Seventy-eight children and adolescents aged 3.3-17.7 years were included. At 14.5 months post-diagnosis, 54.5% of the participants with stimulated c-peptide > 300 pmol/L were not in partial remission. The same participants had significant lower IS 2.5 (p=0.032), and 14.5 (p=0.022) months after diagnosis compared to participants in partial remission with similar c-peptide levels. IS did not fluctuate during the remission phase.

Conclusions: More than 55% of the participants with stimulated c-peptide >300 pmol/L were not in remission 14.5 months after diagnosis and had impaired insulin sensitivity.

eP099 | The Microflora Assessment of the urethra area of children with newly diagnosed type 1 diabetes

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Introduction: Children affected by Type 1 Diabetes (T1D) are more prone to various infections of the urinary tract and urethra area because of their immune system dysfunction and glycosuria.

Objectives: The microflora assessment of the urethra area of children with newly diagnosed T1D.

Methods: The study group consisted of 63 children (37 boys) admitted to Department of Children's Diabetology, Katowice, Poland due to newly diagnosed T1D. The swabs were taken prospectively from the urethral area at the time of admission, then the results were correlated to the clinical parameters.

Results: The mean age was 9.4 years (6 months-17.4 years). The mean HbA1c value was 12.1% (5,6 - 20.1).

The following microbial species were isolated in the collected materials: *Staphylococcus epidermidis* in 18 children (28.6%), *Enterococcus faecalis* in 17 children (27%), *Candida albicans* in 15 children (23.8%), coagulase-negative staphylococci in 11 children (17.5%), group B Streptococcus (GBS) in 10 children (15.9%), *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus anginosus*, *Corynebacterium glucuronolyticum* and *Aerococcus urinae* in 7 children each (11.1%), *Staphylococcus hominis* in 6 children each (9.5%), *Lactobacillus gasseri* in 5 children (7.5%), *Candida dubliniensis* in 4 children (6.3%), *Candida parapsilosis* in 3 children (4.8%), *Streptococcus vestibularis*, *Streptococcus salivarius*, *Klebsiella oxytoca*, *Actinotignum schaalii* in 2 children each (3.2%) and other, isolated cases. 2 patients were cultured negatively (3.2%).

In the group of patients with mixed colonization, the median of HbA1c value was significantly higher (13.4%) than in the patients with only bacterial colonization (11.4%; p=0.01). Additionally, the mixed colonization appeared significantly more often in girls (53.8%) than in boys (21.6%; p=0.01).

Conclusions: It is extremely important to examine the urethral area at the time of diagnosis of T1D in order to detect inflammation and to undertake appropriate and effective intervention.

eP100 | Autoimmunity in type 1 diabetes mellitus: The most prevalent autoantibodies in children with inaugural diagnosis under 10 years old in a Portuguese population

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Introduction: Type 1 Diabetes *Mellitus* (T1D) is a chronic disease, with a recent disproportionately increased below 5 years, characterized by a selective loss of insulin-producing b cells. Its etiology is multifactorial, to which immune factors contribute through the formation of pancreatic autoantibodies.

Objectives: To assess whether the type of pancreatic autoantibody and the age group influence clinical manifestations and laboratory parameters of T1D in children with an inaugural diagnosis under 10 years old.

Methods: Observational, retrospective and analytical study performed at Pediatric Endocrinology and Diabetology Unit, 95 patients included. Two age groups (≤60 months and >60 months) and each type of autoantibody (positive/negative) were compared concerning demographic, immune, clinical and laboratory characteristics. It was analyzed the impact of autoimmunity, glycated hemoglobin (HbA1c), gender and age on the clinical and laboratory parameters of these children.

Results: Children diagnosed over 60 months presented a higher HbA1c value (p=0,005) and this laboratory parameter was the only one that showed an impact in the form of DKA presentation (OR=1,66; p=0,001). The blood glucose value at admission demonstrated to be negatively influenced by age (b=-0,25; p=0,022) and positively by HbA1c (b=0,35; p=0,001) and by male gender (b=0,27; p=0,008). Age (b=0,30; p=0,006) proved to be a significant predictor of the HbA1c percentage at diagnosis. None of the evaluated autoantibodies showed to interfere with the clinical and laboratory manifestations of T1D.

Conclusions: Demographic and clinical-laboratory characteristics did not present statistically significant differences between the groups of pancreatic autoantibodies (positive/negative) analyzed, although they may be influenced by other factors. It is crucial to develop further studies in the field of autoimmunity that allow structuring potential immune phenotypes and assisting the discovery of new therapeutic targets.

Tabela 6. Avaliação das diferenças entre os grupos etários ≤60 meses e >60 meses relativamente às caraterísticas demográficas, clínicas e laboratoriais dos doentes.

Variável	Idade ≤60 meses (n= 40)			Idade >60 meses (n= 55)			Estatística de teste
	n	%	M±DP ou Mdn (AIQ)	n	%	M±DP ou Mdn (AIQ)	
Género							$X^2(1) = 0,32$
Masculino	22	55,0		27	49,1		$p = 0,57$
Feminino	18	45,0		28	50,9		$\varphi = -0,058$
Caraterísticas Clínicas							
Apresentação							$X^2(2) = 1,19$
Hiperglicemia	11	27,5		10	18,2		$p = 0,55$
Cetose sem acidose	15	37,5		24	43,6		$\varphi c = 0,11$
CAD	14	35,0		21	38,2		
Parâmetros Laboratoriais							
Glicemia à admissão (mg/dL)			486 (155)			479 (244)	$U = 947$ $p = 0,44$ $r = 0,10$
HbA1c (em %)			10,0 (2,70)			11,4 (2,10)	$U = 685$ $\mathbf{p = 0,005}$ $r = 0,33$
Caraterísticas Imunitárias							
Autoanticorpos							
ICA (%)							$X^2(1) = 2,18$ $p = 0,14$ $\varphi = 0,16$
Positivo	3	7,90		10	18,9		
Negativo	35	92,1		43	81,1		
GAD (%)							$X^2(1) = 0,29$ $p = 0,59$ $\varphi = 0,067$
Positivo	13	43,3		18	50,0		
Negativo	17	56,7		18	50,0		
IAA (%)							$X^2(1) = 1,13$ $p = 0,29$ $\varphi = -0,15$
Positivo	10	50,0		12	35,3		
Negativo	10	50,0		22	64,7		
ZnT8 (%)							Teste de *Fisher* $p = 0,41$ $\varphi = 0,21$
Positivo	4	33,3		6	45,5		
Negativo	8	66,7		5	54,5		
Nº AC positivos							
N= 0	21	52,5		28	50,9		Teste de *Fisher* $p = 0,51$ $\varphi c = 0,15$
N= 1	11	27,5		11	20,0		
N= 2	5	12,5		13	23,6		
N= 3	3	7,50		3	5,50		

NOTA: Os valores de *p* estatisticamente significativos encontram-se realçados a negrito.
M±DP – média±desvio padrão; Mdn (AIQ) – mediana (amplitude inter-quartil); n – número de casos (frequência absoluta); % - frequência relativa; ICA – autoanticorpo anti-ilhéus de *Langerhans*; GAD – autoanticorpo anti-descarboxilase do ácido glutâmico; IAA – autoanticorpo antiinsulina; ZnT8 - autoanticorpo anti-transportador de zinco 8; CAD – cetoacidose diabética; HbA1c – hemoglobina glicada; *U* – Teste de *Mann-Whitney*; X^2 – Teste do Qui-Quadrado; *r* – effect size; φ – Phi; φc – V de Cramer.

eP101 | **To detect the presence of GAD antibodies in newly detected patients with type 1 diabetes**

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Introduction: GAD antibodies are one of the antibodies that are described in association with the development of T1DM. The study aims to look into the association of type 1 diabetes with specific GAD antibodies.

Objectives: To detect the presence of GAD antibodies in newly detected patients with type 1 diabetes.

Methods: A prospective study was carried out from July 2020 to June 2021 at tertiary diabetes care center. Inclusion criteria were newly detected with type 1 diabetes, exclusion criteria included patients visiting the clinic for first time, patients with co-morbidities and growth issues. All patients visiting the clinic with newly detected type 1 diabetes were enrolled in the study. Details on anthropometric details, past history and diabetes detection history were collected. Laboratory investigations were carried out for all the patients, that includes HbA1c, C-peptide, GAD antibodies,

thyroid antibodies, Serum creatitine, lipid profile and complete blood count.

Results: A total of 35 patients visited the clinic in 9 months who were newly detected with type 1 diabetes. All had a typical presentation of symptoms of polyuria, polyphagia, and weight loss. 77.1% (27) had a history of diabetic ketoacidosis. 16 (45.7%) showed the presence of GAD antibodies. The average age was 9 years, Gender-21 female, 14 male, mean height and weight 136 cms and 26 kgs, BMI 20.1 kg/m2, mean RBS 303 mg/dl, and mean BP 108/77. Mean A1c 10.1%, Mean C-peptide 0.04 and mean creatinine 0.9. Presence of GAD antibodies 16 (45.7%)

Conclusions: Measurements of GAD antibodies may aid the clinician in the choice of treatment in patients with type 1 diabetes. However, GAD antibody may have a lower sensitivity and hence it is important to look for other antibodies as well in type 1 dibaetic.

eP102 | Clinical characteristic, precipitating factor and outcome of DKA among children and adolescents with T1DM

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Introduction: One of the most common endocrine diseases in children is type 1 diabetes mellitus (T1DM). 10 to 70% of T1DM children present in diabetes ketoacidosis (DKA). DKA highlights a triad of metabolic derangement characterized by hyperglycemia, acidosis, and ketonuria/ketonemia. It carries life-threatening complications like cerebral edema and is commonest cause of diabetes related death in children. However, it is uncertain why some present in DKA and others do not; hence, it is essential to identify the factors associated with DKA. Recognizing such factors enlightens our understanding of the disease and detects interventions at multiple levels ranging from the patient, parents, and physicians in-order to decrease the number of children presenting with detrimental consequence of T1DM, DKA.

Objectives: To determine the incidence of DKA in children and adolescence and describe their clinical characteristics. We will identify the potential predictors of DKA in newly diagnosed subjects and will assess factors associated with severe DKA in established cases with T1DM.

Methods: A cross-sectional, retrospective review of EMR of children and adolescence whom have presented in DKA at SKMC, Abu Dhabi during the period from Jan 2014 till August 2019.

Results:

Conclusions: Our study demonstrates a high rate of new patients presenting in DKA. Risk factors for recurrent DKA are poor glycemic control, insulin regimen, and the primary team for follow-up. Recognition of these factors by physicians, patients, and families aid in decreasing the admission rates with DKA, provide acute care for the patients, and prevent long-term complications of DKA.

eP103 | Risk factors for type 1 diabetes mellitus in children live in Karbala province-Iraq

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TABLE-1: Clinical and biochemical characteristic of all patient admitted with DKA during study period (new and established T1DM)

Total n= 180	Newly Diagnosed T1DM (n= 66)	Established T1DM (n= 114)	P value
Age, Median (IQR)	7.94 (6.9- 8.9)	10.8 (10.1-11.3)	**<0.0001**
Age group, % (n)			
•0-5 years	33.3% (22)	10.5 % (12)	**<0.0001**
•6-12 years	54.6 % (36)	56.1 % (64)	
•More than 12	12.1 % (8)	33.3 % (38)	
Sex (Male), % (n)	51.5 % (34)	41.2 % (32)	0.18
HbA1C, Median(IQR)	11.3 (10.4-13.3)	10.4 (9.0-12.1)	**0.004**
Metabolic acidosis, % (n)			
•Mild	42.4 % (28)	46.5 % (53)	0.26
•Moderate	25.8 % (17)	32.5 % (37)	
•Severe	31.8 % (21)	21.1 % (24)	
PICU admission, %(n=47)	37.9 % (25)	29.8 % (22)	**0.006**
Hospital Length of stay, Median (IQR)	3.7 (3.2- 4.3)	1.43 (1.1-1.7)	**0.017**

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Introduction: One of the most important autoimmune diseases which affect children is type 1 diabetes mellitus (T1DM). Various risk factors for this chronic condition have been considered including genetic and environmental factors.

Objectives: To identify the most important risk factors related to type 1 diabetes mellitus among children and adolescents live in Karbala - Iraq.

Methods: A descriptive cross-sectional study conducted among all children and adolescents diagnosed with T1DM, receiving their follow-up at AL-Hussainy hospital in Karbala. Data were collected between July and August 2019.

Results: 50 patients were included, representing all patients. The age of included patients ranged between 18 months and 17 years. 70% of patients had no family history of diabetes. 32% patients had positive family history of thyroid disease. Pregnancy history showed 6% of patients' mothers were diagnosed with gestational diabetes and 3% were treated with insulin during pregnancy. 84% of mothers drank red tea daily during pregnancy. Negative smoking history. All of the studied children were delivered in hospitals. 68% of these deliveries were normal and 32% were caesarean section. 54% of those patients had no disease postnatally, however, 28% had jaundice, 10% had respiratory illness, and 8% had neonatal sepsis. Most of our patients (80%) were breastfed for more than 6 months.

Conclusions: Patients with T1DM expressed higher percentages of different environmental factors that could contributed to their development of diabetes mellitus. Some of these factors were related to in utero life during pregnancy like (maternal drinking of tea, gestational diabetes, and pre-eclampsia), other factors related to early life as (infection and jaundice). Avoiding exposure to those factors worth studying to see if it reduces the incidence of T1DM.

ePoster - 4.a: Virtual Diabetes Care

eP104 | An evaluation of CO2 emissions and cost saving associated with remote video consultation for children and young people with diabetes in a single-centre

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Introduction: Telemedicine use has increased rapidly during the COVID-19 pandemic replacing many face-to-face (FTF) consultations. FTF consultations are associated with increased CO2 emissions (CO2em) from travel to clinics. Children and young people (CYP) express high levels of concern regarding climate change. Changes to their healthcare interface should reflect this.

Objectives: This study aims to assess what impact telemedicine consultations have on CO2em, financial cost to CYP and families and a review of their satisfaction with telemedicine consultations in a CYP diabetes clinic.

Methods: Data were collected via telephone interview from CYP and their families, looked after by a single paediatric diabetes service and who had recently had a telemedicine consultation. Usual mode of travel to clinic was asked and travel distance calculated using Google Maps. An estimate of CO2em was calculated based on published average vehicle CO2em. Families were also asked how much a FTF appointment would have cost them in travel expenses including petrol and parking charges. Patients were asked which clinic type they preferred between FTF and telemedicine appointments.

Results: 42 telephone interviews with CYP, age 6-18 years, and their families were conducted. Average CO2em was calculated at 1.65kg per clinic visit per patient for travel to F2F appointments. With an expected 4 clinic visits per patient per year this equates to 6.62kg CO2 emitted for patient travel to clinic/patient/year. Mean distance driven to clinic was 11.87km. Median reported cost saving from not coming to a F2F clinic was 9.40GBP. 29% of responders reported a preference for F2F consultation, 45% preferring telemedicine consultation and 26% expressed no preference.

Conclusions: A large reduction in CO2em is achieved in reducing travel to appointments. Remote consultation allows for lower CO2em per clinic review with good levels of patient satisfaction reported. Other causes of CO2em are not factored here.

eP105 | Diabetes care team and parent perspectives on the use of social media to support adolescent type 1 diabetes management

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Introduction: Social media (SM) offers opportunities to provide tailored support and education to adolescents with type 1 diabetes (T1D).

Objectives: The aim of this study was to explore diabetes care team (DCT) and parent perspectives on the use of SM by DCTs to support adolescent diabetes management.

Methods: Focus groups of DCT members (n=4) and parents of adolescents with T1D (n=4) were conducted in the Seattle, WA metropolitan area to elicit views about DCT members and adolescents communicating via SM to supplement current ambulatory diabetes care. Qualitative content analysis was carried out and emergent themes were subsequently mapped onto 4 feasibility domains, which included acceptability, demand, implementation, and practicality.

Table

Feasibility Domains	Theme	Diabetes Care Team Member Quote	Parent Quote
Acceptability & Demand	**Improved communication outside of clinic visits to optimize diabetes management**	"Every [adolescent with T1D] starts off motivated after the visit, but as time progresses, challenges and barriers come up. And so, being able to interface with a one week, two week, one month interval [may] help to get them over the hurdle, so that we can actually see positive progression by the time that we see them in clinic next."	"You need to support them in [ways] that they can best communicate, understand, listen, and hear in the best possible way."
	Adolescent independence in diabetes self-management, including successful transition to adulthood	"Allowing for that communication will help with transitioning from adolescent into adulthood in that there is independence and learning to communicate with your doctor about your needs, which is something that doesn't change from 20 to 21. It takes time."	"As caregivers, our job is always to grow them up so that they can be self-sufficient in this…so giving our kids that sense of competence and agency about how they want to live with diabetes. I don't see any downside."
	Delivery of timely and personalized care, including communication about sensitive topics	"They're sitting in clinic and they just don't have any questions, but if they could message us in the moment they had a question or had an idea or had a goal, I could see how that could be positive."	"I think it could be an opportunity for him to ask awkward questions and not have to come to me personally, to ask this awkward question that it might be easier to do with a provider over social media."
	Connection to a peer educator with diabetes for diabetes support	"We try to focus on medical care, but they are living [with T1D], they have issues, they have significant time burdens and social difficulties, and sometimes there is not enough time to explore that. And I think a [peer educator] can kind of feel where those barriers and feedback to us important information we can use to this task."	"I think some of the best training that my kid has had with diabetes has been at diabetes camp from her peers…learning what…they have going on all year in between camp…'when I was driving, or this is what I did with my new pump, guess what this pump is doing.' I think some of her best information has come from peers."
	Stronger relationship between adolescent and diabetes care team	"We might get more of the whole picture [from social media communication]. Sometimes when the parents they think they know what's going on and they assume what's going on, but the patient's actually not telling them the whole story."	"She would feel empowered to reach out more. I feel like it would give her a more personal feeling towards her doctor…a tighter connection, a more personal connection, a more one-on-one connection."
Implementation & Practicality	**Adolescent education on potential patient privacy issues**	"PHI and HIPAA compliance, that it is ethically ok to be communicating with teens separate from their parents on a social media platform. Yeah, I think those are my biggest concerns."	"I just think with social media, I don't think that anybody honestly can guarantee that everything is going to be confidential."
	Opportunities to support appropriate parental involvement	"It goes back to setting expectations if your child's using the social media platform…[we'll need to work through expectations about communication that is] privileged, confidential so that it's not creating added work and the parents are like, 'Well, what did they ask about?' That could be kind of a sticky area."	"What gets worrisome to me as they start communicating directly…is that you now are out of the position where you can actually help…but I would hope that my care provider could contact me then even though I wasn't on the direct message [communication] and say, 'Something serious is going on. I recommend us having an appointment.'"

(Continued)

Feasibility Domains	Theme	Diabetes Care Team Member Quote	Parent Quote
	Adolescent education on using social media communication for urgent versus non-urgent medical issues	"There's a lot of things that could become really quickly urgent that start off as non-urgent within diabetes. Like 'Yeah, I'm having some site issues' can quickly become diabetic ketoacidosis."	"Even though it's not an urgent question, I still feel like, given the direct message nature of it, then the expectation automatically is that there's something a little more rapid about or attention paid on the other end to just real quick sending a response to something like that."
	Adequate staffing and compensation for staffing	"We are so overloaded and overwhelmed right now. We could not add this to our plates right now with the amount of staffing that we have."	"Our nurse, she doesn't always have time to respond rapidly. It would be great if she did, but you know then she might be sitting in front of a computer all the time."

Results: Participants included 18 DCT members (medical providers, nurses, social workers, nutritionist, psychologist) and 19 parents of adolescents with T1D. Nine major themes were identified (Table). For acceptability and demand, participants shared that SM could help facilitate: (1) improved communication outside of clinic visits to optimize diabetes management, (2) adolescent independence in diabetes self-management, (3) connection to a peer educator with diabetes for diabetes support, (4) delivery of timely and personalized care, and (5) a stronger relationship between adolescent and DCT. Addressing implementation and practicality, participants shared the need for: (1) education on potential privacy issues, (2) opportunities to support appropriate parental involvement, (3) education on using SM communication for urgent versus non-urgent medical issues, and (4) adequate staffing.

Conclusions: DCT members and parents of adolescents with T1D expressed that SM communication is acceptable and offers potential benefits to adolescents. In addition to the need for adequate staffing and managing parental involvement, specific measures around privacy and appropriate communication of urgent and non-urgent issues over SM should be addressed.

eP106 | The impact of virtual diabetes care on clinical outcomes

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Introduction: There has been a necessity for healthcare services to greatly adapt delivery of care since the onset of the COVID-19 pandemic. Virtual diabetes consultations within our paediatric department were quickly set up to ensure continued care for children and adolescents with diabetes.

Objectives: The study aimed to identify if the COVID-19 lockdown in 2020 and thus, the introduction of virtual diabetic reviews, had impacted upon patient outcomes of HbA1c levels, annual diabetic blood tests and number of admissions due to diabetes.

Methods: A cross-sectional study was conducted with children under the age of sixteen diagnosed with type 1 diabetes prior to 1st January 2020. All were under the care of the paediatric diabetes team at Blackpool Victoria Hospital, U.K. Data was collected on whether each patient had been reviewed virtually, whether they had undergone annual diabetic blood and urine tests, as well as the number of HbA1c tests each patient had in 2019 and 2020 and their respective levels. Pre-lockdown admissions in 2019 were compared to admissions in 2020.

Results: 108 patients were included in this study; all were reviewed virtually at least once in 2020. 82.24% and 60.75% had annual review of diabetic investigations in 2019 and 2020 respectively. 92.52% had at least one HbA1c test in 2019, with the same percentage tested in 2020. There was no significant difference in the median HbA1c levels in 2019 and 2020 as shown by Wilcoxon signed-rank test for the paired samples ($p = 0.9932$). This was the same for patients on insulin pumps ($p=0.2174$). There was no significant difference in the average number of admissions for those on insulin pumps ($p=0.8211$), however there was a greater number of pre-lockdown admissions in 2019 for those on basal-bolus regimes than in 2020 ($p=0.0056$).

Conclusions: Virtual diabetes care did not appear to have a detrimental effect on diabetic outcomes. This paves the way for it to continue to play an active role in delivery of paediatric diabetes care.

eP107 | Impact of lockdown during the COVID-19 pandemic on glycaemic control in children and young people with diabetes mellitus

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Introduction: During COVID 19 pandemic, various governments had to impose lockdown; closing schools, restricting movements etc. This resulted changed eating pattern, reduced physical activity

Objectives: To assess the effect of lockdown on diabetes outcome among patient population served by our paediatric diabetes team; benchmarked our performance against National &local guidelines

Methods: Casenotes reviewed retrospectively. HbA1c values immediately before and after lockdown were compared among all children. The lock down occurred in United Kingdom from 16th March to 30th June 2020. Median HbA1c values were calculated for the patient population both before & after lockdown and these were compared to measure the overall effect.

Results: 229 patients were included in the audit. The median HbA1c value found was 64 mmol/mol and 66 mmol/mol respectively before and after lockdown.62(27% of total)patients did not have HbA1c done post lockdown. When we compared the individual patient's HbA1c values (in cases where both before and after lockdown values were available)38% showed deterioration (rising HbA1c) and 30% showed improvement (falling HbA1c)in the overall glycaemic control. Attendance to virtual clinics was better than attendance to face to face clinics (83% vs 73%)

Conclusions: Amidst the pandemic situation, virtual clinics were the only alternative to provide continuous care. Though the attendance rate in the virtual clinics was better than those in face-to-face clinics before lockdown, overall diabetes control has deteriorated. Clinical examination (inspection of the insulin injection sites, looking for signs of complication of diabetes) was not possible in virtual clinics. Our study suggests that virtual clinics are a useful alternative especially for recurrent non-attenders, it should not replace face to face clinics for all patients

ePoster - 4.b: Diabetes at School

eP108 | Diabetes and school health (dash) program: an innovative school based health model to optimize care for children and adolescents with type 1 diabetes

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Introduction: Management of pediatric Type 1 Diabetes (T1D) requires collaboration among families, the diabetes team and any other caregivers. Healthcare inequities, behavioral, psychosocial and educational challenges result in suboptimal care and complications. As youth spend much of their time at school, optimization of care in this setting offers an opportunity for intervention. There are no evidence-based guidelines for school-based care, therefore management varies based on state legislation, district policy, and school staff training.

Objectives: An innovative school-based program can improve outcomes, reduce healthcare inequities, and inform guidelines for optimal management of T1D in schools.

Methods: The Nationwide Children's Hospital (NCH) Diabetes and School Health (DASH) program is a large scale, school-based care coordination program. The DASH team includes a diabetes nurse educator and advanced practitioner who will provide direct education to patients and staff, oversee care, and facilitate communication between schools, families, and the diabetes clinic. The team also includes a pharmacist who will facilitate approval and delivery of medications and supplies to schools. The DASH pilot will target patients who are at high risk for complications based on their Diabetes Composite Score, a novel risk assessment tool developed by NCH.

Results: Qualitative and quantitative data regarding patients, caregivers and school staff will be collected. This will include Diabetes Composite Scores, HgbA1C, acute care utilization, educational mastery, quality of life, psychosocial, and health equity measures.

Conclusions: DASH is a novel school-based program which will provide direct support, education and coordination of care to patients with T1D and their school staff. The program aims to optimize care, address inequities that increase risk for diabetes related complications, facilitate collaboration and education with school staff, and provide a framework for school based care.

ePoster - 4.c: Economics/Access to Care

eP109 | The cost effectiveness of treating mild diabetic ketoacidosis in children with type I diabetes mellitus with subcutaneous insulin aspart: A retrospective cohort study

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Introduction: DKA requiring IV regular insulin infusion and close clinical and laboratory monitoring is the main cause of ICU admission and the main cause of inpatient resource utilization in children with Type1 DM. The recent use of SC rapid-acting insulin analogue in the treatment of mild uncomplicated DKA has provided a safe and effective alternative to the standard IV insulin infusion. Currently, no comprehensive study that analyzed the different elements of DKA management cost effectiveness.

Objectives: We aimed to compare the cost-effectiveness, efficacy and safety of subcutaneous (SC) insulin Aspart vs. intravenous (IV) insulin infusion in treating children with mild Diabetic Ketoacidosis (DKA) in real-world setting.

Methods: We performed a retrospective cohort study that took place at King Khalid University Hospital on children aged 2-14 years presenting to the Emergency Department with mild DKA between January 2015 and March 2020. We reviewed medical records for DKA treatment course, hospitalization cost and management complications. We used the incremental cost effectiveness ratio (ICER) to report cost-effectiveness estimate.

Results: A total of 102 patients with 129 mild DKA episodes with mean age 9.98 years ± 3.1 were enrolled in the study. Seventy children received SC insulin Aspart Vs fifty nine children received IV insulin infusion. Overall, the length of hospital stay in the SC group was 16.9(7.8) hours less compared to IV infusion with (p-value 0.005). The

average cost of hospitalization in the SC group was lower by 769.8 (236.2) Saudi Riyals (p-value=0.001). The ICER was - 47.1 SR/hr. In addition, the SC group had a shorter duration of treatment, and required fewer PICU admissions with odds ratio 0.11 (95thCI 0.02, 0.39). The DKA management complications were similar between the two groups.
Conclusions: The present findings suggest that SC insulin Aspart used in the treatment of mild DKA is a cost-effective strategy.

eP110 | Heavy financial burden of diabetes care among children with type 1 diabetes attending a tertiary care center in North India

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Introduction: Type 1 diabetes (T1D) incurs substantial out-of-pocket expenses (OOPE) on insulin and diabetes-related supplies. In high-income countries, the mean OOPE for T1D care was nearly $2500 in 2018. There is little information on this from low and middle income countries.
Objectives: We aimed to estimate the OOPE for children with T1D attending our pediatric diabetes clinic.
Methods: An online survey was conducted, among parents of 102 children with T1D (Mean±SD age: 10.4±4.6 years, to estimate the annual OOPE related to diabetes care. Modified BG Prasad scale was used to estimate the socio-economic status (SES).
Results: 54.9% of children were boys and the mean duration of T1D was 4.3 years (range 2-5 years). Only 24% had an A1C of less than 7% (median A1C: 8.4% [inter-quartile range (IQR): 7.1-9.3%]. 61.8% belonged to the middle SES. Mean annual spending on glucose monitoring, insulin and laboratory investigations was Indian Rupee (INR) 19355, INR 33359 and INR 10014, respectively (total INR 62017, IQR: 47194-72277). The cost of single visit to doctor was approximately INR 4194. Thirty children required hospitalization during the last year which costs INR 36963 on average. 24.5% had more than 50% of their total family income being spent on diabetes care. Only 14.7% are receiving financial support from any agency. 29.4% of them are surviving by borrowing money and charity; 10.8% were having their OOPE going beyond their income from all sources.
Conclusions: There is a high financial burden of T1D care for North Indian children, almost on the verge of losing sustainability. Further studies are warranted to furnish OOPE data to guide economic policy decisions in order to reduce direct costs to patients by reallocating resources.

eP111 | Development and current status of care structures for the treatment of children and adolescents with diabetes in Germany

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Introduction: Pediatric guidelines recommend multiprofessional care for children and adolescents with diabetes. Since 1993, the status of care has been presented in four nationwide surveys in Germany.
Objectives: To assess the current status of multiprofessional pediatric diabetes care in Germany.
Methods: All 355 German pediatric hospitals and 75 pediatric specialist practices were surveyed with a questionnaire about the number of children and adolescents treated as outpatients and inpatients in 2019, indications for admission, diabetes education courses and team composition including full-time equivalents.
Results: The response rate was 90% for pediatric clinics and 64% for practices. A total of 176 clinics provide inpatient as well as outpatient care for children and adolescents with diabetes and 37 specialist practices only provide outpatient care. A total of 3419 diabetes manifestations were treated as inpatients in 2019 (median: 13 days); and 26,614 patients were cared for as outpatients (median: 102; 4-767 patients per clinic). In addition, there were approximately 4,400 patients in diabetes practices. At least one pediatric diabetologist was involved in inpatient care in 149 clinics, a diabetes educator in 169, a dietitian in 120 and a mental health professional in 145 clinics (non-physician team members often with a small hourly quota). Of all newly diagnosed patients, 83 % were treated by a pediatric diabetologist and a diabetes educator. In the outpatient setting, 97% of patients were treated by a pediatric diabetologist and 90% were also treated by a diabetes educator. In contrast, less than 50% of patients had outpatient access to dieticians, social workers and/or psychologists.
Conclusions: Since 1993, the number of multiprofessional diabetes teams has steadily increased, but the hourly quotas are often not sufficient to meet the demand. In the outpatient setting, multiprofessional teams are not the rule. Against the background of the increasing psychosocial burden on families, there is a need for action here.

eP112 | Diabetes Self-Management Program (DSMP) for Caring Type 1 Diabetes under Expansion of Thai-Type 1 Diabetes and Diabetes diagnosed Age before 30 years Registry, Care and Network (T1DDAR CN)

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Thailand, [5]College of Medicine, Rangsit University, Rajavithi Hospital, Department of Medicine, Bangkok, Thailand, [6]Faculty of Medicine, Siriraj Hospital, Mahidol University, Siriraj Diabetes Center, Department of Medicine, Bangkok, Thailand

Introduction: T1DDAR CN has been established since 2015 supported by National Health Security Office (NHSO) to leverage standard of care for T1D across country. Participating sites increased from 31 to 37 hospitals during 2015 to 2019, covering all health regions of the country. The DSMP composed of training for structured Diabetes Self-management Education (DSME), promoting the use of intensive insulin treatment, free of charge supply of self-monitoring of blood glucose (SMBG) devices and urine ketostrips.

Objectives: To evaluate clinical outcomes of T1D underwent DSMP in T1DDAR CN project, as a part of Thailand universal coverage health care system.

Methods: A prospective study was conducted since 2019. Medical personnel had been trained for the structured-DSME and online data recording in RedCAP program at first enrolment, 3rd month, 6th month and every 6 months. Descriptive statistics and analysis of repeated measures mixed models were employed.

Results: The participants (n=484) were recruited. There were 190 (39%) T1D males with a mean age at enrolment of 17.1±8.8 years old. Sixty four percent of participants were <18 years old and 93% received intensive insulin therapy. The mean diabetes duration was 6.6±5.3 years.

After 1 year of follow-up, the mean A1C, incidence of diabetic ketoacidosis episode (DKA) and severe hypoglycemia (SH) was not statistically different from baseline. Age ≥18 years old and SMBG ≥3 times/day were associated with A1C target achievement (adjusted OR 2.17, 95%CI 1.33 to 3.55, p=0.002 and 2.28, 95%CI 1.33 to 3.90, p=0.003, respectively) and less DKA episode (adjusted OR 0.32, 95% CI 0.13 to 0.78, p=0.013 and 0.39, 95%CI 0.21 to 0.75, p=0.004, respectively).

Conclusions: T1DDAR CN fostered network of standard care designed for people living with T1D based on universal coverage health care system in Thailand. However, short term clinical outcomes did not reveal improvement of glycemic control and acute DM complications. Nevertheless, T1D enrolled in this program whose aged ≥ 18 years old and who performed frequent SMBG ≥ 3 times/day had lower the risk of DKA and more glycemic achievement. This endorsed the importance of education, supporting and promoting self-monitoring of blood glucose in T1D care.

eP113 | Health related quality of life and cost effectiveness of continuous subcutaneous insulin infusion in children with type 1 diabetes in Egypt: A limited resources country perspective

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Introduction: Type 1 diabetes (T1D) management quality indicators include glycemic control, health related quality of life (HRQoL) and psychosocial wellbeing.

Objectives: study compared the HRQoL, confidence in diabetes self-management (CIDS) and cost-effectiveness of continuous-subcutaneous insulin infusion (CSII) versus multiple-daily injections (MDI) among children with T1D in Egypt and correlated HRQoL to HbA1C, depression and socioeconomic.

Methods: Sixty children with T1D (30 on CSII and 30 on MDI), aged 6-18 years were assessed for diabetes-duration, insulin daily dose (IDD), HbA1C, CIDS, socioeconomic-standard, Mini-International Neuropsychiatric-Interview for Children and Adolescents depression module and HRQoL scales. Cost utility analysis was done with calculation of the quality life-year adjusted (QALY) and the incremental cost-effectiveness ratio (ICER).

Results: Children with T1D on CSII have significantly higher HRQoL and CIDS than those on MDI (P<0.001). HRQoL is negatively correlated with IDD (P=0.022) and HbA1C (P<0.001) and positively correlated with CIDS (P<0.001) and health care (P=0.033), home sanitation (P=0.001), family possessions (P<0.001) and occupation (P=0.006) socioeconomic scores. CSII is associated with higher cost but better QALY with net benefit 0.22 and ICER 72862.82 LE per QALY.

Conclusions: Children with T1D on CSII have significantly better HRQoL, CIDS and QALY than those on MDI. This is related to better glycemic control, affect and socioeconomic standard.

eP114 | Impact of COVID-19 pandemic on access and quality of care in type 1 diabetes pediatric patients

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Table

Parameter	Baseline n (%)	At 1 year n (%)	p
SMBG ≥ 3 times/day (%)	291/473 (61.52)	287/421 (68.17)	p = 0.038
A1C (%) mean±SD	9.26 ± 2.43	9.10 ± 2.39	p = 0.136
Proportion of glycemic target achievement (%)	87/474 (18.35)	94/395 (23.80)	p = 0.050
No. of patient with DKA (%)	69/483 (14.29)	46/422 (10.90)	p = 0.130
No. of patient with SH (%)	19/479 (3.97)	10/418 (2.39)	p = 0.189

Introduction: The coronavirus disease 2019 (COVID-19) affected countless peoples' lives including pediatric patients with type 1 diabetes. Dasman Diabetes Institute, as a specialized diabetes center, collected routine patient clinical data from 2018 to date to improve quality of care and optimize outcomes.

Objectives: We aim to investigate the impact of COVID-19 on glycemic control, diabetic ketoacidosis (DKA) occurrences, and diabetes management.

Methods: Body mass index (BMI), blood pressure (BP), hemoglobin A1C (HbA1c), DKA and insulin treatment modality were analyzed in 152, 154 and 53 pediatric patients aged <18 years from March to December in the pre-pandemic years 2018, 2019 and during the pandemic in 2020. In March 2020, a nation-wide total lockdown was implemented. Glycemic control was defined as an HbA1c <7%. DKA occurrence was self-reported in the past 12 months. Chi-squared test for trend was used to assess differences between the years.

Results: Most patients in 2018 (99.3%) and 2019 (99.3%) had at least 1 value of HbA1c, BP and BMI recorded, however in 2020, only 32.1% had at least 1 value of HbA1c and BMI and none had BP recorded ($p<0.0001$). Glycemic control was found in 15.8%,12% and 7.7% of the patients consulted in 2018, 2019 and 2020, respectively. DKA occurred in 6.5%, 3.2% and 5.7% of the patients in those years too. Of the 112 clinic visits in 2020, 99 (88.4%) were virtual consultations. Over time, pump use was 44.7%, 48.7% and 54.7% and continuous glucose monitoring remained the same in 21.1%, 20.8% and 20.8% of the study population from 2018-2020.

Conclusions: COVID-19 interrupted access to care due to nation-wide lockdowns and curfews which led to a decrease in patient follow up and poor data monitoring. Despite the decrease in patient follow-up, markers of care were not different before and during COVID-19. The steep decrease in follow-up and lack of difference in quality of care could potentially be due to patients seeking medical care elsewhere.

ePoster - 4.d: Ethics of Care

eP115 | Influence of familial social risk factors (SRF) on metabolic control in children with type 1 diabetes mellitus (T1D) in the Russian Federation

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Introduction: The Russian obligatory medical insurance system provides all children with T1D the modern comprehensive treatment. However less than 40% achieve the treatment goals. One of the reasons for insufficient metabolic control of diabetes in children is the SRF in the family. Quite often families in difficult life situation underestimate their social problems, not inform health providers about them and not apply for social support.

Objectives: to determine the most common SRF in families of children with T1D and its influence on metabolic control to plan support. The study was conducted in 4 Russian regions and was supported by charitable Alfa-Endo Program.

Methods: The assessment of the SRF was conducted as routine interview of parents by pediatric endocrinologists in health facilities using a standard questionnaire with the main focus to families with poor control of T1D in their children. The analysis included 252 families: 192 with poor metabolic control in children, mean HbA1c - 9.6% (7.5-17%); and 60 with sufficient metabolic control, mean HbA1 - 6.6% (5.3%- 7.3%). Families with SRFs were recommended to apply for social care. Control of HbA1c was carried out at baseline and after 3 months.

Results: In general, about 15% of families T1D have different social risk factors. The frequency of SRF was higher in families with poor control of diabetes in a child in comparison with families with sufficient diabetes control: low level of education - 50% versus 28%, no permanent job - 47% versus 33%, alone parenthood - 45% versus 25%, lack of any support - 41% versus 28%, respectively. About 70% percent of families with SRF applied for social care after the interview. Mean HbA1c in the group with poor metabolic control in children was decreased from 9.6 to 8.4% due to social support.

Conclusions: The families of children with type 1 diabetes need the routine SRF assessment and comprehensive social support.

ePoster - 4.e: General Diabetes Care

eP116 | Good glycemic control without exceeding the BMI trajectory during the first five years of treatment in children and adolescents with type 1 diabetes

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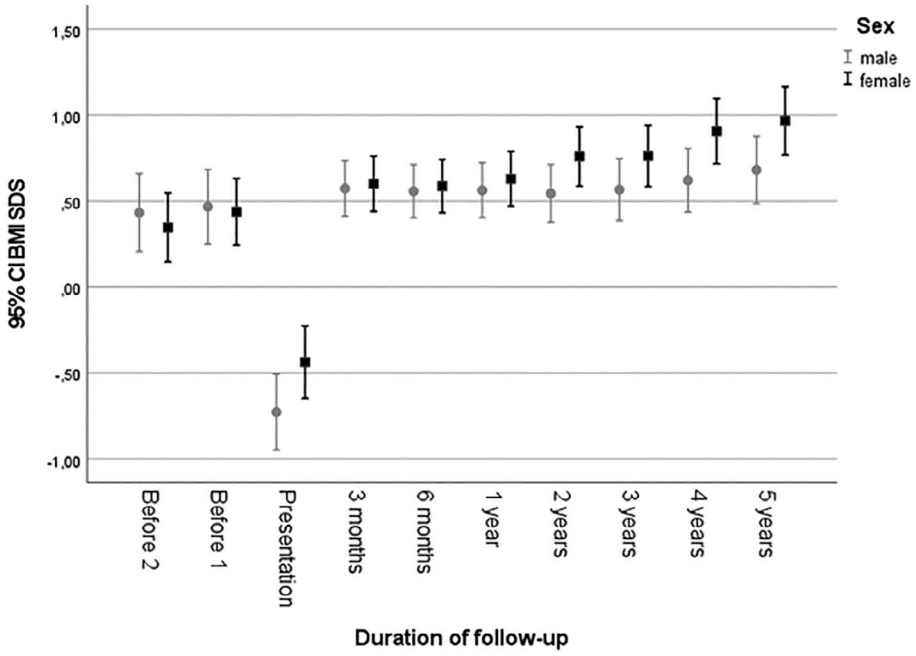
Introduction: The long-term trend of excessive weight gain in children and adolescents with type 1 diabetes is a problem and can be tracked into adulthood and cause adverse changes of cardiovascular risk factors.

Objectives: To study BMI changes and glycemic control in children and adolescents during the first five years following diagnosis of type 1 diabetes.

Methods: 295 children and adolescents (60 % male), <18 years of age, diagnosed with type 1 diabetes during 2005-2014 at Uppsala University Children's Hospital were followed up during the first five years of treatment with respect to glycemic control and weight change. Growth curves preceding the onset of diabetes were obtained from the school health services and child care centers. BMI was recalculated into BMI standard deviation scores (BMISDS). All were started on



multiple injection treatment and at five years 106 (51 %) had switched to insulin pump treatment. Statistical analyses were performed using SPSS 27.0, and data are given as means ± SD. A multiple regression analysis was used for prediction of outcomes and ANOVA for the main effects. A p-value<0.05 was considered as statistically significant.

Results: Prior to the onset of diabetes, the BMISDS was 0.46 ± 1.24 (mean ± SD), decreased to -0.61± 1.36 (p<0.001) at presentation and was at one year 0.59± 0.99 (p>0.05). At 5 years it was 0.80± 1.03; 0.97±0.93 in females vs. 0.68±1.08 in males (p<0.001). BMISDS at one year and 5 years were directly proportional to and highly predicted by BMISDS prior to the onset of type 1 diabetes, (r=0.76; p<0.001) vs (r=0.58; p<0.001). HbA1c at one year was 50 ± 10 mmol/mol, increased to 58 ± 12 mmol/mol (p<0.001) at 5 years; females had Hba1c 60 ± mmol/mol vs. males 56 ± 11 mmol/mol (r=0.35, p<0.001). There was a correlation, irrespective of gender, between HbA1c and BMISDS at one year (r=0.18, p<0.003), but not at 5 years (r=0.036, (p>0.5). In a repeated measurements ANOVA, diabetes duration correlated to HbA1c (p<0.001), irrespective of gender (p>0.05).

Conclusions: It is possible to achieve good glycemic control without exceeding the BMI trajectory during the first five years of treatment in children and adolescents with type 1 diabetes. During long term follow-up, females may be at greater risk of excess weight gain and increase of HbA1c.

eP117 | High glycemic variability is associated with worse continuous glucose monitoring metrics in children and adolescents with type 1 diabetes

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Introduction: In recent years, coefficient of variation (CV) has emerged as the primary metric for the evaluation of glycemic variability of patients with type 1 diabetes (T1D) using Continuous Glucose Monitoring (CGM). To the best of our knowledge, to date no studies have evaluated CV and its possible associated determinants in pediatric subjects with T1D in a real-life setting.

Objectives: The primary aim of this study was to quantify the prevalence of children and adolescents with T1D who achieve the recommended target for CV (≤36%) in a real-life setting identifying the factors determining the achievement of this target. The secondary aim was to examine the relationships between CV, the other metrics derived from CGM data and clinical parameters.

Methods: CGM data were collected from 805 children/adolescents with T1D. Several CGM metrics and patients' characteristics were evaluated. Participants were categorized in two groups according to the recommended target for CV (low CV≤36%, high CV>36%) and student t-test for unpaired samples was used to compare the characteristics between them. Binary logistic regression analysis was performed using CV (CV>36%=1) as the dependent variable and the factors that could contribute to explain it [i.e. age, diabetes duration, gender, BMI, type of CGM device (isCGM vs. rtCGM), insulin therapy

administration (MDI vs. CSII),%TBR,%TIR,%TAR>180mg/dL] as independent variables.

Results: CV≤36% was found in 31.4% of the subjects. CV was positively correlated with %TBR<70mg/dL (r=0.752, p<0.001), %TBR<54mg/dL (r =0.680, p<0.001), LBGI (r=0.736, p<0.0001), %TAR>250mg/dL (r=0.249, p<0.0001), HBGI (r=0.321, p<0.0001) and negatively with %TIR (r=-0.160, p<0.0001). The CV>36% group spent less time in %TIR, more time in hypoglycemia and hyperglycemia with lower proportion of subjects using rtCGM and CSII. Binary logistic regression analysis showed that %TBR<70mg/dL and %TAR>250mg/dL were significant predictors of having CV>36% (p<0.001, R2Nagelkerke=0.487), whereas age, gender, BMI, duration of diabetes, type of CGM device, type of insulin therapy administration, %TIR and %TAR>180mg/dL were not significant.

Conclusions: This study highlights the clinical usefulness of CV for identifying children and adolescents with worse glycemic control at higher risk of both hypoglycemia and hyperglycemia, independently from their HbA1c.

eP118 | Can dietary carbohydrate content influence the glycemic control in children and adolescents with type 1 diabetes?

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Introduction: Nutritional management is a core aspect of diabetes care.45-55% of healthy children's energy should be supplied from carbohydrates,30-35% from lipids and 15-20% from proteins. The ideal amount of energy for each macronutrient is not established in children with type1 diabetes mellitus (T1DM) and must take into account individual and family preferences

Objectives: To quantify carbohydrate intake and to evaluate its effect on glycemic control in children and adolescents with T1DM, using continuous subcutaneous insulin infusion (CSII)

Methods: We conducted a retrospective study with patient age 4-18years with T1DM, diagnosed ≥2 years, using CSII ≥ 6months, ≥ 2-4weeks of consecutive downloaded data and ≥70% of sensor data captured.

Results: From a total of 208 T1DM patients followed in a Pediatric Endocrinology Department,64 children and adolescents meeting the inclusion criteria were analyzed. Thirty-six were female (56,3%); median age was 11,5years (IQ8,5-15,2). Median of BMI z-score was 0,7(IQ0,3-1,5). Median total daily insulin dose was 0,8 U/kg (IQ0,7-1,0). Median HbA1C was 7,2%(IQ6,9-7,7) and 28,1% achieved HbA1C target (<7,0%). Median time of sensor use was 95% (IQ88,3-99,0) and median time in range (TIR)(70-180mg/dL) was 54,5% (IQ48,3-62,8).59,4% of the patients had a moderate carbohydrate intake. Median daily carbohydrate intake/kg was 4,5g/kg (IQ3,1-5,5). There was no statistically significant correlation between daily carbohydrate intake/kg and HbA1C (r=0,035; p0,791) or between daily carbohydrate intake/kg and TIR (r=0,001; p0,992). Comparing individuals with different daily carbohydrate intake/kg there was no statistically significant differences in their BMI z-score (p=0,213)

Conclusions: From a total of 208 T1DM patients followed in a Pediatric Endocrinology Department,64 children and adolescents meeting the inclusion criteria were analyzed. Thirty-six were female (56,3%); median age was 11,5years (IQ8,5-15,2). Median of BMI z-score was 0,7 (IQ0,3-1,5). Median total daily insulin dose was 0,8 U/kg (IQ0,7-1,0). Median HbA1C was 7,2%(IQ6,9-7,7) and 28,1% achieved HbA1C target (<7,0%). Median time of sensor use was 95%(IQ88,3-99,0) and median time in range (TIR)(70-180mg/dL) was 54,5%(IQ48,3-62,8).59,4% of the patients had a moderate carbohydrate intake. Median daily carbohydrate intake/kg was 4,5g/kg (IQ3,1-5,5). There was no statistically significant correlation between daily carbohydrate intake/kg and HbA1C (r=0,035; p0,791) or between daily carbohydrate intake/kg and TIR (r=0,001; p0,992). Comparing individuals with different daily carbohydrate intake/kg there was no statistically significant differences in their BMI z-score (p=0,213)

eP119 | Ambulatory Patient Safety Learning Lab: Failure modes and effects analysis for management of type 1 diabetes during illness

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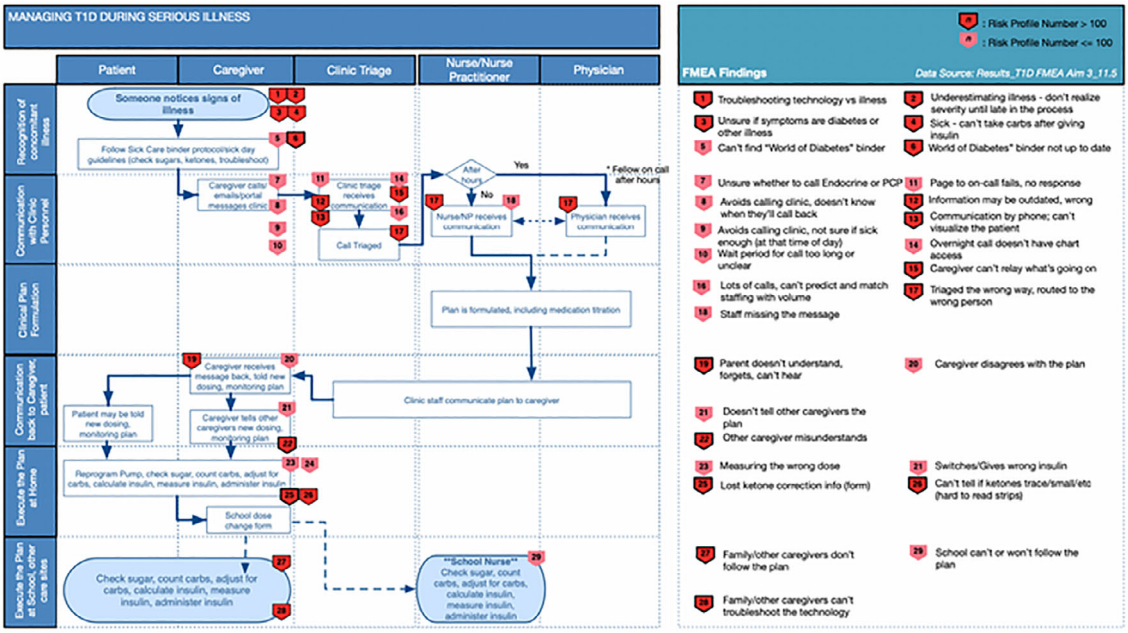
Introduction: The vast majority of care for children with type 1 diabetes (T1D) occurs at home; however, pediatric patient safety research frequently focuses on care delivered in a hospital setting.

Objectives: In collaboration with parents of children with T1D and diabetes clinic staff, we sought to identify common failures in self-management and opportunities to improve ambulatory safety for youth with T1D.

Methods: Failure modes and effects analysis (FMEA) is an approach used to identify how a process can fail, facilitating the development of



interventions to reduce the most serious risks. A failure mode (FM) is an action or omitted action that results in deviation from target behaviors and may cause harm. We performed an FMEA for management of T1D during serious illness. Two staff and five parents participated in FMEA. Participants agreed on process steps as detailed on the vertical axis categorized by individuals performing each step along the horizontal axis (see Figure). Each FM was rated on 3, 10-point scales: frequency of occurrence (very unlikely to very likely), likelihood of detection (very likely to very unlikely), and severity (rated by two physicians as clinically trivial to fatal). Ratings were multiplied to create a risk profile number (RPN).

Results: The highest risk FMs (RPN >150) included confusion if symptoms are related to diabetes technology or other underlying illness, delayed recognition of symptoms, and incomplete communication between caregiver and clinic. Most high risk FMs (RPN >100) fell under the role of caregiver.

Conclusions: Caring for a child with T1D requires complex real-time decisions that primarily burden caregivers. We are developing interventions to redesign systems of care and coordination between clinic and home to better support sick day management and improve communication, thus eliminating harm due to healthcare in these settings.

eP120 | Psychological care for children and adolescents with diabetes - results from the international pediatric registry SWEET

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Introduction: ISPAD Clinical Practice Consensus Guidelines (CPCG) recommend easy accessibility of psychosocial care for children and adolescents with type 1 diabetes (T1D) and their families.

Objectives: To evaluate the availability of psychological care and its associations to glycemic control in centers from the multinational SWEET (Better control in Pediatric and Adolescent diabeteS: Working to crEate CEnTers of Reference) registry.

Methods: All centers (n=112) were invited to a structured online survey regarding their psychology service. Using ISPAD Guidelines (2018) the centers were classified in 3 groups with none (1), partial (2) or complete compliance (3). Linear/logistic regression models adjusted for several confounders were used to determine patient's HbA1c (mmol/mol) and odds ratios (OR) for diabetic

ketoacidosis (DKA) and severe hypoglycemia (SH) related to survey responses.

Results: 76 (68%) centers with relevant data in the SWEET database responded to the survey (27.819 subjects, 52% male, 12.9 (IQR 9.7; 15.5) years old, age at T1D onset 7.3 (4.1; 10.5)). Psychological services were provided in 88% of them. Availability of psychological service in centers was associated with a slightly lower HbA1c of the patients (72 [62-82] vs. 67 [57-78] mmol/mol [95%-CI], p=0.004). DKA frequency in patients was negatively associated with availability of psychological care. The OR [95%-CI] for DKA was lower in centers with higher compliance to the ISPAD guidelines (partial: OR 0.6 [0.4-0.9], p=0.027; full: OR 0.4 [0.3-0.6], p=0.007) vs. no compliance. Availability of psychological care was not related to SH frequency.

Conclusions: Most centers from SWEET registry offer psychological care consistent with CPCG recommending easy access to psychosocial care for children and adolescents with T1D and their families. Having psychologists in the team and providing their care to young people with diabetes helps to prevent life-threatening and compromising events as DKA.

eP121 | Evaluation of HbA1c and glucose management indicator discordance in a population of children and adolescents with type 1 diabetes

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Introduction: Glucose management indicator (GMI) is a useful metric for the clinical management of patients with Type 1 Diabetes (T1D) derived from Continuous Glucose Monitoring (CGM) data. In adults, a marked discordance between HbA1c and GMI has been reported.

Objectives: The aims of this study were to test the hypothesis that HbA1c and GMI are discordant in children and adolescents with T1D and to identify potential factors affecting the discrepancy.

Methods: HbA1c and real-life CGM data of the 12 weeks and the 4 weeks preceding HbA1c measurement were collected from 805 children/adolescents. The absolute difference between HbA1c and GMI was calculated for both the 12-week and 4-week periods and the proportion of discordant patients was defined according to specific thresholds in the entire study population and in subjects stratified by type of CGM [intermittently scanned (isCGM) vs. real-time (rtCGM)], insulin therapy [Multi-daily insulin (MDI) vs. continuous subcutaneous insulin infusion (CSII)], gender, age and puberty. Regression analyses were performed with HbA1c-GMI discordance as dependent variable and patients 'characteristics as independent ones

Results: HbA1c-GMI discordance calculated on the 12-week sampling period was <0.1,≥0.5 and ≥1.0 in 24.8%, 33.9% and 9.2% of the subjects, respectively. No significant differences in the proportion of discordant patients were found comparing patients stratified by type of CGM, insulin therapy, gender, age and puberty. Multiple regression analysis showed that GMI-HbA1c discordance was not significantly explained by age, gender, BMI, type of CGM, insulin therapy, haemoglobin, anaemia and autoimmune diseases (R^2=0.012, p=0.409). The analysis of HbA1c-GMI discordance calculated on the 4-week sampling period showed comparable results.

Conclusions: GMI could be markedly lower or higher than HbA1c in more than a third of children/adolescents with T1D. This discrepancy should be taken into careful consideration when the two indices are directly compared in the daily clinical practice.

eP122 | Determination of insulin doses in youth with new onset type 1 diabetes

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Introduction: Recommendations for determining insulin doses at diagnosis in youth with type 1 diabetes (T1D) vary across clinical organizations and healthcare providers with suggestions for total daily doses of insulin (TDD) ranging from 0.5 to 1 units/kg/day. At our diabetes center, we provide diabetes education and initiate insulin in an outpatient setting. Frequent adjustments are required the first week after diagnosis to ensure that insulin doses are adequate for patients to meet blood glucose targets.

Objectives: We aimed to determine which patient factors are important for determining appropriate TDD in youth with new onset T1D.

Methods: Youth seen at the Barbara Davis Center for Diabetes for new onset T1D education and a one week follow-up appointment between January and December 2019 who were initiated on insulin dosing that included carbohydrate counting and insulin sensitivity factors were identified. A retrospective chart review was conducted to determine TDD following one week of glucose-stabilizing dose adjustments. TDD was regressed on age, sex, race/ethnicity, weight at diagnosis, and diabetic ketoacidosis (DKA) status. This simple linear model was then used to calculate TDD.

Results: From January to December 2019, 336 patients were identified (Table 1). The linear regression model found that age, HbA1c at diagnosis, and weight at T1D onset most significantly impact TDD. The following equation most accurately determines TDD: 4.7 + (age (yrs) x 1.11) + (HbA1c x 0.94) + (weight (kg) x 0.23). Add 2.76 if DKA present at diagnosis, and subtract 2.07 if biologic sex is male.

Table 1 – Demographics of youth with new onset type 1 diabetes

Age in years (mean±SD)	9.8 ± 4.4
Sex, female (%)	46.7%
Race/Ethnicity (n, %)	
White	213 (63.4%)
Hispanic	45 (13.4%)
Other	38 (11.3%)
Unknown	40 (11.9%)
Weight in kg at diagnosis (mean±SD)	37.4 ± 19.4
HbA1c at diagnosis (mean±SD)	12.1 ± 2.7
Diabetic Ketoacidosis at diagnosis, yes (%)	170 (51.4%)

Conclusions: When determining TDD in youth with new onset T1D, using age, weight, sex, and HbA1c at diagnosis may yield TDD that are more appropriate, allowing for improved glycemic control soon after diagnosis.

eP123 | Hospital at home: Intensive training at diabetes onset at home: the Luxemburg model

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Introduction: Education is the cornerstone of diabetes treatment. At onset, this necessitates in most places a 10-14 days hospitalization.

Objectives: As daily life in the clinic is not the same as at home, the Luxemburg model includes a short hospitalisation (2-6 days) and an intensive virtual training (4-6 phone exchanges/day) the following days/weeks (duration is patient tailored). To evaluate our approach, we compared metabolic control and acute complications within DPV longitudinal registry

Methods: DECCP (Diabetes and Endocrine Care Clinique Pediatric, Luxembourg) caring for 298 patients, participates in the DPV registry (251 centres). Average time of hospitalization at type 1 diabetes onset, DKA (Diabetes Ketoacidosis) rate, incidence of severe hypoglycemia and median HbA1c in our center were compared within the registry.

Results: In 2020, 24 newly diagnoses patients were seen (median in DPV: 12/year). Average hospitalisation lasted 4,8 days (median DPV 11,6 days). Metabolic control of all our patients is good (2020 median HbA1c 7,17 versus 7.6 median DPV), with a low incidence of severe hypoglycemia (0,054/1 patient year) and low DKA rate (0.008/1 patient year).

Conclusions: Our combined short hospitalization and intensive ambulatory follow up of the newly diagnosed patients ("hospital at home") is associated with a good metabolic control (Good HbA1c low rates of DKA and severe hypoglycemia, and is therefore a safe alternative to the mostly applied longer and more comprehensive inpatient training.

eP124 | Health disparities likely emerge early in the course of type 1 diabetes in youth

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Introduction: Glycemic control in the year following diagnosis with Type 1 diabetes (T1D) is predictive of long-term outcomes. For those with established T1D, current observations document disparities in care and outcomes by socioeconomic status (SES), race, and ethnicity, but there is limited literature on early differences in metabolic control.

Objectives: To analyze HbA1c trajectories of youth with T1D over 1 year post diagnosis and assess differences in HbA1c by markers of SES.

Methods: Youth diagnosed with T1D between 1 Jan 2016 and 20 Feb 2021 and followed at an urban 3° pediatric hospital with a large diabetes program in the U.S. were reviewed for inclusion. Patient level demographic data were supplemented by zip-code level markers of SES generated by the American Community Survey (ACS). HbA1c levels were assessed at diagnosis, and 3, 6, 9, and 12 months following diagnosis. Mixed effect models were used to examine the association of HbA1C over time with SES markers.

Results: Of the 961 patients, 45% identified as female and 49% were 6-13 years old. The sample's race/ethnicity mirrored that of U.S. registry data with 69% of patients identifying as white, 9% Hispanic, 6% Black, 2% Asian, and 14% unknown/other. Average (SD) HbA1c was 11.41 2.20% at diagnosis and 7.31 1.19%, 7.27 2.20%, 7.68 1.41%, and 7.89 1.43% at 3, 6, 9, and 12 months, respectively. On average, patients experienced a decrease in HbA1c 1 year after diagnosis. Patient level zip code matching to ACS data enabled categorization of the sample into low, middle, and high poverty zip codes. At one year following diagnosis, patients from high poverty zip codes had higher HbA1c (8.2% vs. 7.8%, $p<0.05$) than those from low or middle poverty zip codes.

Conclusions: These data demonstrate that patients from lower SES backgrounds already demonstrate significantly higher HbA1c 1 year post diagnosis. These findings further reinforce the need to design and implement interventions to mitigate disparities early in the course of T1D to promote health equity.

eP125 | To evaluate neutrophil gelatinase-associated lipocalin as a marker of diabetic nephropathy

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Introduction: MA (Microalbuminuria) is usual marker for early identification of DN (Diabetic Nephropathy). However, in young patients or non-albuminuric DKD (approx 2%), MA is unable to predict DN. Therefore newer markers are required for identifying early renal

	Cases (n=60)		Controls (n=25)		Test Statistics	
Lab Parameters	**Median (IQR)**	**range**	**Median (IQR)**	**range**	**P Value**	**Statistic**
uNGAL (ng/ml)	7.31(8.01)	0.51-35.85	3.62(5.06)	0.92-28.98	0.001	Z=-3.279 U= 410
uNGAL/Cr ratio (ng/mg)	11.56(17.04)	1.82-246.26	8.42(8.26)	0.59-59.21	0.000	Z=-3.540 U= 1117
urinary albumin:creatinine ratio (mg/g creatinine)	11.95(25.98)	0.20-337.60	0.90(1.45)	0.90-11.40	0.000	Z=-6.294 U= 97.5
eGFR (ml/min/1.73m^2)	115.29(52.58)	56-349.35	129.49(28.44)	76.70-308.72	0.036	Z=-2.103 U= 532

injury in DN. Neutrophil gelatinase-associated lipocalin (NGAL) is most studied marker in pediatric population and increases in both acute and chronic renal injury like DN. (3,4) Therefore, the present study was done to estimate the urinary NGAL in T1DM children and its utility in diabetic nephropathy.

Objectives: To evaluate NGAL as a marker of Diabetic Nephropathy in children with T1DM and its comparison with healthy control.

Methods: This was a case-controlled study carried in 5–15-year-old patients with type 1 diabetes and matched healthy control at a tertiary care center in northern India. The demographic data and disease related data was collected.15 ml of random urine sample was collected from cases and controls between 8AM and 11 AM. Urinary albumin was measured using by turbidimetric method after ruling out urine infection. Urinary NGAL levels were estimated using commercially available kit for ELISA.

Results: We enrolled 60 (31 boys) cases of T1DM and 25(19 boys) age, sex matched controls. The median time since diagnosis was 5.33 (3.27) years. Majority of patients were on basal bolus regimen (96.7%) and mean HbAIc of cases was 7.8±1.8%. Our study showed statistically significant difference between the values of uNGAL, uNGAL/Cr ratio, UACR and eGFR among cases and controls.(Table 1)

Subgroup analysis in normoalbuminuric and microalbuminuric groups was found to be non-significant. But normoalbuminuric cases had significantly higher uNGAL (0.006) and uNGAL/Cr ratio (0.001) than health controls.

Conclusions: Our study showed higher level of NGAL in both albuminurics and normoalbuminuric patients. Further studies are required for validation of this novel marker for practical use in day-to-day practice.

eP126 | A pragmatic real world trial examining the impact of an alteration of prescribing practice at diagnosis in pediatric type 1 diabetes mellitus

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Introduction: In April 2019, an alteration in prescribing practice occurred at the Royal Children's Hospital, Melbourne; all children are now commenced on MDI therapy from diagnosis regardless of age. Prior, younger children were commenced on a variety of regimens including traditional BD regimens.

Objectives: The impact of this change was examined, based on HbA1c measurements at 12 months post-diagnosis of T1DM, with an emphasis on children <10 years of age.

Methods: Glycemic outcomes in youths aged ≤18 years diagnosed with T1DM before and after the change (pre-change 1st March 2017-31st March 2019, post-change 1st April 2019-31st March 2020) were examined. Participant characteristics, length of stay (LOS), insulin dose adjusted HbA1c (IDAAC) at 3, 6 and 12 months, allied health contact and adverse outcomes in the first-year post diagnosis were extracted.

Results: In total, 280 participants presented to the RCH with new onset T1DM during the study period, 111 were diagnosed after the change. In children aged <10 years at diagnosis (n=148), HbA1c was lower at 12 months in those diagnosed in the post-intervention period (7.6±0.9 vs 7.1±0.9, p <0.003). This was independent of insulin regimen but not IDAAC scores (β 0.5, SE 0.1, p<0.001). A shorter total LOS (4.3±2.8 vs 3.1±2.9 days, p <0.007) was also seen. The total number of physical allied health contacts were significantly lower in the post-intervention group over the first 12 months (5.0±2.6 vs 3.9±2.0 contacts, p <0.005) with no increase in overall combined contacts (22.6±13.6 vs 22.6±15.6, p=1.00). There were no associations between prescribing practice and acute complications.

Conclusions: This study demonstrated lower HbA1c at 12 months post diagnosis of T1DM and a shorter LOS in a cohort of children <10 years at presentation when MDI insulin therapy was initiated from diagnosis, without any corresponding negative effects. While the prescribing change in itself didn't affect positive improvements in glycemic control, such significant changes in HbA1c are encouraging.

eP127 | Progestin subdermal implant compared to combined oral contraceptive in young women with type 1 diabetes

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Introduction: The metabolic impact of the progestin subdermal implant ("Implant") compared to combined oral contraceptive (COC) in young women with T1D is unknown

Objectives: To evaluate glucose profile, insulin requirements, body composition, and inflammatory profile in T1D women using the implant compared to COC for 24 months

Methods: Young women with T1D aged 15-24 years were followed prospectively for 24 months after starting contraception with either the implant (n:18; age 19.3±3 y; etonogestrel 68 mg) or COC (n:20; age 20.6±3.3 y; ethinyl estradiol 30ug/desogestrel 150ug). The Choice protocol was used to assign the treatment group. Body fat mass was assessed with the Tanita® system. Ultrasensible c-reactive protein (usCRP) was determined. Time-in-range (TIR) and mean glucose level was determined. Freestyle Libre® was used for 14 days at baseline and at 3 and 12 months. HbA1c and daily insulin dose (TDD) were assessed with DCA-2000® and by self-report, respectively. Insulin sensitivity was calculated by the eIS method (Duca 2016). Assessments were performed at 0, 3, 12 and 24 months. Statistics: ANOVA for repeated measurements using a mixed model.

Results: COC and implant groups showed similar glycemic profile, body composition, insulin sensitivity, and usCRP at 0, 3, 12, and 24 months (Table). BMI and fat mass increased over time compared with baseline in both groups. HbA1c transiently increased at 3 months compared to baseline in both groups, but TIR and mean glucose did not change. Insulin sensitivity increased in both groups at 24 months. BMI, fat mass and usCRP increased in both groups over time (*p<0.05 3, 12 and 24 months vs basal).

Conclusions: The implant and COC have similar effects on glycemic control and insulin sensitivity in young women with T1D. Increasing BMI, fat mass, and a pro-inflammatory marker were observed with both methods. Obesity prevention should be emphasized in young women with T1D requiring hormonal contraception. (FONDECYT Grant 1170895)

eP128 | Abstract withdrawn

eP129 | Managing pediatric diabetes in the times of pandemic in India

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Introduction: SARS-CoV2 has created devastating effects on the whole healthcare system, but has also brought opportunities for new innovations and brought organizations together for betterment of the system.

Objectives: The objective is to summarize the management measures initiated by various organizations and the role of telemedicine in the management of pediatric diabetes in India.

Methods: Type 1 diabetes was identified to be an independent risk factor associated with in-hospital death in COVID-19. During the pandemic, due to fear of visiting the hospitals there were underrepresentation of new cases and spike in the number of cases of diabetic ketoacidosis due to delay in the diagnosis.

Results: International Society for Pediatric and Adolescent Diabetes (ISPAD) advises continued monitoring and attention for pediatric diabetes to avoid hospitalization and emergency care during the pandemic. Elabary et al. conducted a web-based survey in ISPAD members involving 215 diabetes centers from 75 countries (including India) and it was identified that 32% used telephonic consultations and 18% used video consultations. Though patients faced various challenges like sharing blood reports and internet issues, most of them adapted over time. The shortage of insulin injections and glucose strips was solved by Research Society of Study of Diabetes in India (RSSDI) through CDiC program and Life for a Child Program. The efficiency of telehealth visits were enhanced by the use of diabetes technologies like insulin pumps, CGMs and Bluetooth glucose meters. As children got ample time to spend with their parents and perform the in-home physical activity, they had a good glycemic control during the pandemic period.

Conclusions: Various measures through the organizations working for Pediatric diabetes have resulted in better care inspite of the challenges being faced due to the COVID pandemic. The difficulties have brought the world together for better implementation of innovative ideas for betterment of the lives of people with Diabetes.

eP130 | The impact of continuous subcutaneous insulin infusion therapy (CSII) on glycemic control type 1 diabetes children and adolescents: single-tertiary center audit

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Introduction: Continuous subcutaneous insulin infusion therapy (CSII) is known to impact clinical outcomes. The pediatric team wished to evaluate the changes in glycemic control among the paediatric diabetes clinic at Dasman Diabetes Institute (DDI) from January 2007 till December 2018

Objectives: To audit the changes in glycemic control defined by glycosylated hemoglobin HbA1c (%) of children and adolescents with T1D over the first year following transition from multiple daily injection (MDI) to continuous subcutaneous insulin infusion therapy (CSII) at Dasman Diabetes Institute (DDI).

Methods: A one-year retrospective data was collected from DDIs' electronic health record system. The extracted data included children and adolescents with type 1 diabetes who transitioned to CSII from January 2007 till December 2018. Changes HbA1c (%) were assessed before and one year after initiation of CSII.

Results: A total number of 60 T1D children and adolescents (25 Males; 35 Females; mean age 7± 2.25 years), with a mean diabetes duration of 3.18 ± 2.14 years initiated CSII from 2007 till 2018 were identified. At 1 year after CSII therapy initiation, the 60 subjects had no significant change in the mean HbA1c ($n = 60$, pre 8.46 ±1.16% vs. 8.21 ± 1.10%, $P = 0.11$). Interestingly, poor controlled children with (HbA1c >9.5%) had a significant 1.35% reduction in HbA1c ($n = 10$, pre 10.23 ±0.78 % vs. 8.88 ±1.51%, $P = 0.03$) compared with the overall reduction of 0.25%.

Conclusions: CSII regimen could be beneficial in improving glycemic control in poorly controlled pediatric T1D, which implies recommendation of CSII to poorly controlled T1D and not to limit to HbA1c 8%. These outcomes need to be confirmed in a study with a longer duration.

eP131 | Is weight gain associated with higher insulin dose among T1D children on continuous subcutaneous insulin infusion therapy (CSII)?: Single-tertiary center audit

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Introduction: Continuous subcutaneous insulin infusion therapy (CSII) is known to impact clinical outcomes, insulin doses and vital measurements especially weight in children and adolescents with T1D. The pediatric team wished to examine the changes in those parameters one year after CSII initiation

Objectives: To evaluate the changes in insulin requirements and to identify the association between insulin doses and weight change among children with T1D over the first year following shifting intensive insulin therapy from MDI to CSII

Methods: A one-year retrospective data was collected from DDIs' electronic health record between January 2007 till December 2018. Changes in body weight, as well as changes in total daily dose (TDD), basal and bolus were assessed 1 year after initiation of CSII

Results: A total number of 60 T1D children and adolescents (25 Males; 35 Females; mean age 7± 2.25 yrs), with a mean diabetes duration of 3.18 ± 2.14 yrs initiated CSII from 2007 till 2018 were identified. At 1 year after CSII initiation, a significant weight increase was observed (pre 28.67 ± 10.62 kg vs. Post 32.28±12.55 kg, $P < 0.001$). Additionally, the TDD had significantly increased (from 19.78 ±11.65 vs. to 24.82±19.64 U; $P = 0.00$). Looking further, the total daily bolus had significantly increased (from10.35±6.01 U vs. to 17.45 ±10.22 U; $P < 0.001$), also, the total daily basal had significantly increased (from10.12±8.518.93 U vs. to 13.07±8.50 U; $P = 0.00$). Moreover, there was a significant correlation between TDD and weight change (r 0.52, $P=0.00$), as well as a significant correlation between daily bolus insulin with weight change was observed (r 0.44, $P=0.00$). Whereas, there was a negative correlation between daily basal insulin and weight change (r-0.13, $P=0.76$)

Conclusions: An increase of bolus insulin dose was found, and it was correlated with weight gain. This implies that this correlation was probably due to abrupt changes in eating behaviors. Therefore, it is recommended to a well-structured dietary intervention program for these children

eP132 | Type 1 diabetes, from pediatric to adult age: How to succeed the transition?

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Introduction: Adolescence is a period that coincides with the transition from pediatric to adult age. It is characterized by both physiological and psychosocial changes that complicates diabetes and self-care.

Objectives: The aim of this work is to study epidemiological and clinical particularities of this population.

Methods: Retrospective descriptive study of 166 type 1 diabetics mellitus from 10 to 19 years old followed-up in the department of endocrinology diabetology and nutrition at Mohammed VI University Hospital Center Oujda, Morocco during 6 years and 6 months.

Results: The mean age was 15.15 ±2.7 years, with a sex ratio M/F = 0.84. 27% of cases had diabetes for over 5 years. The predominant causes of decompensation were newly onset diabetes in 38% of cases, errors in therapeutic adaptation in 52% of cases. The mean initial HbA1C was 11% ± 2.6, 22% of patients had dyslipidemia, 22.3% and 46% of them had vitamin D deficiency and insufficiency respectively. Diabetes was complicated by nephropathy in 2.5% of cases. All patients were put on a basal bolus insulin and insulin pumps for some of them, and 8% of patients have been trained to functional insulin therapy. All patients received therapeutic education facilitated by use of free electronic applications and practical manual developed by our service. The average HbA1C after 3 months was 8.8 ± 1.72%, a 20% decrease from the initial value.

Conclusions: The transition period predisposes to glycemic imbalance and acute and degenerative complications. Preparing and supporting these patients during this period is necessary for optimal management.

ePoster - 5.a: Adjunctive Therapies

eP133 | Abstract withdrawn

[Correction added on 17 November 2021, after first online publication: ePoster eP133 has been withdrawn.]

ePoster - 5.b: New insulins

eP134 | Glucose variability, glycated hemoglobin, and time in range in children with type 1 diabetes after switching from basal insulin detemir to degludec

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Introduction: Reaching of proper glycemic control in children with type 1 diabetes (T1D) is a serious challenge not only for the patients themselves and their relatives, but also for the physicians. Estimation, analysis, and titration of doses are complicated by multiple factors, such as lifestyle heterogeneity and unpredictability of eating and emotional behavior, which, both individually and in combination, affect intra- and inter-day fluctuations of blood glucose levels. Modern ultra-long-acting insulin analogue degludec may improve glycemic control by decreasing glucose variability in children with type 1 diabetes.

Objectives: Compare glucose variability, glycated hemoglobin levels, and time in range in children with type 1 diabetes with different baseline glucose variability after switching from basal insulin detemir to degludec.

Methods: The study involved 30 children with type 1 diabetes mellitus aged 5 to 17 years. Time in range (TIR), time above range (TAR), time below range (TBR), as well as the coefficient of variation (CV) were estimated based on the data of the standard ambulatory glucose profile of the intermittently scanned continuous glucose monitoring system (isCGM) FreeStyle Libre before and after changing of the basal insulin.

Results: The patients were divided into 2 groups depending on the CV: ≤36 % for group 1 and >36 % for group 2. After switching from insulin detemir to insulin degludec children of group 2 had increasement of TIR (from 40.3 ± 11.5 % to 62.4 ± 6.7 %; $p < 0.001$), decreasement of TAR (from 53.7 ± 10.7 % to 34.1 ± 6.6 %; $p < 0.001$) and decreasement of CV (from 43.2 ± 5.4 % to 37.0 ± 3.3 %; $p = 0.001$). These changes were associated with reduction of HbA1c (from 9.4 ± 1.5 % to 7.5 ± 0.7 %; $p < 0.05$) without increasement of TBR.

Conclusions: In pediatric patients with type 1 diabetes mellitus, who previously received detemir as basal insulin and had a high glucose variability, switching to degludec allows to achieve a significant improvement in metabolic control without risk of hypoglycemia.

eP135 | Influence of insulin degludec therapy on frequency of daily scanning of flash glucose monitoring system in children with type 1 diabetes with initially low glucose variability

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Introduction: Necessity for multiple finger pricks is a significant barrier to achieving successful glycemic control. CGM and isCGM systems, which allow to obtain data both on the current and retrospective level of glycemia, eliminate frequent painful procedures, which makes their use in pediatric practice more reasonable. Analysis of the effect of the frequency of isCGM scans on glycemic control shows that an increase in the number of daily scans is associated with a significant decrease in HbA1c level, an increase in time in range (TIR), and a decrease in the frequency and duration of hypoglycemic episodes

Table

	iDet	iDeg
TIR, %:	71,3 ± 9,2	74,9 ± 6,8
• boys	71,6 ± 11,9	75,1 ± 8,8
• girls	69,4 ± 7,9	74,4 ± 6,2
TAR, %:	19,9 ± 8,3	19,3 ± 5,5
• boys	22,8 ± 10,6	20,2 ± 7,4
• girls	20,0 ± 5,9	19,1 ± 4,5
TBR, %:	8,8 ± 4,8	5,7 ± 3,1
• boys	5,5 ± 3,2	4,6 ± 1,5
• girls	10,7 ± 5,0	6,4 ± 3,8
HbA1c, %:	6,8 ± 0,5	6,3 ± 0,5
• boys	7,0 ± 0,8	6,6 ± 0,5
• girls	6,8 ± 0,3	6,3 ± 0,4
CV, %:	33,5 ± 2,4	30,2 ± 4,1
• boys	33,8 ± 1,8	28,7 ± 4,8
• girls	33,2 ± 3,0	32,0 ± 1,8
Daily scans (N):	26,1 ± 11,6	18,9 ± 6,8 (p<0,05)
• boys	31,0 ± 15,1	19,6 ± 8,1 (p<0,05)
• girls	22,5 ± 8,4	18,1 ± 6,5 (p<0,05)

Objectives: The aim of this trial was to study the effect of therapy with detemir (iDet) and degludec (iDeg) on frequency of scans of the flash glucose monitoring system in children type 1 diabetes with low glucose variability.

Methods: The study involved 15 children with type 1 diabetes aged 5 to 17 years with low glucose variability. Time in range (TIR), time above range (TAR), time below range (TBR), as well as the coefficient of variation (CV) and frequency of scanning were estimated based on the data of the standard ambulatory glucose profile of the intermittently scanned continuous glucose monitoring system (isCGM) FreeStyle Libre before and after changing of the basal insulin.

Results: Switching of patients with initially low glycemic variability from iDet to iDeg is not associated with statistically significant changes in TIR, TBR, TAR, CV and HbA1c. However, within 24 weeks after switching to iDeg, all patients showed a statistically significant decrease in the frequency of daily scans. This decrease in scan rate did not result in a clinically significant impairment of glycemic control.

Conclusions: In pediatric patients with type 1 diabetes, who previously received iDet as basal insulin and had a low glucose variability, switching to iDeg reduces the necessity of frequent daily scans without the risk of impairing of glycemic control.

eP136 | Effectiveness and safety of GLARGIN 300 U/mL versus GLARGINE 100 U/mL in a cohort of patients with Type 1 diabetes

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Parameters	*Gla300*	*Gla100*	*p-value*
Female	3	2	NS
Male	4	5	
Age (ys)	10,8 ± 2,9	9,1 ± 4,0	NS
BMI-z	-0,0 ± 0,9	-0,2 ± 0,89	NS
TBR % ≤ 70 mg/dL	1,7 ± 0,96	3,4 ± 1,7	< 0,05
TBR % < 54 mg/dL	0,01 ± 0,0	0,8 ± 0,6	< 0,05
TIR % 70-180 mg/dL	68,9 ± 10,0	66,4 ± 11,2	NS
TAR % > 180 mg/dL	25,6 ± 10,2	21,9 ± 4,4	NS
TAR % > 250 mg/dL	6,5 ± 4,4	8,4 ± 6,9	NS
CV %	34,5 ± 3,4	39,2 ± 5,6	< 0,05
GMI	7,0 ± 0,5	6,9 ± 0,3	NS
TDD U/Kg/die	0,58 ± 0,11	0,42 ± 0,2	0,05
Basal insulin U/Kg/die	0,25 ± 0,1	0,18 ± 0,1	< 0,05
Basal dose %	42,9 ± 2,5	48,4 ± 17,8	NS
Bolus dose %	57,1 ± 6,6	51,6 ± 17,8	NS

Introduction: Glargine 300 U/mL (Gla300), second generation basal insulin, reduce glycemic variability and the risk of hypoglycemia compared to glargine 100 U/mL (Gla100) (1).

Objectives: The aim of our study was to evaluate the efficacy and safety of Gla300 vs Gla100 in children and adolescents with newly diagnosed type 1 diabetes (T1D) and after 1 month of follow up (T1), using continuous (CGM) or flash (FGM) sensor metrics.

Methods: Retrospective observational study. A group of 14 T1D children (9.9 ± 3.4 ys), were enrolled between December 2019 and March 2021 and were randomized in 1:1 ratio to either Gla300 or Gla100, matched by sex and age. We evaluated the effectiveness and safety of both therapies at T1 evaluating the average percentage of time in range (TIR, 70-180 mg/dL) and time above range <70 mg/dL, <54 mg/dL (TBR) and coefficient of variation (CV). The total daily insulin requirement (TDD) was also assessed and subjects with insulin requirements to <0.5 Units/kg per day were considered in honey moon.

Results: Patients in therapy with Gla300 had higher basal insulin dose compared to Gla100 at discharge ($p<0.05$) and after 1 months ($p <0.05$). At T1, all patients in Gla300 had a significant reduction of TBR <70 mg/dL, TBR<54 mg/dL and CV ($p <0.05$). TIR values were good in both groups with no significant differences (Gla300 68.9% vs Gla100 66.4%; NS). No episodes of severe hypoglycemia were found.

Conclusions: Gla300 compared with Gla100, demonstrates comparable efficacy and a higher safety profile, highlighting a reduction in TBR and glycemic variability both at the onset of the disease and during 1 months of disease when there is a high frequency of honeymoon phase.

ePoster - 5.c: Other Pharmacologic Agents

eP137 | Temporal trends for diabetes management and glycemic control between 2010 and 2019 in Korean children and adolescents with type 1 diabetes

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Introduction: There is increasing use of modern devices in the management of patients with type 1 diabetes (T1D). However, to the best of our knowledge, there are no previous studies on the trends for T1D management in adolescents and children in Korea.

Objectives: We investigated temporal trends for diabetes management and outcomes in Korean pediatric T1D patients over 10 years.

Methods: We retrospectively collected the data from 752 participants (boys: 311, 41.4%) diagnosed with T1D and aged ≤ 18 years, with ≥ 1 year of follow-up between 2010 and 2019 in any of the seven study hospitals in Korea.

Results: Over the 10-year study period, use of continuous glucose monitoring (CGM) increased from 1.4% to 39.3%. From 2010 to 2019, there was an increased use of multiple daily insulin injections (MDI; 63.9% to 77.0%, respectively) and continuous subcutaneous insulin infusion (CSII; 2.1% to 14.0%, respectively), but decreased use of conventional insulin therapy (CIT, 33.9% to 9.0%, respectively). Mean glycated hemoglobin (HbA1c) decreased from 8.56% to 8.01% ($p < .001$) and was lower in younger patients, boys, and CGM users ($p < .001$). MDI and CSII users had lower mean HbA1c levels than CIT users ($p < .01$).

Conclusions: There was significant improvement in the glycemic control of Korean pediatric T1D patients over the 10-year study period. The use of CSII has increased approximately 7-fold, and the use of CGM has increased approximately 30-fold during the study period. The improvement in glycemic control was associated with the increased use of T1D technologies.

Table. Mean glycated hemoglobin values over the 10-year study period

Parameters		Calendar year										*p*-value
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Total patients, n		284	312	359	375	376	375	410	443	453	425	
Aggregate mean HbA1c, % (SD)		8.56 (1.70)	8.45 (1.65)	8.24 (1.75)	8.61 (1.89)	8.46 (1.67)	8.47 (1.55)	8.46 (1.59)	8.24 (1.48)	8.15 (1.68)	8.01 (1.47)	<.001
Glucose monitoring methods, n (%)	SMBG	280 (98.6)	302 (99.0)	345 (98.6)	353 (98.6)	364 (98.6)	360 (98.4)	374 (93.0)	367 (84.6)	351 (78.3)	258 (60.7)	<.001
	CGM	4 (1.4)	3 (1.0)	5 (1.4)	5 (1.4)	5 (1.4)	6 (1.6)	28 (7.0)	67 (15.4)	97 (21.7)	167 (39.3)	
Insulin delivery methods, n (%)	CIT	95 (33.9)	94 (31.0)	104 (29.9)	89 (25.0)	86 (23.3)	73 (20.1)	59 (14.8)	60 (14.0)	42 (9.4)	38 (9.0)	<.001
	MDI	179 (63.9)	205 (67.7)	237 (68.1)	260 (73.0)	276 (74.8)	284 (78.0)	330 (82.7)	331 (77.0)	353 (79.1)	325 (77.0)	
	CSII	6 (2.1)	4 (1.3)	7 (2.0)	7 (2.0)	7 (1.9)	7 (1.9)	10 (2.5)	39 (9.1)	51 (11.4)	59 (14.0)	

SMBG: self-monitoring of blood glucose; CGM: continuous glucose monitoring; CIT: conventional insulin treatment; MDI: multiple daily insulin injection; CSII: continuous subcutaneous insulin infusion; HbA1c: glycated hemoglobin

ePoster - 5.d: Novel Advances and Interventions

eP138 | Microvesicles in T1D at the onset: Preliminary data in acute phase of disease (MINDFUL project)

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Introduction: MVs are small extracellular vesicles, released into biological fluids by all cells. They play an important role in intracellular communication, caring a lot of information in form of proteins, mRNAs and miRNAs. They are therefore able to reprogram the target cells. In pathological conditions MVs increase in number and typology and would therefore be candidates for being good biomarkers of disease.

Objectives: The aim of this study was to quantify the most abundant MVs in the peripheral blood (leukocytes, endothelials, platelets) in patients with type 1 diabetes (T1D) and in control subjects (CS) in order to identify possible disease biomarkers.

Methods: Children and adolescents with T1D (n=15) and 17 CS were recruited. All T1D patients were enrolled at the onset of the disease. The study was carried out from January 2020 and is ongoing. At the onset (T0) and after 6 months (T6), all subjects underwent anamnestic evaluation, physical examination and assessment of metabolic parameters (HbA1c, c peptide). Biological sampling (blood, urine and stool) were collected to perform MVs analysis. MVs were analyzed in flow cytometry using an innovative kit provided by BD company, able to detect them directly in fresh blood. Antibodies conjugated with fluorochromes able to bind specific antigens (leukocytes (CD45+), endothelial cells (CD31+) and platelets (CD31+CD41a+), expressed on the surface of these cells were used.

Results: We found a significant decrease in the number of leukocytes-derived MVs compared to CS ($p<0.05$). At T6, the number of leukocytes derived MVs returns to baseline levels, comparable to healthy controls. No significant differences have been found in endothelial and platelets-derived MVs between the two groups at each times.

Conclusions: Our study is ongoing and could give interesting results. Leukocyte MVs could undergo autoimmune-based seizure and their reduction in peripheral blood could prove to be biomarkers of acute phase of type 1 diabetes.

eP139 | Optimizing post-prandial glucose excursion following consumption of traditional egyptian ramadan iftar meal among youth with type 1 diabetes on insulin pump therapy

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Introduction: During Ramadan, traditional Egyptian Iftar meals are high in both glycemic index carbohydrate (GI CHO) and fat.

Objectives: The aim of the current study was to assess the efficacy of different bolus regimens on optimizing post prandial glucose (PPG) excursion following consumption of this Iftar meal using insulin pump.

Methods: A randomized controlled trial examining the effect of six different bolus-type combinations on 4-h PPG measured by continuous glucose-monitoring was conducted. A total of 25 youth with T1DM using insulin pump therapy had a mean age of 11.1 ± 1 years and HbA1c of 7.6 ± 0.5 %. Participants were given the same Iftar meal (fat (45 g), protein (28 g), CHO (95 g)) with equal macronutrient, energy, and fiber content on 7 consecutive days. Each day, a different bolus delivery regimen was allocated. Insulin to carbohydrate ratio (ICR) was measured, and all boluses were given upfront 20 minutes before Iftar. Participants were randomized to receive either a standard bolus or 6 different split boluses delivered over 4 hours in the following split bolus each day: a dual-wave (DW) (50/50 with no increment); (DW 50/50 with 20% increment); (DW60/40 with no increment); (DW 60/40 with 20% increment); (DW 70/30 with no increment) and (DW 70/30 with 20% increment).

Results: Early glucose excursion was successfully controlled by the split 70/30 either with no increment or 20% increment with mean glucose excursion of less than 40 mg/dl. The split 70/30 with 20% increment significantly optimized late post prandial glucose excursion in comparison to standard bolus and other split boluses ($p<0.05$) as well as had significantly lower post meal area under the curve compared with standard bolus ($P<0.001$) with no risk of late hypoglycemia.

Conclusions: To achieve physiologic PPG profile in traditional Egyptian Ramadan Iftar meal, a dual-wave bolus with 20% increment given 20 minutes upfront as split bolus 70/30 over 4 hours, optimized delayed post prandial glucose excursions.

eP140 | HLA haplotype determines treatment response to GAD-alum (Diamyd®) immunotherapy in Type 1 diabetes: Design of DIAGNODE-3, a precision medicine, randomized, placebo-controlled Phase III clinical trial

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Introduction: Disease heterogeneity poses challenges for clinical development in Type 1 diabetes (T1D). A precision medicine approach targeting genetically defined patient populations can provide a solution.

Objectives: Our objectives are to describe the design and rationale of the first precision medicine randomized controlled Phase III trial of an immunotherapy (recombinant GAD65 protein) in the population of T1D patients carrying the HLA DR3-DQ2 haplotype.

Methods: A meta-analysis of 521 individuals with recent-onset T1D (Hannelius et al. Diabetologia 2020, PMID:32754804) showed that recombinant GAD65 conjugated to aluminium hydroxide (GAD-alum [Diamyd®]) has a significant dose-dependent effect on the preservation of endogenous insulin secretion over 15 months in individuals with T1D carrying HLA DR3-DQ2. An even stronger effect was seen in individuals with HLA DR3-DQ2 lacking HLA DR4-DQ8. These HLA-specific effects were subsequently confirmed in a randomized controlled Phase IIb trial (DIAGNODE-2, Ludvigsson et al. Diab Care 2021, PMID:34021020).

Results: We describe the rationale and key decision points in the design of the randomized placebo-controlled 24-month Phase III DIAGNODE-3 trial in individuals with recent-onset T1D carrying HLA DR3-DQ2, stratified by the presence or absence of DR4-DQ8, which will start enrolling in the second half of 2021. This is the first precision medicine Phase III trial of a disease-modifying treatment in T1D using a genetic marker to identify patients most likely to benefit. We will summarise results from the meta-analysis and the Phase IIb trial and present details on the genetic precision medicine strategy for GAD-alum immunotherapy. We will also present new results from a post-hoc meta-analysis demonstrating that drug product age (up to 3 years) does not influence clinical efficacy.

Conclusions: Utilising HLA haplotyping to identify responders to antigen-specific immunotherapy in T1D is a promising strategy currently used in a Phase III trial of intralymphatic GAD-alum.

eP141 | Impact of functional insulin therapy on glycemic control in adolescents with type 1 diabetes mellitus

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Introduction: Functional insulin therapy (FIT) is a new approach of intensified insulin therapy that allows patients with Type 1 diabetes mellitus to adapt their insulin treatment to their lifestyle and particularly their meals, by miming the physiological insulin patterns.

Objectives: The aim of our study is to assay the impact of Functional insulin therapy on glycemic control in adolescents with type 1 diabetes mellitus.

Methods: This is a prospective, descriptive and analytical study that involves 19 adolescents with type 1 diabetes mellitus aged from 13 to18 years old and followed up in the endocrinology diabetology department of Mohamed VI University Hospital center in Oujda. All of them entered the FIT teaching program that lasts a week, after receiving basic therapeutic education. Data collected were analyzed by Statistics Program SPSS Version20.

Results: The mean age of our patients was 15,3 years ± 1,8 with a sex ratio M/F of 1. 62.5% of them had diabetes for less than 5 years and 37.5% of them for more than 5 years. And none of them had any chronic diabetes complications. At three months follow up after the FIT teaching program, the mean HbA1c dropped from 8,75±1,6% to 8 ±1,4% with a significant decrease in the number hypoglycemic events especially severe hypoglycemia.

Conclusions: Functional insulin therapy remains an interesting alternative to conventional therapies as it allows a less restrictive diet, and is more flexible with everyday life activities.

ePoster - 6: Diabetes Education

eP142 | Parental involvement and education in the management of pediatric insulin-dependent diabetes in a resource-limited country

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Introduction: Many obstacles hinder the treatment of pediatric insulin-dependent diabetes mellitus (IDDM) in resource limited countries (RLS) in addition to providing insulin and clinical care.

Objectives: A small, pediatric IDDM program in Northern Haiti instituted a program emphasizing regular education sessions and parental involvement to improve outcomes.

Methods: A retrospective cohort study was conducted on all patients ≦18 years enrolled in the Hôpital SacréCoeurPediatric Diabetes Program. Data gathered included age, gender, HbA1c, and parental involvement at education sessions held over an 18 month period. . The mean HbA1c at the beginning and end of the study period were compared and the latter compared to a similarly aged historical control group.

Results: A total of 30 patients were enrolled with 23 females. Median age was 15 years old (IQR 13-17). The mean HbA1c at initial presentation was 14.5% (SD 3.6) and after 16 months, 11.2% (SD 1.71; $p < 0.001$). During this period, parents were present at every monthly clinic visit for 18 patients (60%) with initial mean HbA1c of 14.9 % (SD 1.9) declining to 10.4% (SD 2.7, $p < 0.001$). The mean HbA1c of 32 patients in the same age-group from 2 years prior had been 13.4 % (SD 2.8).

Conclusions: There are many challenges encountered in treating IDDM in children in RLS. The availability of insulin alone does not guarantee improved outcomes. Children with IDDM and their families require ongoing education and training on a range of issues beginning with the proper administration of daily insulin. In addition, dietary and lifestyle adjustments are important to optimize outcomes. Dialogue with parents is also crucial to refute misconceptions about IDDM and counter the influence of traditional healers. Our study shows that regular educational sessions and parental involvement can improve outcomes in children in RLS with IDD; the biggest improvement (30%) occurred for those whose parents attended sessions most often.

eP143 | The experience of online therapeutic education for parents of children with type 1 diabetes during the COVID-19 pandemic

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Introduction: The therapeutic education for patients with type 1 diabetes (T1D) is an integral part of achieving good metabolic control, which has significant limitations during a pandemic.

Objectives: To assess distant therapeutic education for parents of children and adolescents with T1D in the Moscow region (the total area of which is 44,329 km^2, the number of children population - 1,489,778 people, the number of children with T1D - 2,520).

Methods: The education was organized by Public Organization "Russian Diabetes Association" and supported by charitable Alfa-Endo Program (as a part of CAF). For 9 months pediatric endocrinologists, psychologist and representatives of patients' organizations conducted educational online workshops (webinars) for 176 parents of children with T1D. The program consists of 8 webinars including insulin therapy, food, glycaemia self-monitoring, physical activity, CSII, CGM system, psychological issues. Informational support was also provided by telephone messenger (WhatsApp) for any participants' questions. After educational program the parents were asked to fill out an online questionnaire to assess their satisfaction with the distant educational program.

Results: The responses were received from 144 parents (81,8% of all participants). All respondents highly appreciated the webinars with very important information for them, convenience of online training, interactive style, friendly environment, immediate feedback on any questions. The participants advised to expand the program by discussions of clinical cases, provide new data about possibility to cure T1D, include more social and psychological support sessions, continue the training program in future.

Conclusions: Interactive educational webinars were very useful and important for families of children with T1D in the conditions of COVID-19 pandemic. This successful experience of distance training would be useful for all large regions.

eP144 | Influence of ISPAD Science School for Physicians on personal career and networking development: Assessment of a twenty-year-program

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Introduction: The ISPAD Science School for Physicians (ISSP) is an international program aimed to enhance physicians in early career's knowledge in principles of diabetes research methodology

Objectives: This study completes the previous 2016 report, describing participants' perceived efficacy of the ISSP on aspects related to their career development, scientific skills, and networking over the all 20-year program

Methods: An online survey was sent to all 408 attendees from 2000-2019 editions to assess the perceived efficacy of the ISSP on four major areas: career development, scientific enhancement (overall 18–items rated on a 5-point Likert scale), scientific networking and social opportunities (overall 20 fixed choice items)

Results: One-third of the past attendees (135) responded to the survey (65.9% female; mean age 36.9 years). Most of them agree that the ISSP supported their career (82%), mostly through: helping to achieve a research position (59%), being engaged with diabetes care (68%) or research (63%) or starting a research fellowship (59%). Respondents indicated that ISSP was effective in increasing interest in diabetes research (87%) and enhancing the number (66%) and quality (83%) of their scientific productions. After the ISSP, 34% of respondents were research grants recipients. Many responders (86%) indicated that ISSP promoted international collaborations: 50% started clinical, and 67% research collaborations, while other 64% continued to share knowledge and clinical cases. 87% of responders met new friends due to the ISSP and are still in contact with other attendees. Finally, 93% of those who responded to the survey would recommend participating in future ISSP editions

Conclusions: From a time perspective, past attendees picture the ISSP program as quite effective in improving engagement with diabetes research, supporting career opportunities, increasing scientific skills and enhancing networking and research connections

eP145 | Trial of 3-day kids in control of food (KICk OFF) format in Kuwait

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Introduction: Kids In Control Of Food (KICk OFF) has been conducted in Kuwait since 2015. The Kuwait team adapted and modified the course to a 3-day format instead of a 5- day, due to the attendees preferences.

Objectives: To pilot a modified educational program KICk-OFF for children and adolescents (11-16 years old) with T1D and to evaluate the HbA1C and weight change, when compared with usual care

Methods: The team successfully conducted 4 modified courses from July- September 2019 at Damsan diabetes institute (DDI). Prior to the

trial courses that were conducted; the team responded to the requests of the previous graduates by piloting a shorter format (3-day). Also, the following modifications were made: 1)Ongoing follow up individual sessions, 2) Group booster sessions 4 weeks post course,3) Sending biweekly text messages, 4) Fasting Ramadan sessions and 5) Flash glucose monitoring devices were distributed throughout the courses instead of the classical SMBG. Glycaemic control measured by HbA1c and body weight calculated by body mass index (BMI) were taken at baseline, 6, and 12 months for intervention groups and compared with controls.

Results: Due to the Covid-19 pandemic, the trail outcomes were tracked up to 6months instead of 12months. For the intervention group, there was a significant reduction in mean HbA1c (n =22, pre: 9.6 ± 2.0%vs. post 8.6 ± 0.9%; $P = 0.01$), whereas, there was no significant BMI differences (n=22, pre 23.52±4.6 vs. post-I 23.74±4.2; $P = 0.8$). Moreover, no episodes of severe hypoglycemia, DKA, or hospitalization occurred after 6 months for all graduates. In addition, three graduates started insulin pump therapy. Finally, there were no changes in HbA1c (n=21, pre: 9.6 ±1.9% vs. post 9.2 ±1.2%; $P= 0.19$) and BMI (n=21 pre22.7 ±5.6 vs. post23.1 ±5.9, $P=0.37$) in the control group.

Conclusions: Joining a 3-day KICk-OFF Kuwait format was associated with significantly improved in Glycaemic control at 6 months compared with control group. These outcomes need to be confirmed in a study with a longer duration.

eP146 | Effect of flexible insulin therapy in children with type 1 diabetes. Impact on quality of life and diabetes control parameters

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Introduction: Flexible insulin therapy (FIT) is an educational approach whose aim is to transfer to type 1 diabetes (T1D) patient how to manage his insulin treatment.

Objectives: The aim of this study was to assess changes in quality of life (QL), glycemic control and body mass index (BMI) in T1D young children whose mothers were trained in FIT.

Methods: From July 2015 to January 2019, T1D patients<12 years, duration of diabetes>1year and HbA1c<9%, were enrolled in a prospective, mono-centric and controlled study. T1D patients waiting for inclusion matched for age, sex and diabetes duration were considered as controls. The number of subjects required was 30 in each. Mothers with children were included in FIT workshop, either directly or after 4 months from inclusion. Assessments were conducted at inclusion, monthly for 4 months and quarterly thereafter. The evaluation of efficacy focused on QL (PedsQ Version 3.0-Arabic), T1D knowledge (Local quiz), HbA1c by HPLC and BMI in percentiles.

Results: The study involved 49 couples for the treatment group and 49 for the control group. Characteristics at inclusion were identical for sex, age, onset and duration of T1D, mothers' educational level and occupation. The QL, 64.14±12.39/100 at inclusion, improved from the first month to 69.98±10.82 (p<0.02) and throughout the follow-up, in relation with 3 QL components: Diabetes Symptoms (p<0.01), Treatment Barriers (p<0.01) and Communication (p<0.04); QL treatment group at the 4th month at 69.61±13.42/100 vs 62.15±12.94 in controls (p<0.01). T1D knowledge at 11.63±2.31/20 improved to 13.55±2.33 ($p < 10^{-6}$) and vs control group (p<0.0001). Treatment group's mean HbA1C (7.41±1.13%) and percentage of HbA1C in the target of 7.50% (57.14%) at inclusion showed no significant variation. Mean initial BMI was 63.66 percentiles, 64.35 at the 4th month and 64.27 after 23 months of follow-up (p=0.16).

Conclusions: These results suggest that learning FIT contributes to improving the QL, knowledge of mother's young T1D child while maintaining constant glycemic control and corpulence.

eP147 | Cook and eat programme: Outcomes of the first five years

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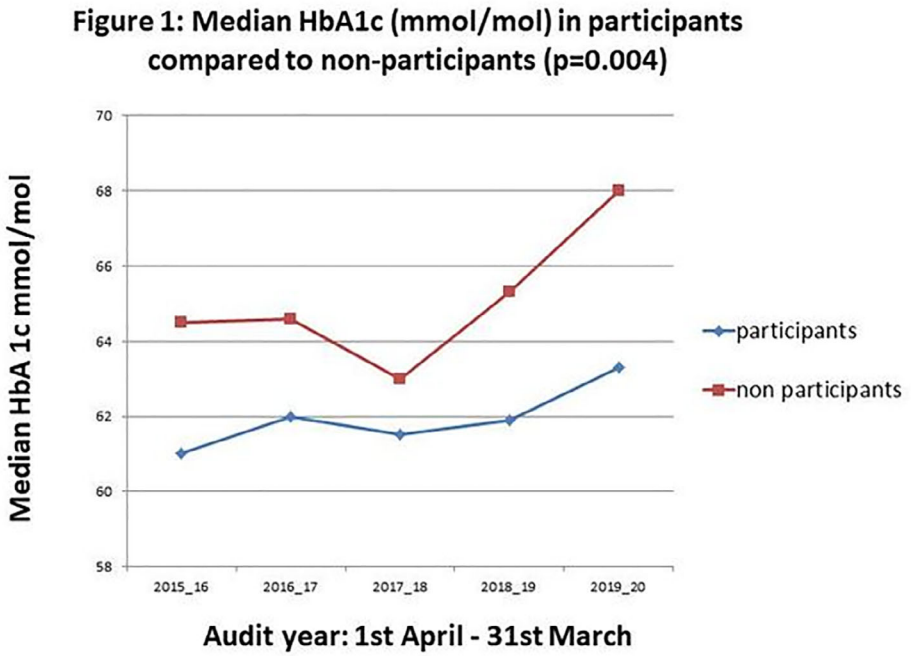
Introduction: Level 3 carbohydrate counting Cook and Eat programme has been offered to all ≤ 16 year olds in Exeter, Devon for the past 5 years.

Objectives: Demographics and HbA1c of participants are compared to non-participants.

Methods: HbA1c of participants (audit year mean) were compared to that of age matched non-participants over 5 years from participant first attendance. Those with no HbA1c data or who attended pilot or post 16 sessions were excluded. All HbA1c within first 6 months of diagnosis were excluded. Paired, two tailed t-test were used for statistical analysis.

Results: Ninety four participants in Cook and Eat and ninety four non-participants were age matched. Three participants were excluded. There were more males than females (55:48) in the non-participant group. Mean age 10.8 years was greater in non-participants (9.6 years). There was a significant difference p=0.04 between the number of HbA1c available for analysis in participant group (n=333) than non-participant (n=294). There was no significant difference in mean HbA1c between both groups and HbA1c in both groups followed similar trends over time, although non-participants consistently had higher HbA1c than participants. There was a significant difference (p=0.004) in median HbA1c between groups (Figure 1). Sixty (63.8%) participants attended at Cook and Eat sessions for more than one year. Those who attended five (n=3; p=0.02) or six (n=3; p=0.003) consecutive years had lower median HbA1c compared to those who attended once (n=34).



Conclusions: Young people enjoy Cook and Eat and many come yearly for education. HbA1c data must be interpreted with caution; there were significant differences in the number of HbA1c tests included for analysis in the non-participant group and multiple factors influence HbA1c. There is a trend that people with lower HbA1c access education and that these young people are more likely to attend more often.

eP148 | Role of a multidisciplinary team assisted, technology enabled education program in empowering people with type 1 diabetes

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Introduction: Carbohydrate counting (CC)-a meal planning tool is an integral part of type 1 diabetes (T1D) management. CC have been evidenced to have positive effects on glycemic control.

Objectives: We investigated and analyzed the effect of a multidisciplinary team (MDT) assisted, technology enabled education program in empowering T1D to meticulously use carb counting.

Methods: T1D (n=50; age: 5-35 years; HbA1c>8 % at baseline; 55% females) during their initial visit to the center were invited to participate in a MDT assisted technology enabled program. Group I (G1) received continuous assistance from a MDT along with trimonthly education and the use of technologies (n=25) and Group II (G2) opted for performing CC on their own based on the trimonthly education and used technologies at their convenience. Both the groups were trained on CC trimonthly and virtually during the Covid pandemic. Individual WhatsApp group was created for G1 comprising of the patient/caretaker and the MDT, for reporting their BG values, and sharing photos of their meals so that MDT can assist them continuously. Patients were encouraged to use a connected glucometer to monitor the BG values to improve MDT engagement. 66% of the patients were on MDI and 34% were on CSII. 8% of the participants belong to the 5-9 age group and rest of them were 10-35 years of age.

Results: A significant improvement in HbA1c (Baseline 9.53 ± 1.65 to 7.50 ± 0.68) was observed in G1 Compared to G2. CC in Indian foods is challenging given the hidden carbs in the traditional meals. The greater ability to count carbs accurately led to better A1c reduction.

Conclusions: Counting carbohydrates with the help of a MDT assisted technology enabled education program was found to be of significant benefit in the management of T1D.

eP149 | Flash glucose monitoring to improve self-efficacy in adolescents with type 1 diabetes

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Introduction: Optimal care of an adolescent with type 1 diabetes mellitus is to safely maintain glycemic control and avoid hypoglycaemia but the daily diabetes routine are challenged during the adolescence period of low treatment adherence. Evolving

technologies in glucose monitoring, the Flash glucose monitoring (FGM) devices, are used to assess percentage of time that they spends with their blood glucose levels in target range (TIR) and to inform diabetes treatment decisions for self-efficacy (measured as Confidence in Diabetes Scale, CIDS).

Objectives: To explore self-efficacy through Flash Glucose Monitoring (FGM) for adolescents with Type 1 diabetes mellitus.

Methods: Advanced Practice Nurse (APN) recruited the adolescents as prospective sampling in the clinic. At the first visit, CIDS was administered and glycemia levels retrieved from glucometer records. Appropriate diabetic education was provided with materials on the FGM system. Telehealth conducted at second and third visits including the FGM uploads of 14 days with post-CIDS administered. Results were analyzed on CIDS scores, percentage of TIR, hypoglycaemia events, mean glucose levels and frequency of sensor scanning.

Results: Of the 64 adolescents, 22 (73%) completed 4 weeks use of FGM with more females (63.7%). Half of the group are Chinese ethnicity and in express education stream (college preparatory). The mean statistics for age was 15.3 years (SD 1.6), duration of diabetes was 7.0 years (SD 3.5) and A1C 10.3% (±2.0). By 4 weeks, CIDS significant improvement focusing on insulin doses for food, exercise, and hypoglycemic events 3.00±5.07 (P<0.05); TIR (7.18±15.21%, P<0.05) and more hypoglycemic events identified (8.27±5.48, P<0.01).

Conclusions: The use of flash glucose monitoring (FGM) improved patients' TIR and identified hypoglycemia more frequently compared to conventional test. This study can extend for longer duration to evaluate the possibility to implement FGM as standard of care with funds by state government for better ease of usage.

eP150 | The role of social media in safe fasting ramadan for children and adolescents: Kuwait experience

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Introduction: Fasting in Ramadan poses a risk for children with type 1 diabetes (T1D) who insist on fasting. This project was caried out during Ramadan 2021 for older children and adolescents with T1D to ensure safe fasting during the COVID -19 pandemic

Objectives: Using the social media platform to ensure safe fasting during Ramadan among children and adolescents with T1D.

Methods: A total of23 older children and adolescents (mean age was14.4 ± 2.95) who chose to fast during Ramadan2021 were successfully close-monitored. Among 11(52.17%) of them, insulin was administered by MDI and12(47.8%)were on IPT. Prior to starting this project, a pre-Ramadan education webinar was conducted to educate children and their family members on how to fast safely in Ramadan. The webinar was focused on the following: fasting eligibility, dose adjustment, carbohydrate counting, hypoglycemia and hyperglycemia management and glucose monitoring timing. Due to COVID-19 pandemic, the progress of the participants was tracked via a well-developed daily online questionnaire shared via WhatsApp to adjust the insulin doses when required. All these instructions were given to the patients in the presence of their guardians.

Table 1: Glucose data analysis during fasting Ramadan

Parameters	Patient groups MDI (n=12)	CSII (n=11)	*P* value
Average glucose pre- Suhur	9.5±3.28	8.9±3.3	0.70
Average glucose post-Suhur	9.47±3.70	8.9±3.27	0.70
Average glucose pre-Iftar	7.72±2.68	7.90±2.87	0.87
Average glucose post -Iftar	10.44±3.23	9.74±2.50	0.56

Results: Of the total fasting days (30 days), the children were able to fast 14.57± 5.59 days, whereas 15.43±5.72 of these days were not fasted. The most common cause of breaking the fast was mild hypoglycemia events (9.2%, of all cases), followed by hyperglycemia (23.08% before Iftar) for both groups. No events of severe hypoglycemia, DKA, or hospitalization occurred. Furthermore, there was no significant difference in the average of blood glucose levels between two groups (Table 1).

Conclusions: Despite the COVID-19 situation, the pediatric team managed to use the social media to deliver pre-education webinar and provided daily supervision to participants who fasted Ramadan, with the main aim of preventing severe hypoglycemia and hospitalization.

eP151 | A novel longitudinal diabetes educational program (the Diabetes Learning Centre) to improve confidence in type 1 diabetes self-management skills in adolescents

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Introduction: Despite international diabetes guidelines recommending *structured and continuous* education programs to expand diabetes knowledge and self-efficacy in youth, there are few examples of such programs. The Diabetes Learning Centre (DLC) is a novel longitudinal diabetes educational program designed to improve adolescents' self-efficacy through confidence in type 1 diabetes (T1D) self-management skills.

Objectives: To describe the conception and implementation of the DLC. To evaluate adolescents' confidence in T1D self-management skills and predictors of confidence prior to their first DLC visit.

Methods: 13 to 17 year old youth rated their confidence in overall and individual T1D self-management skills on a 5-point Likert-scale prior to attending the DLC. Baseline characteristics were collected and summarized using frequency and percentage for discrete variables and median and interquartile range (IQR) for continuous variables. Spearman's correlation coefficient was used to estimate association between ordinal and continuous characteristics.

Results: Of 232 eligible youth, 215 (92.7%) consented to participate: 97 (45.1%) females, age 14.9 (IQR 13.9, 15.9) years, duration of diabetes 5.8 (IQR 2.9, 8.9) years, A1C 7.9% (IQR 7.1, 8.8), 110 (51.2%) on insulin pumps, 47 (21.9%) with parents involved "always" or "very often" in management. Median overall confidence in diabetes management on a Likert-scale (0-4) was 3, representing "quite confident" and correlated with mean ratings of individual self-management skills (r=0.54). Higher confidence in overall diabetes management was associated with lower A1C (p<0.001). There was little evidence of association between confidence and other baseline characteristics.

Conclusions: Adolescents reported being quite confident in T1D self-management skills prior to the DLC, with higher confidence significantly associated with lower A1C. Assessment of the DLC is ongoing, including evaluation of its impact on confidence and glycemic control.

eP152 | Evaluating the knowledge about diabetes mellitus among final-year medical students at Wasit University

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Introduction: Diabetes mellitus (DM) is one of the most common non-communicable illnesses worldwide. About 1.4 million Iraqis are living with diabetes mellitus. Awareness of its early symptoms and signs may contribute to an early diagnosis, for which there will be less risk for developing complications. Diabetes Mellitus is a subject that is taught for medical students.

Objectives: To assess the knowledge of final-year medical students at College of Medicine-Wasit University, Iraq, about Diabetes Mellitus

Methods: A cross-sectional study carried out in May 2020 using an Online survey that consists of 38 questions was distributed among all of the final-year medical students. Statistical confidence was considered significant when p-value<0.05.

Results: Response rate was 98.8%. 85 responses were analysed (50M:35F). Majority of the students 75 (88.2%) had attended diabetology classes during their undergraduate course. On a self-assessment, 57.7% of students thought having an "average" level of knowledge compared to 24.7% with only basic knowledge. For which almost half of responders felt they are ready and prepared to some extent to manage patients' diabetes clinically. The median score for correct answers was 67.1%, mean and standard deviation score (65.8 ±18.5%) with a minimum of 35.3% and a maximum of 100%. Lowest scores were related to diabetes technology and highest scores were related to understanding the pathophysiology. 38/85 (44.7 %) are either living with diabetes or at least one of their first-degree family members have diabetes mellitus, they were able to give better answers related to insulin requirement compared to non-exposed students (73.7% vs52.2%, p<0.05). Male students gave more correct answers than female students (p<0.05).

Conclusions: Relatively good knowledge was observed. There is a need to incorporate diabetes technology in the curriculum to broaden the knowledge of our graduates. Reviewing and updating the undergraduate curriculum was warranted. Similar studies are recommended by other Colleges of medicine.

eP153 | Knowledge retention in paediatric diabetes education - A quality improvement project

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Introduction: Structured education plays a fundamental role in the care of children and young people (CYP) with type 1 diabetes mellitus (T1DM) by empowering self-management and reducing the risk of complications.

Objectives: This project assesses whether the retention of structured education of T1DM management by families of CYP reduces over time; in particular which management areas are not recalled accurately.

Methods: 25 carers of patients from the Northwick Park Hospital Paediatric T1DM clinic completed a questionnaire assessing their understanding of 6 different areas of diabetes management. Respondents were divided into groups by the number of years since diagnosis: <0.5 (6/25), 0.5 – 1.0 (5/25), 1.0 – 2.0 (10/25), and >2.0 (4/25). The percentage of questions answered correctly in each group was measured.

Results: Questions on normal blood glucose ranges and insulin doses, exercise, carbohydrate counting and sick day rules were answered relatively well. The lowest proportion of correct answers across all groups were seen in questions pertaining to hypoglycaemia management (55%) and hyperglycaemia management (45%). When comparing results between groups based on time since diagnosis, families of patients diagnosed >2 years ago performed worse than other groups; with 33% giving correct answers on hypoglycaemia management, 32% on hyperglycaemia management and 69% about sick day rules. There was good retention of knowledge across all groups on normal blood glucose ranges and insulin doses, exercise and carbohydrate counting.

Conclusions: Our results suggest that the understanding of T1DM management in 3/6 areas of diabetes education deteriorates over time, particularly those which are not used on a daily basis, supporting the need for directed education on specific management areas at defined times during the patient's journey.

eP154 | A culturally-tailored diabetes health education program for the Somali immigrant community

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Introduction: Diabetes literacy is low in Somalis. Evidence suggests that the stigma against diabetes can be associated with poor diabetes control.
Objectives: To improve general diabetes knowledge and reduce its stigma in the general Somali community by developing and testing a culturally-relevant video-based approach to education.
Methods: This cross-sectional pilot study involved Minnesota Somali community adults ≥18 years without diabetes, who were recruited from local mosques/community centers. Participants watched a 7-minute culturally-tailored diabetes Somali educational video developed by the study team. The video addressed specific diabetes-related attitudes prevalent in the community. Participants completed pre- and immediately post-video questionnaires to assess knowledge and stigma related to diabetes in their preferred language (English/Somali). The questionnaire consisted of three parts: diabetes-related attitudes and stigma, diabetes knowledge, and demographic data. Knowledge questions were scored using numerical values (continuous), and stigma-related attitudes were scored using a 5-point Likert scale. The average of scores for stigma and diabetes knowledge from pre- and post- video questionnaires were compared using paired *t*-tests using R version 4.0.5. P-values <0.05 were considered statistically significant.
Results: Forty-five Somali adults participated (64% ≤40 years; 38% female; 13% had personal/family history of diabetes).
Conclusions: Culturally-relevant video education may be an effective method in improving general diabetes knowledge and reducing stigma associated with diabetes within the general Somali immigrant community. This is proof of principle that the effectiveness of this approach could be tested in other chronic conditions.
Funding Source: Boston Scientific.

Table

n=45	Pre-video (mean±SD)	Post-video (mean±SD)	*p*-value
Knowledge Score	8.9±2.6	9.4±2.3	0.04
Stigma Score	21.3±9.6	17.2±8.4	0.01

eP155 | Formative research to develop diabetes self-management education and support (DSMES) program for adults with Type 1 diabetes

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Introduction: There is a lack of data on effectiveness of diabetes self-management education and support (DSMES) programs for South Asian adults with type 1 diabetes mellitus (T1DM).
Objectives: This formative research was conducted to explore existing practices on the said subject and gather information for planning an enhanced usual care (EUC) intervention program.
Methods: We conducted in-depth semi-structured interviews with endocrinologists, dieticians, diabetes educators and adults with T1DM for this qualitative formative research. The participants were selected from a mix of public and private health facilities. Thematic analysis using inductive and deductive approach was undertaken.
Results: In total, 28 in-depth interviews were conducted, 18 with health care professionals and 10 with adult individuals with T1DM. The results demonstrated deficiencies in the implementation of a structured self-management program for diabetes owing to several patient and healthcare system-related factors. A detailed nutritional counselling was provided at all sites by a qualified dietitian, however, carbohydrate counting was not routinely practiced. The content of this formative research revolved around two broad domains hence explored: (a) evaluation of the existing usual care and gaps in implementation of a structured DSMES program, and (b) development of approaches that will help in formulation of an intervention package and its effective delivery to the participants. Principles of FUSED and COM-B models were also reported to be significant components for the success and refinement of such interventions.
Conclusions: This research study comprehensively investigated the existing practices among diabetes-health care professionals caring for persons living with T1DM, deficiencies in carbohydrate counting meal-planning technique and rendered insights towards development of a scientific DSMES program.

ePoster - 7.a: Acute Complications

eP156 | Alarmingly high rates of diabetic ketoacidosis at type 1 diabetes onset in children in Austria - An increasing problem beyond the corona pandemic?

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Introduction: For decades (1989-2009), the rate of diabetic ketoacidosis (DKA) at onset of type 1 diabetes (T1D) in children in Austria has remained stable at a high level of around 37%.

Objectives: As a follow-up project, we analyzed the annual rates of onset DKA from 2012 to 2020 with a sub-analysis for the lockdown-period during the corona pandemic.

Methods: All newly diagnosed children aged <15 years with T1D are prospectively registered in the population-based Austrian Diabetes Incidence Study in Austria. The annual DKA rates were analyzed using Joinpoint regression. Definition of DKA: pH<7.3, mild DKA: pH<7.3-7.1, severe DKA: pH<7.1. DKA frequencies during the lockdown periods in 2020 and the corresponding periods in 2015-2019 were examined using Fisher's exact test.

Results: In the years 2012-2020 the mean prevalence for onset-DKA in Austria was 43.6% and thus above the level of the previous decades. Particularly high prevalence was found among children under 2 years of age (72.0% DKA, 32.8% severe DKA). We found a significant increase of severe DKA at T1D onset since 2015 (p=0.023). During the lockdown in 2020, 59.3% of children were diagnosed with onset-DKA, compared to 42.1% during the previous 5 years (p=0.022). Moreover, 20% of children showed severe DKA at T1D onset, compared to 14% during the comparison period.

Conclusions: The previously already high prevalence of DKA at T1D diagnosis has increased over time. The corona pandemic has further exacerbated the problem of a late or delayed diagnosis in children with T1D with resulting onset-DKA. Since there was a significant increase in the annual DKA rate years before the pandemic, there is a need for action beyond the times of the pandemic.

eP157 | Diabetic ketoacidosis in children with new onset diabetes in Poland during COVID-19 pandemic

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Introduction: The COVID-19 pandemic imposed a heavy burden on the healthcare systems worldwide, especially during initial outbreaks. The strain on medical systems, including human resources, as well as shift to telemedicine and pro-isolation policy may have delayed diagnosis and aggravated the outcomes of type 1 diabetes (T1D) in children, possibly increasing the incidence of diabetic ketoacidosis (DKA) at diabetes onset.

Objectives: Compare the incidence of T1D in children and fraction of new T1D cases presenting with DKA among multiple pediatric diabetes care centres in Poland between a year before COVID-19 pandemic outbreak and after.

Methods: We contacted 14 reference pediatric diabetes centres in Poland, which collectively provide diabetes care for a population of 6.2 MLN children. They were asked to provide a case-by case data concerning new cases of T1D diagnosed between 15th March 2019 and 15th Match 2021 in children <18 y.o., together with available clinical information. Collected data were divided into two year-long periods – before COVID-19 pandemic outbreak and after, with the division made on March 15 2020, when policy changes and lockdown was imposed. In addition, demographic data for each studied region was downloaded from central statistical office for years 2019 and 2020.

Results: In the assessed period, we noted 2942 new cases of T1D (overall incidence rate 23.6 per 100000 patient-years) amongst 12 Poland regions (19.9 – 27.1), with a significant increase between pre-COVID-19 and COVID-19 period across all regions (mean increase 4.8±4.2 per 100000, p=0.0002). Among new T1D cases, 1409 (47.9%) presented with DKA (38.8 to 72.1%). The first wave of COVID-19 was associated with a significant increase in fraction of DKA at T1D diagnosis across all regions (mean +8.4±10.5%, p=0.0175). Greatest increase was noted during the first 3 months after lockdown.

Conclusions: In a multicentre national perspective, COVID-19 outbreak and related restrictions were associated with increased incidence of DKA at T1D presentation.

eP158 | Utilization of Serum β-hydroxybutyrate to define resolution of DKA

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Introduction: Accepted clinical definitions of resolution of diabetic ketoacidosis (DKA) vary and are limited in their precision. Increased use of serum β-hydroxybutyrate (BOHB) assays in clinical practice has created an opportunity to define more consistent endpoints for DKA treatment.

Objectives: To determine the BOHB concentration that corresponds to accepted biochemical markers of DKA resolution: venous blood gas pH (vpH), serum anion gap (AG), and serum total dissolved CO_2 (tCO_2).

Methods: We retrospectively reviewed all patients with type 1 diabetes mellitus (T1D) who presented with DKA and were treated with intravenous (IV) insulin and admitted to an urban tertiary care children's hospital in the United States between January 1, 2017 and December 31, 2020. Eligibility for inclusion in the analyses required repeated measurements in the laboratory of BOHB, vpH, AG, and tCO_2 and documented DKA resolution defined by AG14, vpH>7.3, or tCO_2>15 mmol/L.

Results: A total of 471 encounters (403 patients) were included; the median (IQR) age at presentation was 13.1 years (9.7–16.9). Based on a comparison of 528 paired laboratory samples from these 471 DKA encounters, an AG of 14 corresponded to a mean ± SD BOHB 0.900.66 mmol/L (range 0.07 to 3.7 mmol/L). Utilizing a BOHB cutoff of 1.5 mmol/L to define resolution of DKA would correctly classify 86% of subjects who had resolved using the traditional AG criterion, 77% resolved by vpH criterion, 73% resolved by tCO_2 criterion, and 77% who had resolved by all three criteria.

Conclusions: Unlike AG, an indirect measure of ketosis, or vpH and tCO_2 which can be affected by hyperchloremic acidosis during DKA treatment, a serum BOHB reflects degree of resolution of ketogenesis, the cardinal manifestation of DKA. A cutoff of 1.5 mmol/L may be useful to determine resolution of DKA and facilitate more efficient practice. A prospective randomized control trial is required to assess the impact of using BOHB as a marker of DKA resolution on clinical practice and resource utilization.

eP159 | Standardization of care for pediatric diabetic ketoacidosis in emergency departments in nova scotia, Canada

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Introduction: High quality pediatric diabetic ketoacidosis (pDKA) management requires adherence to evidence-based pediatric protocols. In Canada, 85% of children present for emergency care in general rather than pediatric specific Emergency Departments (ED). DKA management is an identified need of practitioners in these settings.

Objectives: To implement a new provincial pDKA protocol in EDs using knowledge mobilization techniques to improve quality of care for children with DKA.

Methods: A baseline survey of general ED practitioners was performed. Using a plan, do, study, act approach a new pDKA protocol was developed with input from stakeholders (pediatric endocrinology, emergency medicine, intensive care, pediatrics, pharmacy, nursing, management) based on the Translating Emergency Knowledge for Kids (TREKK) evidence base, a national agreement on best practices. This was piloted at the tertiary centre, revised and disseminated for implementation across NS with a peer to peer in-house training program via 18 sessions in 10 locations. A recorded tutorial helps train new staff.

Results: Baseline survey (n=32) revealed 4 different protocols and 2 different insulin concentrations in use and only 1/3 of respondents felt comfortable managing pDKA. Training improved comfort with management and increased adherence to the TREKK based protocol. SMART IV pumps facilitated standardization of insulin concentrations. Adaptations were required for general EDs where some IV solutions were not immediately available. No significant safety events after protocol implementation.

Conclusions: ED staff are more comfortable managing pDKA. Facilitators included nursing embracing a single protocol-based standard of care. Access to appropriate IV solutions outside the tertiary centre was a barrier. Lessons learned regarding the quality improvement initiative included resistance to protocolization particularly amongst tertiary care physicians, difficulty effectively engaging community pediatricians who serve as the local expert and lack of a formal EMR.

eP160 | Predictors of cetoacidosis and clinical presentation at diagnosis of Type 1 diabetes in pediatric age

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Introduction: Type 1 Diabetes Mellitus (T1DM) is a chronic immune-mediated disease, causing destruction of pancreatic β-cells that consequently leads to insulin deficiency. The prolonged lack of insulin and increase in counter-regulatory hormones may cause Diabetic ketoacidosis (DKA), which is a serious acute T1DM complication. DKA has been increasing worldwide in recent years although Portugal evidence on this subject is limited, highlighting the need for further research.

Objectives: The main aims of this study were to evaluate clinical presentation of T1DM over the past 11 years; assess which factors are associated with the presence of DKA at the onset of T1DM; compare clinical presentation of T1DM with HbA1c over the first 24 months after diagnosis.

Methods: This is a longitudinal, retrospective and observational study performed with children under 10 years old, diagnosed with T1DM between January 2009 and July 2020, who are currently being followed at Hospital of Braga. Sociodemographic, clinical and laboratorial data were extracted from clinical processes of the

selected patients. It was performed descriptive, association and correlation analysis, logistic regression and repeated measures ANOVA.

Results: Polyuria (87.5%) and polydipsia (83.2%) were the most frequent symptoms at diagnosis of T1DM; 36.5% of the patients presented with DKA at diagnosis; asthenia and HbA1c>11% were significant predictors of presentation with DKA ($p<0.05$); children with DKA needed more frequently to be treated on intermediate care and showed higher HbA1c, although these differences were significative only at 3 months after diagnosis.

Conclusions: DKA at T1DM diagnosis in this population has a high incidence and did not show significant differences between 2009-2014 and 2015-2020. Asthenia and HbA1c were identified as factors to be aware in T1DM diagnosis, as they were significant predictors of DKA. Children who presented with DKA at T1DM diagnosis showed significant worse control 3 months after diagnosis.

eP161 | Complications and specific considerations in managing newly diagnosed DKA with COVID-19; challenges in managing DKA with COVID-19 infection

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Introduction: New cases of type 1 diabetes (T1D) remain commonly found in Indonesia. One of the most typical presenting symptoms is diabetic ketoacidosis (DKA); approximately 71% of all cases. There has been several reports of the negative association between type 2 diabetes (T2D) and Coronavirus disease (COVID-19) cases in adults, but T1D and COVID-19 cases in children are still scantily studied. Mortality of COVID-19 pediatric case could reach higher than 50% in children below 5 years old.

Objectives: Early detection and prompt treatment for DKA, T1D and COVID-19 should be emphasized.

Methods: This case described new-onset T1D presented with DKA and severe COVID-19 infection.

Results: 7-year-old boy was presented with altered consciousness, epigastric pain, dehydration, dyspnea, history of nocturnal enuresis, polydipsia, and polyphagia. Random blood glucose (BG) was 516 mg/dL, blood ketone 5.2 mmol/L, A1c 15%, pH 6.932, pCO2 16 mmHg, pO2 153.8 mmHg, base excess -26.5 mmol/L, HCO3 3.4 mmol/L, and positive polymerase chain reaction COVID-19 with E gene Cq of 30.66. The patient was treated in isolation PICU as severe DKA with hypovolemic shock and confirmed COVID-19 case; received fluid resuscitation, intravenous insulin with saline and dextrose infusion and remdesivir. The patient had recurring hyponatremia, hyperkalemia, hypophosphatemia, increased coagulation markers, and had catecholamine-resistant shock, and received hydrocortisone from 2 mg/kg/day and subsequently titrated. The patient regained consciousness on the 2nd day of admission, and were stable on the 5th day of admission. The patient's condition improved on day 6 of admission and insulin and hydrocortisone were weaned. COVID-19 PCR test yielded negative result on day 9 of admission.

Conclusions: The COVID-19 pandemic presents additional unwanted complications in both clinical and non-clinical aspects of DKA and T1D management. Special considerations should be highlighted considering the comorbidities and medications given in addition to the treatment for DKA.

eP162 | Hypertrigliceridemia in children and adolescents with onset of type 1 diabetes in the pandemic COVID-19

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Introduction: The rapid spread of SARS-COV2 infection has led to a pandemic affecting people of all ages.

Objectives: Hypertriglyceridemia is a complication that can occur when diagnosing diabetes, especially the onset of ketoacidosis

Methods: The cases of diabetes at onset during the March-October 2020 pandemic were analyzed and were compared with the same period of 2019

Results: During the pandemic there were 14 cases of type 1 diabetes at onset, compared to the same period in 2019, when there were 10 cases of type 1 diabetes. Of these, 7 (50%) had ketoacidosis at onset in 2020, compared to 2019 - 3 cases (30%) with ketoacidosis at onset. In 2019, 1 single patient had triglyceride levels> 500 mg/dl. 6 patients (85%) in 2020 presented triglycerides> 500 mg/dl as follows: 2 had> 2000 mg/dl, 2> 1000 mg/dl, 3> 500 mg/dl.

Conclusions: Diabetic ketoacidosis is a common form of diabetes in the pediatric population. When accompanied by severe hypertriglyceridemia, it must be managed with great care by the medical team to prevent complications, thus reducing the mortality of cases of diabetic ketoacidosis.

ePoster - 7.b: Chronic Complications

eP163 | Relationship between intrarenal hemodynamics and renal biomarkers in youth with type 1 diabetes

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Introduction: Biomarker discovery in young people with Type 1 Diabetes (T1D) is needed to identify those at risk for Diabetic Kidney Disease (DKD).

Objectives: This study aims to examine the relationship between kidney biomarkers, including copeptin, gelatinase-associated lipocalin (NGAL), kidney injury marker 1 (KIM-1), interleukin 18 (IL-18), monocyte chemoattractant protein-1 (MCP-1), and chitinase 3-like 1 (YKL-40), and intrarenal hemodynamic function in T1D youth.

Methods: The study included fifty adolescent participants diagnosed with T1D in the past 10 years (16.1±3.0 years, HbA1c 8.6±1.2%) and 20 controls of similar BMI (16.1±2.9 years, HbA1c 5.2±0.2%). Glomerular Filtration Rate (GFR), Renal Plasma Flow (RPF), filtration fraction (FF), afferent arteriolar resistance (R_A), efferent arteriolar resistance (R_E), renal vascular resistance (RVR), intraglomerular pressure (P_{GLO}), and urinary albumin-to-creatinine ratio (UACR) were also assessed.

Results: GFR, RPF, R_E, and P_{GLO} were at least 29% greater, and RVR and R_A were at least 25% lower in the T1D adolescents versus the controls (p<.0001 for all comparisons). YKL-40 concentrations associated positively with elevated GFR (r:0.43, p=0.002), RPF (r:0.29, p=0.08), UACR (r:0.33, p=0.02), and P_{GLO} (r:0.45, p=0.006) in adolescents with T1D. KIM-1 concentrations also associated positively with elevated GFR (r:0.41, p=0.003), RPF (r:0.34, p=0.04), UACR (r:0.50, p=0.0002), and P_{GLO} (r:0.52, p=0.001) in adolescents with T1D.

Conclusions: These findings suggest that monitoring levels of YKL-40 and KIM-1 may help define DKD risk in early adolescence for T1D youth due to the biomarkers' direct correlation with intraglomerular dysfunction.

eP164 | Serum Netrin-1 is an early biomarker for detection of hearing impairment in adolescents with type 1 diabetes

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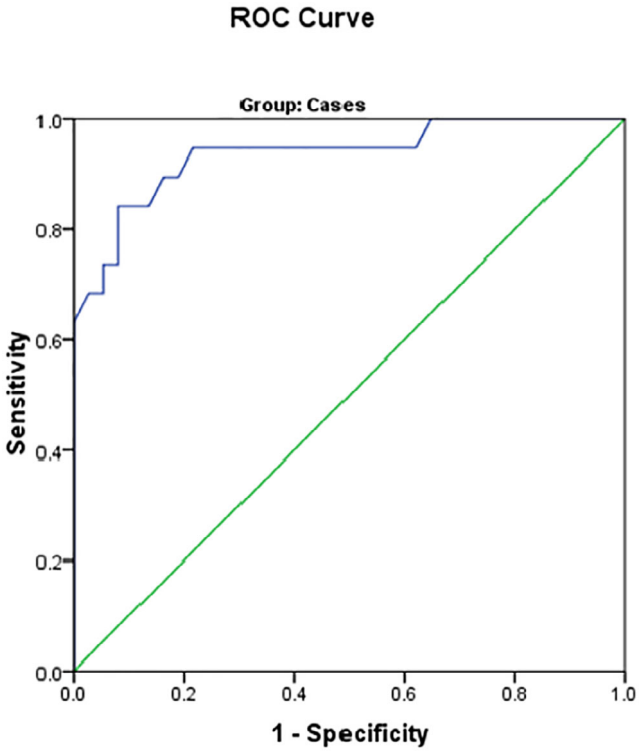
Introduction: Several studies have reported higher prevalence of mild auditory dysfunction among people with type 1 diabetes mellitus (T1DM) due to either neuropathy or cochleopathy. Netrin-1 plays a crucial role in upholding Schwann cell multiplication, peripheral nerve regeneration, and migration.

Objectives: To assess the prevalence of hearing impairment (HI) in a cohort of Egyptian adolescents with T1DM and to study serum Netrin-1 as a novel biomarker for early detection of subclinical hearing loss in T1DM.

Methods: This cross-sectional study included 56 adolescents with T1DM and matched 56 controls. All underwent audiological assessment with pure tone audiometry (PTA), extended high frequency (EHF) audiometry and otoacoustic emission (OAE). Serum Netrin-1 assay was assessed by ELISA technique for both cases and controls.



Results: PTA detected bilateral HI in 12.5% of T1DM cases while, EHF and OAE detected bilateral hearing loss in 26.8% and 30.4% of the studied cases, respectively. Serum Netrin-1 was significantly higher in T1DM cases in comparison to controls ($P < 0.001$). T1DM cases with HI in one ear showed higher level of serum Netrin-1 when compared to those without HI whatever the method of diagnosis (PTA, $P = 007$, EHF, $P < 0.001$, OAE, $P < 0.001$). Adolescents with T1DM and bilateral HI diagnosed by either PTA, EHF or OAE showed significant higher level of serum Netrin-1 in comparison to those with normal audiological tests ($P = 0.04$, $P = 0.001$, $P < 0.001$), respectively. Serum Netrin-1 at a cutoff-value of 427.5 pg/ml (AUC=0.936, 95% CI = 0.86-1) can predict HI (detected by OAE) in adolescents with T1DM, with 94.7% sensitivity and 78.4% specificity.

Conclusions: There is a relationship between T1DM and an increased risk for developing subclinical HI. Serum Netrin-1 is significantly correlated with the presence of auditory dysfunction in T1DM and is considered as a potential biomarker which can have a therapeutic implication in the future.

eP165 | History of diabetic ketoacidosis and current metabolic control significantly influence on retinal parameters in children with type 1 diabetes without retinopathy

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Introduction: Patomechanisms of retinal vasculature damage are not fully explained. Optical coherence tomography (OCT) and angiography (OCTA) gives now new tools for non-invasive, measurable, repeatable diagnostic of retina and ophthalmic vascularity. We hypothesise that early detection of suboptimal risk factors allow for planning of subsequent interventions either pharmacological or lifestyle

Objectives: The aim of the study was to determine risk factors which could influence on OCT results in children with type 1 diabetes (T1D) without retinopathy.

Methods: 175 children with T1D without symptoms of diabetic retinopathy were enrolled, but 330 eyes were used for the final analysis (168 children, mean age 12,81±3,63 years, diabetes duration 4,59 ±3,71 years). Commercially available RTVue XR Avanti with AngioVue (Optovue, USA) was used to perform OCTA. The multivariate regression models for retinal thickness (foveal FT, and parafoveal PFT) and vascular densities (superficial and deep) were carried out separately for both genders using all collected metabolic and demographic parameters. Statistical analysis was performed using Statistica Tibco v13 software.

Results: In the statistically significant multiple regression models for all analysed OCT parameters for both genders, pH at the onset of diabetes were in existence, as well as for retinal thickness current HbA1c. Duration of continuous insulin infusion (CSII) was an important factor in all retinal parameters, except PFT. For the girls, the more significant were daily insulin dose, uric acid, and triglycerides, but for the boy's serum creatinine, systolic pressure, and free thyroxine level.

Conclusions: Current metabolic control, diabetic ketoacidosis at the disease onset, serum creatinine and longer use of CSII are the most important factors for retinal thickness and vessel densities in both genders in children with type 1 diabetes. For the girls, elements of metabolic syndrome (uric acid and triglycerides) and parameters of insulin dosage were more pronounced.

eP166 | The retrospective survey of glycemic control and psychological factors during adolescent ages in type 1 diabetic patients who already had complications

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Introduction: The glycemic control during adolescent periods strongly affects the diabetes complications of childhood-onset type 1 diabetes (T1D) patients.

Objectives: The aim was to see the history of glycemic control in T1D patients whose diabetes complications developed in young adults.

Methods: We retrospectively investigated the clinical profile of 452 childhood-onset T1D patients in Osaka City University Hospital Department of Pediatrics from April 1, 2010, to March 30, 2021. We identified 28 patients who already had some diabetic complications before 30 years old. Their complications included diabetic retinopathy (pre-proliferative diabetic retinopathy or higher) and diabetic nephropathy (stage 3A or higher). The profiles of these patients with diabetes complications were compared with those of the other patients.

Results: The mean onset age of the patients with complications was 9.9 ± 3.5 years, and the disease duration was 18.2 ± 6.6 years. The youngest age of the onset of proliferative retinopathy among them was 18 years old. The youngest onset age of nephropathy stage 3A was 22 years old. All patients with complications had more than five years period when their HbA1c level was above 9%. Furthermore, some socio-psychological factors, such as the eating disorder, family factors, stigma, and so forth contributing to their poor glycemic control, were identified.

Conclusions: The T1D patients who developed some complications at the young adult age had poor glycemic control periods in their adolescent age. All of them had some socio-psychological problems. These results reaffirmed the importance of glycemic control and comprehensive care during adolescent T1D patients.

eP167 | Oxygen-binding characteristics of hemoglobin among children and adolescent with type 1 diabetes

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Introduction: The influence of type 1 diabetes (T1D) on RBCs is multifactorial; shortened life-span, membrane deformability and altered lipid composition as well as enzymatic changes. All these changes possibly modify the oxygen-binding characteristics of hemoglobin (Hb).

Objectives: Thus, the current study aimed to map the oxygen-binding characteristics of Hb among pediatric patients with T1D.

Methods: A total of thirty-five patients with T1D and 35 matched healthy controls were enrolled. Raman spectroscopy ((l= 532 nm) was used to evaluate conformation of hematoporphyrin (HP) and Hb's oxygen-binding properties. Specific Raman-scattering spectral lines were evaluated (maximum Intensities): I1355, I1375, I1550, I1580, I1172 cm^{-1}. I_{1355}/I_{1550} and I_{1375}/I_{1580} reflect the relative ability of Hb to bind and release ligands respectively. $(I_{1355}/I_{1550})/(I_{1375}/I_{1580})$ reflects affinity of Hb to ligands (Oxygen) and $I_{1375}/(I_{1355}+I_{1375})$ reflects the relative amount of oxyHb (HbO2). I_{1375}/I_{1172} reflects conformational changes of pyrrole rings.

Results: The intensities of I_{1355}/I_{1550} and $(I_{1355}/I_{1550})/(I_{1375}/I_{1580})$ were significantly lower among patients compared to healthy controls ($p< 0.05$). However, intensities of I_{1375}/I_{1172} and $I_{1375}/(I_{1355}+I_{1375})$ were significantly higher ($p<0.05$). Both I_{1355}/I_{1550}, and $(I_{1355}/I_{1550})/(I_{1375}/I_{1580})$ negatively correlated with duration of diabetes, HbA1c, cholesterol and urinary albumin execration (UAE) ($P<0.05$). Furthermore, the relative amount of HbO_2 was found to be related to conformational changes in the pyrrole rings (I_{1375}/I_{1172}).

Conclusions: In patients with T1D, Hb's ability to bind ligands as well as its affinity to O2 was decreased. Conformational changes of HP

directly influence oxygen-binding properties of Hb in T1D. The two-state allosteric model of Hb and Bohr's effect could provide insights for oxygen-binding characteristics in T1D.

eP168 | Screening for microvascular and macrovascular complications using echocardiography and cathelicidin in children and adolescents with type 1 diabetes

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Introduction:/

Objectives: to determine serum Cathelicidin levels in children and adolescents with type 1 diabetes (T1D) as a potential marker for diabetic vascular complications and to study its relation glycemic control, microalbuminuria, diastolic dysfunction and carotid intima media thickness (CIMT).

Methods: Methods: Eighty four children and adolescents with T1D were divided into 3 groups (28 patients each); newly diagnosed group (aged 12.38 ± 1.99 years), T1D without microvascular complications group (aged 13.04 ± 2.27 years) and T1D with microvascular complications group (aged 13.96 ± 2.30). Patients were investigated for serum Cathelicidin level and Echocardiography for detection of CIMT and diastolic dysfunction.

Results: Total serum cholesterol [171.36 ± 27.89 vs 140.18 ± 22.33 and 142.21 ± 43.22 mg/dl, p=0.001], microalbuminuria ([24.46 ± 10.43 versus 15.55 ± 5.17 and 10.83 ± 4.03 mg/24 h, p<0.001] and Cathelicidin levels [median (IQR) = 23.5 (20.5 – 35.25) versus 14.75 (9.75 – 22.75) and 4 (3.5 – 10) ng/ml, p<0.001] were significantly higher in T1D with microvascular complications compared to the newly diagnosed group and T1D without microvascular complications group respectively. T1D with microvascular complications had higher CIMT [0.09 ± 0.02 vs 0.07 ± 0.02 and 0.04 ± 0.01 mm, p<0.001] and E/A ratio (2.29 ± 0.44 vs 1.77 ± 0.38 and1.66 ± 0.27, p<0.001]. When E/A ratio of two or more was used to diagnose diastolic dysfunction, 24 (85.7%) of T1D with microvascular complications had diastolic dysfunction compared to 4 (14.3%) in those without microvascular complications and 2 (7.1%) in newly diagnosed groups. A positive correlation was found between Cathelicidin levels and total cholesterol (r=0.346, p=0.001), microalbuminuria (r=0.437, p=0.0001), CIMT (r=0.544, p<0.001) and E/A ratio (r=0.405, p<0.001).

Conclusions: Conclusions: Serum Cathelicidin levels can be used as a early marker for the occurrence of diabetic vascular complications in children and adolescents with T1D..

eP169 | Large fibre, small fibre and autonomic neuropathy in adolescents with type 1 diabetes: A systematic review

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Introduction: The prevalence of different types of neuropathy in adolescents with type 1 diabetes are not reliably estimated despite up to 50% of adults with diabetes have neuropathy.

Objectives: To estimate the prevalence of large fibre neuropathy (LFN), small fibre neuropathy (SFN), and autonomic neuropathy in adolescents with type 1 diabetes.

Methods: Systematic collection of published studies exploring the prevalence of LFN, SFN, and autonomic neuropathy in adolescents with type 1 diabetes. Following prospective registration (Prospero CRD42020206093), PubMed, EMBASE, and Cochrane Library were searched for studies from 2000 to 2020. PICO framework was used in the selection process (Population: adolescents aged 10-19 years with type 1 diabetes; Intervention: diagnostic methods for neuropathy; Comparison: reference data; Outcome: data on prevalence or comparison). Data were extracted concerning study quality based on available data and established methods for determining and diagnosing various neuropathy types.

Results: From 2,017 initial citations, 27 studies (7589 participants) fulfilled eligibility criteria. The study population (47% males) had a diabetes duration between 4.0-10.6 years, and HbA1c level between 7.3-10.8%, 56-95 mmol/mol. The prevalence of LFN, based on nerve conduction studies, was 10-57%. Based on other tests for neuropathy, the prevalence of LFN and SFN was 12-62%, and that of cardiac autonomic neuropathy was 12-75%.

Conclusions: The described prevalence of neuropathy in adolescents with type 1 diabetes varied, which can be methodological due to different screening methods and classifications of neuropathy.

eP170 | Cystatin C level and persistent non-dipping status are the risk factors of high blood pressure in pediatric population with type 1 diabetes mellitus

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Introduction: Elevated blood pressure worsens the prognosis in diabetic patients and is a risk factor for their premature death.

Objectives: To determine risk factors of the development of high blood pressure in young type 1 diabetic patients.

Methods: The study was a retrospective longitudinal analysis of pediatric population evaluated using automatic 24 hours blood pressure monitoring (ABPM). Each patients' ABPM records with matching biochemical and biometric parameters were collected. Ambulatory arterial stiffness index (AASI) and dipping status were calculated for each observation based on the ABPM records.

Results: The study included 131 (F57, M74) patients, in average age 12.2±2.0 years, with the mean duration of diabetes 3.96±3.97 years and mean HbA1c 7.35±1.35%, without established arterial hypertension and drugs affecting blood pressure value. Each patient had ABPM three times, the average time between ABPM records was 1.8 ±0.7 years. Based on the first ABPM hypertension (HT) was diagnosed in 4 patients and preHT in 35 patients; 92 ones were normotensive (NT). In these NT patients on the basis of the results of consecutive ABPM preHT or HT were found in 47 persons and normal blood pressure in 45. PreHT and HT children had significantly higher mean level of total cholesterol (4.53 vs 4.09 mmol/l; p=0.008) and HbA1c (7.5 vs 6.9 %; p=0.005) than NT patients. Survival analysis of baseline NT patients indicated that persistent non-dipping status is a risk factor of developing HT or preHT (p<0.001). No significant differences were found in mean age, median duration of diabetes, mean BMI z-score and mean AASI retrospectively. Mean level of cystatin C was significantly higher in the group which developed HT (p<0.001).

Conclusions: Dyslipidemia, increased HbA1c and cystatin C level are the risk factors of a development of elevated blood pressure in previously normotensive young type 1 diabetic patients. The persistent non-dipping status precedes the development of HT in children and adolescents with DM1.

eP171 | Could semaphorine and DKK-1 be new metabolic bone markers in patients with type 1 diabetes?

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Introduction: The treatment advancement and availability of technologies imitating physiological insulin secretion in patients with type 1 diabetes (T1D) allow to prolong the life of patients. However, several complications of the disease can still be observed, and there have been numerous reports of bone metabolism disorders in T1D patients. To diagnose bone metabolism disorders in children and adolescents both routine calcium-phosphate metabolism parameters and recognized bone metabolism markers such as: osteocalcin, osteoprotegerin and its sRANKL receptor are used. Interesting potential new markers of bone metabolism seem to be semaphorin 4D, irisine and dickkopf-1 (DKK-1).

Objectives: The aim of the study was to assess the concentration of semaphorin 4D, irisine and DKK-1 in patients with type 1 diabetes and their relation to other indicators of bone metabolism.

Methods: The study groups consisted of 75 patients with T1D after six months of diabetes duration and 23 controls. Serum levels of semaphorin 4D, irisine and DKK-1 were evaluated using the ELISA method. The individual, clinical and biochemical data obtained during follow-up visits after 6 months of diabetes duration were analyzed. Moreover, in the patients both the routine calcium-phosphate metabolism parameters and recognized bone metabolism markers (osteocalcin, osteoprotegerin, sRANKL) were performed.

Results: Significantly higher concentrations of semaphorin 4D and DKK-1 were observed in the study group as compared to the control group. After six months of T1D duration, in the patients from the study group the correlations between the concentration of semaphorin 4D and both calcidiol and alkaline phosphatase were observed. Interestingly, no correlations between both levels of semaphorin 4D and DKK-1 and parameters of calcium-phosphate metabolism and recognized bone metabolism markers was found in controls.

Conclusions: Semaphorin 4D and DKK-1 seem to be promising new markers of bone metabolism in patients with type 1 diabetes.

eP172 | Relationship between psychological stress and diabetes control in adolescents with type 1 diabetes attending the Yaounde CDiC clinic -Cameroon

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Introduction: Type 1 diabetes is one of the most common chronic illness in adolescents, with an increase rate of morbidity and mortality is less developed countries. Adequate self-management of the treatment regimen is a source of stress in adolescents.

Objectives: The aim of this study was to study the relationships between psychological stress (general stress, diabetes-specific stress) and diabetes control (HbA1c levels) in adolescents with T1DM.

Methods: This was a hospital based cross sectional study carried out in the Changing Diabetes in Children (CDiC) clinic at the Yaoundé Central Hospital from 12th of February 2020 to the 20th of June 2020. We included all adolescent with T1DM aged from 10 to 19 years. Participants excluded were other types of diabetes other than type1 diabetes, participants requiring immediate hospitalization or having mental illness. Adolescents completed questionnaires used to measure general stress and diabetes-specific stress. HbA1c levels were measured using glycated hemoglobin detection kit. Data entry and analysis was done using SPSS version 26.0. Statistical significance was set at p<0.05.

Results: A total of 61 participants were enrolled in the study. The mean age of participants was of 17.3± 2.0 year. The mean HbA1c levels was 9.0±2.3 and 78.7% of participants had poor diabetes control. More than half of the participants reported high levels of both general stress (60.7%) and diabetes specific stress (54.1%). Participants who reported high levels of general stress and diabetes-specific stress had HbA1c levels >7%. There was an association between general stress (p=0.023) and HbA1c levels.

Conclusions: Adolescents with Type 1 diabetes report high levels of general and diabetes-specific stress. Health care providers must be mindful of the sources of stress faced by adolescents with T1DM in order to better manage the disease and improve on their quality of life. However, the relation between stress and diabetes control is likely to be bidirectional and warrants interventional studies.

eP173 | Bone mineral metabolism in children with type 1 diabetes

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Introduction: Metabolic derangement, caused by type 1 diabetes mellitus (T1DM) in children and adolescents affects skeletal health in terms of both lower bone mineral density and bone turnover markers. Excess urinary calcium excretion has also been found.

Objectives: To examine and compare the levels of bone mineral metabolism markers - calcium, phosphorous, magnesium, 25(OH)vitamin D and PTH, as well as 24h calciuria in patients with T1D and healthy controls.

Methods: A cross-sectional study of 170 T1DM patients (85 females) aged 11.75years ±3.91 and 50 healthy controls (25 females) aged 7.96years±5.42. Mean duration of T1D 5.08 years (0-15), mean HbA1c 82mmol/mol (9.64%±1.92). Patients were divided into two groups according to HbA1c: < 58mmol/mol (7.5%) - favorable (n= 22) and ≥ 58mmol/mol (7.5%) - poor (n=148) and into four groups according to disease duration: (1)< 6months; (2) >6months and <5years, (3) 5-10 years and (4) >10years. 24h urine was collected in patients for calcium/creatinine ratio determination.

Table

Disease duration/group number	Calcium, mmol/L	Magnesium, mmol/L	Ca/ creatinine
(1)	2.30±0.1 [a] n=30	0.85±0.04[a] n= 15	0.81±0.53[a] n=14
(2)	2.38±0.05 [b] n=53	0.82±0.06[b] n=37	0.44±0.32[b] n=29
(3)	2.37±0.14[b] n=62	0.82±0.07[b] n=37	0.36±0.30[b] n=37
(4)	2.35±0.13[b] n=26	0.81±0.07[b] n=16	0.48±0.80[ac] n=14

Results: We found significantly lower levels of serum calcium, magnesium and PTH in patients: calcium 2.36mmol/L ±0.13 (n=170) compared to 2.41±0.11(n=50) for controls; magnesium 0.82mmol/L±0.06 (n=113) compared to 0.85mmol/L±0.05 (n=23), PTH 2.39pmol/L ±0.98 (n=124) compared to 2.89pmol/L±1.09 (n=44) in controls, p<0.05. All markers were in reference ranges.

Mean HbA1c was 52mmol/mol (6.95%±0.43) and 86mmol/mol (10.05%±1.72) respectively, with no significant correlations/ differences for all markers.

We found significant negative correlation with diabetes' duration for Ca/creatinine ratio (r=-0.355, p<0.001). Significant differences were found for calcium, magnesium and Ca/creatinine ratio (Table1).

Different index letters indicate p<0.05, same index letters - p>0.05

Conclusions: Patients with T1DM seem to have alterations in bone mineral metabolism. We have found significantly **lower levels of serum calcium, magnesium and PTH**. We did not observe PTH compensatory elevation as would be expected. Lower magnesium which interferes with PTH secretion and action, could be a factor. Disease duration seems to have negative impact on calciuria. Bone mineral metabolism in T1D is still poorly understood and should be a target of greater research focus.

eP174 | Metabolic and endothelial risk markers in T1D patients with poor control and long disease duration

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Introduction: The role of metabolic and cardiovascular risk markers for the assessment of type 1 diabetes (T1D) patients is not yet well investigated.

Objectives: To assess established and novel risk markers in T1D patients with poor control and long disease duration.

Methods: A total of 183 participants were studied, 124 (53.2% men) with T1D, aged 42.7±10.4 years, diabetes duration 25.3±8.2 years, BMI 25.6±4.0 kg/m^2, without significant chronic diabetes complications, and 59 age, sex and BMI matched healthy control subjects (54.1% men), aged 45.1±9.1 years (p=0.11), BMI 26.6±5.0 kg/m^2 (p=0.13). A questionnaire and standard examination were applied. Waist circumference (WC)>94 cm for men and >80 cm for women, and waist to height ratio (WHtR) above the median (>0.52) were

defined as "metabolic". Adiponectin (ADN), SHBG, leptin, IL-6, CRP, lipids, ALT and others were measured at morning fast.

Results: SHBG (80.2±38.6 vs. 42.0±18.0 nmol/l) and ADN (16.6±11.9 vs. 9.7±5.2), were higher in women, p<0.0001, and T1D patients (66.6 ±36.6 vs. 47.2±28.3 nmol/l, p<0.0001. ADN was higher (14.13+7.8 vs. 10.6+12.3, p=0.02) compared to controls. In T1D subjects, SHBG decreased with BMI (p=0.01) and WHtR (p=0.02) increments. In controls, all associations were highly significant, incl. with WC category (p=0.01). SHBG correlated with ALT (r=-0.20, p=0.01), TG/HDL (r=-0.14, p=0.08), and ADN (r=0.12, p=0.13) after adjusting for T1DM and for sex. The correlation with IL-6 was positive and significant (r=0.56). No correlations were found with CRP, TNF-α, osteoprotegerin and leptin. In controls, WHtR correlated with HMGB-1 (rho=-0.3, p=0.028), PAI-1 (rho=0.46, p=0,001), SICAM (rho=0.034, p=0.013) while not with IL1RL1 and MCP-1. In T1D patients with WHtR>0.52, SHBG didn't correlate with HbA1c.

Conclusions: In long-term poorly controlled T1DM patients established factors such as SHBG and ADN behave as metabolic risk markers regardless of diabetes control, while novel inflammatory markers need further elucidation.

eP175 | Abdominal skin necrobiosis as a complication of diabetes type 1 – Case study

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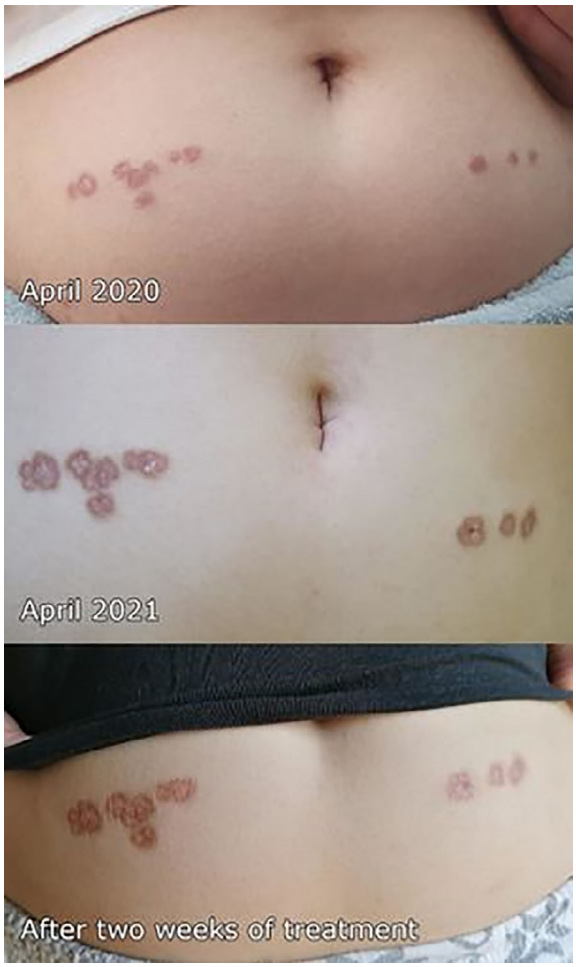
Introduction: Necrobiosis is a microangiopathic skin complication, mainly seen in adults with long, decompensed diabetes, mostly developing on the lower extremities, chest or arms, in areas prone to abrasion.

Objectives: To present a case of abdominal skin necrobiosis in a teenager with type 1 diabetes (T1D).

Methods: A 17-year-old girl with juvenile idiopathic arthritis (methotrexate treatment) since the age of 5 and T1D for 7 yrs, treated with functional intensive insulin therapy using an insulin pump (till 2019), and then by multiple injections (insulin aspart & detemir). Despite numerous reeducation sessions, support of psychologist and social worker she never achieved optimal glycemic control. Latest HbA1c results were: July 2019 - 8.2%, Nov 2019 - 9.8%, Apr 2021 - 10.8%. At the age of 15 yrs she developed necrobiosis-like skin lesions in the umbilical region, on the thighs and arms (figure). The girl had no other microangiopathic complications.

Results: In 2020 (17 yrs old) after a dermatological consultation topical treatment of the lesions was started: natamycin, neomycin, and hydrocortisone. Tight contact of the center resulted in a short improvement in glycemic control (several weeks). After 3 months form initiating this treatment the lesions were more pale, the oozing of serous and purulent secretion subsided (figure). The lesions turned into a dry discoloration. She decreased the contact frequency with the center and stopped visits few months after she turned 18.

Conclusions: Necrobiosis may develop even in pubertal patients and must be considered in the differential diagnosis of skin lesions of various locations. Properly treated necrobiosis will never disappear, but may heal by scar formation and cessation of enlarging oozing ulcers. Only early treatment accompanied by improved metabolic control can inhibit the formation of new lesions.



eP176 | Waist to height ratio as a differentiating marker of metabolic risk among poorly controlled type 1 diabetes patients with long disease duration and without significant chronic diabetic complications

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Introduction: Increased life expectancy in type 1 diabetes (T1D) patients could be compromised by concomitant risk factors such as visceral obesity, metabolic syndrome, etc. The selection of potential early differentiating markers of metabolic risk could be beneficial.

Objectives: To assess waist-to-height ratio (WHtR) as a differentiating factor of metabolic risk in T1D patients with poor control and long disease duration.

Methods: A total of 183 participants were studied, 124 (53.2% men) with T1D, mean age 42.7±10.4 years, mean T1D duration 25.3±8.2 (11-58), 95%CI 23.9-26.8 years, without significant chronic diabetes complications, and 59 age, sex and BMI matched healthy control subjects (54.1% men) aged 45.1±9.1 years (p=0.11). All participants answered a questionnaire and standard anthropometric measurements were performed. WHtR was defined as "metabolic" if >0.52 for both men and women. Adiponectin, SHBG, leptin, CRP, lipids, ALT and other markers were measured at morning fast.

Results: Initial diabetic ketoacidosis (DKA) reported 66.1% of the participants, recurrent DKA - 57.3%, and severe hypoglycemic episodes – 51.6%. Mean HbA1c was 8.4±1.8% (68.5±8.8 mmol/mol). Only 16.5% of T1D subjects had acceptable control (HbA1c<7.0%), only 6.5% were on CSII, and 32.2% had lipohypertrophy or lipohypotrophy. WHtR in T1D subjects didn't differ from controls (0.528±0.07 vs. 0.525±0.08, p=0.8), except for T1D women (0.53±0.07 vs. 0.49 ±0.09, p=0.06). WHtR correlated positively with the mean daily insulin dose (rho=0.324, p<0.0001) but not with HbA1c, even after adjustment for the diabetes duration. Multifactorial linear regression analysis confirmed the independent positive associations between WHtR and sex (b=0.05), age (b=0.002), TG/HDL (b=0.02), and negative with SHBG (b=-0.001) in T1D subjects (p<0.03).

Conclusions: In T1D patients with long-standing disease and poor control, WHtR behaves as a differentiating metabolic risk factor regardless of diabetes control and duration.

eP177 | Association of vitamin D deficiency with diabetic retinopathy in young people with type 1 diabetes in Bangladesh

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Introduction: Diabetic retinopathy (DR) is the most common micro vascular disease seen in children and adolescents with type-1 diabetes (T1D) and prevalence of vitamin D deficiency is significantly high in diabetic patients. Evidences indicated that vitamin D may play a role in the pathogenesis of Diabetic retinopathy (DR).

Objectives: The aim of the study was to assess the association between vitamin D deficiency with diabetic retinopathy in young people with diabetes.

Methods: Sixty participants aged 11- 24 years old were enrolled in this case (with DR) control (without DR) study during their scheduled visit in CDiC Paediatric Diabetes Center in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM 2), and Department of Ophthalmology, Bangabandhu Sheikh Mujib Medical University (BSMMU). The demographic and clinical data were collected in a data collection sheet. Retinopathy was screened by Colour Fundus Photography (CFP) and grading was done on the basis of NSC (National Screening Committy) classification.

Results: Participants with DR were significantly younger age at onset of diabetes (p .001), current age was older (p.004), with longer duration of diabetes (p.0001) and higher mean HbA1c (p.028) compared to participants without DR. While considering vitamin D deficiency, 25 (83%) participants with DR had vitamin D deficiency, compared those without DR 16 (53%). The mean vitamin D level of the participants having DR was 17.38±3,77 ng/ml and without DR was 20.15±5.06 ng/ml (p. 0.019). On logistic regression, univariate analysis-independent predictors of retinopathy were age at onset, older age, diabetes duration, mean HbA1c and Vitamin D level. But only age at onset and Vitamin D level remained significant in multivariate analysis as association of DR.

Conclusions: Young people with T1 D with vitamin D deficiency should be screened for DR and future studies should be done to assess the causal relationship between vitamin D deficiency and DR with T1D.

eP178 | Evaluation of lipid screening practice and outcomes in a transitioning cohort with paediatric-onset type 1 diabetes mellitus

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Introduction: Rates of diabetes-related complications has reduced in the paediatric T1DM population over time.

Objectives: This audit aimed to examine the contemporary practice and outcomes of lipid screening at the Royal Children's Hospital (RCH) paediatric T1DM clinic and to determine whether this aligns with current ISPAD guideline recommendations.

Methods: All youth ≥16 years old with T1DM and transitioned from RCH to adult care between 2018-2021 were identified. Demographic data, date and age at diagnosis, HbA1c at time of each screen, the proportion of abnormal screening results and the proportion of those that commenced treatment was documented

Results: In total, 103 patients (M=55, 53%) met criteria for inclusion. Mean HbA1c was 7.9% (SD1.2), age and duration of T1DM at the time of transition were 18 years and 6.4 years respectively. The timing of the first screen at mean (SD) age of 15.6 (2.1) years aligned with ISPAD guidelines in 84% (n=87). A total of 34 individuals had non-fasting lipid abnormalities (33%, M=10) at average age 15 years after 4.5 years of T1DM duration. Of these 13% of patients (n=20) had abnormal triglycerides (>2.0mmol/L) and 8% of patients (n=8) had abnormal low density lipoprotein (LDL) levels (>2.6mmol/L). There were zero occurrences of repeat fasting lipid function tests and zero individuals were commenced on lipid-lowering medication. The abnormal non-fasting lipid abnormalities persisted to the time of transition in all individuals.

Conclusions: This study demonstrated that the frequency of lipid screening in T1DM at RCH does not follow the 2018 ISPAD recommendations beyond the timing of the first screening test. Further studies looking at this cohort of patients into adulthood following transition would provide further insight into the effect of current practice on medium and long-term cardiovascular health.

eP179 | Frequency of microvascular complications among children with type 1 diabetes mellitus: A cross-sectional observational study from a developing country

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Introduction: There is dearth of data on frequency of vascular complications among children and adolescents with type 1 diabetes (T1D). Further, most of the studies are from the developed world and the results are variable due to heterogeneity of the studied population.

Objectives: To study the frequency of microvascular complications among children and adolescents with T1D and to identify the risk factors associated with these complications.

Methods: A cross-sectional study done at tertiary care centre in northern India from Jan 2019- June 2020 on 188 subjects (5 to 18 years) with T1D for at least 5 years or 2 years (if above 11 years of age). The fundus examination, nerve conduction studies, spot urine albumin/creatinine ratio and fasting lipid profile were performed to screen for retinopathy, neuropathy, nephropathy, and dyslipidaemia, respectively.

Results: Mean age of the subjects was 13.54 years and 48.4% were males. The mean HbA1c (over last 1 year) was 7.78%. Twenty-two percent subjects had at least one complication with retinopathy found in 0.6%; nephropathy in 13.3%; neuropathy in 14.9%; hypertension in 3.7% and dyslipidemia in 37.6%. Children with complications had significantly higher frequency of hypertension (p=0.045) and duration of diabetes (p=0.021), and lower frequency of sugar testing (p=0.019) and family history of T1D (p=0.015). Further, nephropathy was associated with long duration of diabetes (p=0.012) and hypertension (p=0.045).

Conclusions: Microvascular complications associated with T1D can present in childhood especially, among those with longer duration of disease and lower frequency of sugar testing.

eP180 | Diabetic neuropathy in children – What do we know so far?

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Introduction: Diabetic neuropathy (DN) is the most frequent chronic complication of diabetes. Although unusual during childhood, peripheral neuropathy needs to be considered in patients with long term disease.

Objectives: The present study aims to evaluate the prevalence of both clinical and subclinical DN in pediatric patients with type 1 diabetes (T1D) and identify potential risk factors for its development.

Methods: Prospective, observational study involving children and adolescents with ≥3 years of disease. The evaluation consisted of longitudinal electrophysiological testing (EMG) and neurological examination - application of the Neuropathy Disability Score (NDS) and the Diabetic Neuropathy Symptom Score (DNSS). Data regarding patients' metabolic and physical profiles and coexisting comorbidities were also collected. Nowadays, the study is still in progress with re-evaluations being performed.

Results: From a total of 25 patients, 52% were male with ages ranging between 7 and 16 years (median age of 13 ± 2.6). The average disease duration was 6.6 ± 2.0 years (3-10), with poor glycemic control in 68% of patients (HbA1C>7.5%). About 40% of patients had LDL levels>100 mg/dl and 44% were overweight (Body Mass Index ≥P85). Altered EMG patterns were present in 3 patients, one of which compatible with DN. This patient also had abnormal findings on neurological examination, with NDS and DNSS scores >1, and presented the highest HbA1C level of the cohort (12.8%).

Conclusions: Accordingly with previous studies, in our cohort, the patient with the worst metabolic control presented signs of peripheral neuropathy. Despite the small sample size, our study highlights the importance of early screening for DN in children and adolescents with diabetes.

eP181 | Levels of metabolic parameters, even in normal range significantly impact on choroidal thickness in children with Type 1 diabetes without retinpathy, measured by optical coherence tomography

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Introduction: The choroid plays important role in the vision process, supplying the external retina with oxygen and nutrients. Histological

studies show loss of choriocapillaries in patients with type 1 diabetes (T1D), which results in reduced choroidal blood flow, retinal tissue hypoxia as well as retinal pigment epithelium and photoreceptor dysfunction and death. Choroidal vasculopathy plays an important role in the pathogenesis of diabetic retinopathy.

Objectives: Aim of the study was assessing influence of all collected metabolic and demographic parameters on choroidal thickness (CT) in children with T1D.

Methods: Examination using optical coherence tomography (OCT) of 333 eyes out of 167 children with T1D without symptoms of diabetic retinopathy (mean age 12,81±3,63 years, diabetes duration 4,59±3,71 years) was performed. OCT was performed using a commercially available RTVue XR Avanti (Optovue, USA). CT in all quadrants was evaluated. The multivariate regression model was carried out using all metabolic and demographic parameters and then it was built using only the significant ones. Statistical analysis was performed using Statistica software V.13.

Results: In the statistically significant multiple regression model (R=0,9, R2=0,82, p<0,0000), the serum level of free thyroxine, triiodothyronine, total hemoglobin, uric acid, low- and high-density cholesterol, daily insulin dose per kilogram, weight and level of vitamin D significantly influenced on choroidal thickness. Significant differences in CT between males and females, except nasal and superior quadrants were observed.

Conclusions: Levels of metabolic parameters such as cholesterol, uric acid, thyroid hormones, and hemoglobin concentration even within the normal range, significantly influence the CT, and we hypothesize that these impacts potentially similarly affect other blood vessels in the body.

eP182 | Prevalence of early nephropathy and hypertension in children with type 1 diabetes mellitus and its relation to glycemic control

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Introduction: Diabetic nephropathy (DN) is one of the most frequent and serious chronic complications of T1D and the most common cause of end-stage renal disease (ESRD). It occurs in 30– 40% of patients with T1DM. Microalbuminuria is considered to be an early sign of diabetic renal disease and represents a potentially reversible stage of DN.

Objectives: To determine the prevalence of early nephropathy in type1 diabetic children attending our diabetes clinic & its relation to hypertension and glycemic control.

Methods: The study included fifty patients with T1DM for duration of 5 years or more attending diabetes clinic in Alexandria University Children Hospital, Egypt. They were subjected to history, examination specially blood pressure (BP) measurement and classification according to the guidelines to: Pre-hypertensive, Stage 1 HTN and Stage 2 HTN. Investigations were done as HbA1C, renal function tests including blood urea, urinary creatinine and urinary microalbumin and albumin/creatinine ratio. Glomerular filtration rate (GFR) estimated using Schwartz formula. Early nephropathy is defined as persistent Microalbuminuria ≥30 in 2 out of 3 samples collected over 3 months.

Results: Hypertension detected in14% of our diabetic patients. Early nephropathy detected in 32% of the post-pubertal diabetics. Hypertensive diabetic group had a significantly higher GFR (p=0.035) and Albumin- creatinine ratio (p=0.001) compared to normotensive diabetic group. The post-pubertal group had a higher renal function (Urea, Creatinine, and GFR) compared to the pre-pubertal group, however the difference was not statistically significant. Significant positive correlation between HbA1C and systolic BP and between HbA1c & microalbuminuria (p=0.039 & 0.001).

Conclusions: Early detection of hypertension and early nephropathy with good glycemic control delay the risk of development of DN & ESRD and slows its progression.

eP183 | Diabetic neuropathy in a cohort of young adolescent with type 1 diabetes: A 6 years follow-up

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Introduction: Diabetic neuropathy (DN) is one of the most insidious microvascular complications of type 1 diabetes (T1DM), whose initial signs may already appear in pediatric age.

Objectives: The aim of this study is to evaluate the presence of signs for diabetic neuropathy and to estimate any correlations with the main clinical-metabolic parameters, in a cohort of young adults with T1DM.

Methods: Weight, height, BMI, disease duration, insulin regimen, HbA1c, complications or other pathologies, dietary and physical activity adequacy and number of episodes of hypoglycemia and ketoacidosis in the last 12 months were collected for 6 years in a cohort of 72 teenagers suffering from T1DM. Questionnaires Michigan Neuropathy Screening Instrument (MNSI, for the research of somatic dysfunction), COMPASS 31 (specific for anomalies of the autonomic component) and Clarke (perception of hypoglycemias) were offered 6 years after electroneurography (ENG)

Results: 34 subjects completed all questionnaires. At MNSI, 11.8% show alterations compatible with DN, while at Clarke the percentage of people with reduced hypoglycemia perception reaches 41%. No significant correlation was observed between the main clinical-metabolic parameters and questionnaires. Similarly, no correlation was observed between autonomic response at the ENG and the scores of MNSI and COMPASS 31 at a 6-years interval (P-value 0.57 and 0.86, respectively). A correlation was observed between ENG anomalies and a greater number of hypoglycemic episodes (97-fold increased risk, p= 0.009). Finally, it has been observed that diet improvement (from inadequate up to totally adequate) is associated with an average decrease of 1.94 points in Clarke questionnaire (P=0.04).

Conclusions: The frequency of somatic anomalies in a population of young adults affected by T1DM is 12%, while autonomic reaches 41%. The presence of autonomic anomalies recorded at ENG increases the risk of hypoglycemic episodes after 6 years, although more extensive studies are needed to deepen the connection.

ePoster - 8: Childhood Obesity and Type 2 Diabetes

eP184 | Demographic and glycemic parameters in global populations of younger vs. older youth with T2D randomized in clinical trials of sitagliptin

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Age	Younger (Y) 10-14 years		Older (O) 15-17 years	
Study	Sitagliptin Initial Oral Therapy *n* = 109	Sitagliptin Add-on to Metformin *n* = 98	Sitagliptin Initial Oral Therapy *n* = 81	Sitagliptin Add-on to Metformin *n* = 122
Female	71 (65.1)	69 (70.4)	44 (54.3)	76 (62.3)
Age (yr)				
Mean ± SD	12.7 ± 1.4	12.6 ± 1.3	15.9 ± 0.8	15.9 ± 0.8
Median	13.0	13.0	16.0	16.0
Race				
American Indian	6 (5.5)	3 (3.1)	9 (11.1)	10 (8.2)
Asian	22 (20.2)	41 (41.8)	7 (8.6)	23 (18.9)
Black	5 (4.6)	5 (5.1)	5 (6.2)	5 (4.1)
Multiple	27 (24.8)	15 (15.3)	11 (13.6)	20 (16.4)
Native Hawaiian/ Pacific Islander	0	1 (1.0)	0	1 (0.8)
White	49 (45.0)	33 (33.7)	49 (60.5)	63 (51.6)
Ethnicity				
Hispanic	41 (37.6)	31 (31.6)	30 (37.0)	46 (37.7)
Not Hispanic	64 (58.7)	58 (59.2)	46 (56.8)	70 (57.4)
Unknown	4 (3.7)	9 (9.2)	5 (6.2)	6 (4.9)
Height (cm)				
Mean ± SD	158.9 ± 11.0	157.3 ± 9.1	166.2 ± 11.2	164.2 ± 8.7
Median	159.1	157.6	164.1	164.0
Weight (kg)				
Mean ± SD	77.6 ± 22.0	74.1 ± 22.7	96.1 ± 25.5	86.2 ± 25.7
Median	75.2	67.4	95.3	80.9
BMI (kg/m^2)				
Mean ± SD	30.5 ± 7.2	29.8 ± 8.2	34.6 ± 7.9	31.8 ± 8.3
Median	29.5	27.3	34.7	30.2
BMI Percentile				
Mean ± SD	97.7 ± 3.7	95.7 ± 7.8	96.3 ± 9.4	93.2 ± 14.8
Median	99.3	99.1	99.4	98.5
Insulin Use	14 (12.8)	14 (14.3)	8 (9.9)	19 (15.6)
Duration of T2D (yr)				
Mean ± SD	0.8 ± 1.5	1.6 ± 1.2	0.6 ± 0.9	2.6 ± 1.8
Median	0.3	1.2	0.2	2.4
A1C (%)				
Mean ± SD	7.6 ± 1.1	8.1 ± 1.1	7.4 ± 1.0	7.9 ± 1.1
Median	7.3	8.1	7.2	7.8
<8% n (%)	75 (68.8)	48 (49.0)	55 (67.9)	71 (58.2)
≥8% to <9% n (%)	22 (20.2)	28 (28.6)	18 (22.2)	26 (21.3)
≥9% n (%)	12 (11.0)	22 (22.4)	8 (9.9)	25 (20.5)
FPG (mg/dL)				
Mean ± SD	137.1 ± 42.2	146.6 ± 52.5	140.7 ± 48.1	147.4 ± 47.8
Median	127.0	134.5	125.0	134.0

Values are n (%) except as noted; BMI = body mass index, T2D = type 2 diabetes, FPG = fasting plasma glucose

Introduction: Type 2 diabetes (T2D) in youth generally occurs in mid- to late-puberty. Increased incidence of obesity likely underlies the observed increase in incidence of T2D in younger patients. Three recently completed studies assessing the efficacy and safety of sitagliptin in youth with T2D provided a global population for comparison of the demographic and disease characteristics of younger versus older youth with T2D.

Objectives: To compare the characteristics of younger (Y, 10-14 yrs) vs. older (O, 15-17 yrs) patients (pts) with T2D in global clinical trials of sitagliptin as initial oral therapy (IOT, NCT01485614) or as add-on to metformin therapy (AMT, NCT01472367, NCT01760447).

Methods: Demographic and baseline glycemic parameters were summarized by age group for pts in the studies (Table).

Results: The proportion of females was higher in Y groups and that of Whites greater in O groups. All groups had similar BMI percentiles, despite the Y group being shorter, with lower weight and BMI. Duration of T2D was similar across age groups in the IOT study, but duration was less in Y vs. O in AMT studies. Baseline A1C and FPG were comparable across age groups within a study type.

Conclusions: The female preponderance reported in youth with T2D (e.g. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3038479/) was more apparent in Y groups; it is possible that the proportion of females is lower in O groups, approaching the situation in adults where sex distribution is uniform. Both Y and O pts had similar BMI percentiles. While glycemic parameters were similar across age groups within a study type, duration of diabetes was less in Y pts in AMT studies, suggesting that the need for an additional antihyperglycemic agent may occur sooner in pts diagnosed at a younger age.

eP185 | Relationship of serum total insulin-like growth factor-binding protein-3 with triglyceride to high-density lipoprotein cholesterol ratio and glucose tolerance in Korean children and adolescents

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Introduction: lipid homeostasis is related with glucose metabolism importantly and insulin-like growth factor (IGF)–IGF-binding protein (IGFBP) also plays an important role in lipid homeostasis. However, the IGF-independent role of IGFBP-3 is poorly understood in the lipid metabolism.

Objectives: We investigated the relationships between serum IGF-I/IGFBP-3 levels and degrees of triglyceride to high-density lipoprotein cholesterol (TG/HDL) ratio in Korean children and adolescents who underwent oral glucose tolerance test.

Methods: children and adolescents without known diabetes were checked an oral glucose tolerance test and collected the clinical and laboratory data. Serum IGF-I and total IGFBP-3 levels, TG/HDL ratio, total cholesterol, low-density lipoprotein cholesterol (LDL), AST, ALT, C-peptide levels, homeostasis model assessment of insulin resistance (HOMA-IR) index, and glycated hemoglobin (HbA1c) levels were measured.

Results: Serum TG/HDL ratio and IGF-I/total IGFBP-3 levels were significantly higher in individuals with type 2 diabetes (DM) than in those with normal glucose tolerance (NGT) ($P<0.05$). TG/HDL ratio was not related with age and IGF-I levels and it was correlated with serum IGFBP-3 levels, HbA1c, C-peptide, HOMA-IR and body mass index. However, these relationships were altered in patients with insulin resistance state, especially in those with DM. In the DM group, TG/HDL ratio and total IGFBP-3 levels were positively correlated stronger than no-DM groups. In addition, TG/HDL ratio and total IGFBP-3 levels were positively correlated with total cholesterol and LDL levels but not with age.

Conclusions: TG/HDL ratio, the marker of small dense LDL particles, is related with IGFBP-3, especially in patients with type 2 diabetes. The IGF-I-IGFBP-3 axis, especially IGFBP-3, may play roles in the pathogenesis and metabolic control of lipid metabolism.

eP186 | Quality of sleep in adolescents with type 2 diabetes is related to depressive symptoms but not to sleep duration

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Introduction: Inadequate sleep duration has been associated with hyperglycemia and Type 2 Diabetes (T2D) in adolescents. In adolescents with T2D, less is known about the relationship between objective and subjective measures of sleep and if depression influences perceived restfulness or sleep quality.

Objectives: We examined the association between actigraphy based objective sleep measurements and participants' average ratings of restfulness or their scores on sleep-related Patient-Reported Outcomes Measurement Information System (PROMIS) surveys.

Methods: Adolescents (n=19, 68% female) with T2D, a mean age of 15.5 years (12.4-18.2), and a mean T2D duration of 26 months (2-80) completed 8-item PROMIS sleep related impairment (P-SRI 8a) and 8-item PROMIS sleep disturbance (P-SD 8a) surveys. Daily sleep diaries captured restfulness on a 1-10 Likert scale. Objective sleep measurements were recorded for 14 days using wrist actigraphy. A subset of participants (n=7) completed the Child Depression Inventory (CDI). Data were analyzed using univariate linear regressions and two sample t-tests

Results: Participants reported elevated mean P-SRI (56.9) and P-SD (56.8) T-scores compared to the general adolescent population (50) indicating inadequate sleep quality. Actigraphy estimated total sleep duration, sleep efficiency, and sleep onset latency were not associated with self-reported restfulness rating, P-SRI T-score, or P-SD T-score. Reported average restfulness rating was associated with lower P-SRI (β=-.70, p=.001) and lower P-SD T-scores (β=-.61,

p=.007). Further, CDI score was associated with lower restfulness rating (β=-.86, p=.014) and higher P-SRI T-score (β=.63, p=.004); CDI score was not associated with P-SD T-score (p=.072).

Conclusions: Adolescents with T2D have worse P-SD and P-SRI compared to the general population. Perceived sleep measures were not associated with actigraphy estimated sleep metrics. T2D youth with depressive symptoms may have worse sleep health as indicated by lower restfulness and higher P-SRI.

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eP188 | Demographic and glycemic parameters across global regions in youth with T2D in clinical trials of sitagliptin

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Introduction: The demographic characteristics of youth with type 2 diabetes (T2D) have been well characterized in the US but not globally. Three recently completed global studies assessing the efficacy and safety of sitagliptin provide subpopulations of youth from various geographic regions with T2D for comparison.

Objectives: To compare baseline characteristics of 10-17 yr old patients (pts) with T2D from different regions in clinical trials of

Region Randomized	US or Canada		Latin America		Europe or Middle East		Asia Pacific	
Study	IOT[a] *n* = 26	AMT[b] *n* = 30	IOT *n* = 57	AMT *n* = 60	IOT *n* = 76	AMT *n* = 68	IOT *n* = 23	AMT *n* = 55
Male	8 (30.8)	11 (36.7)	22 (38.6)	24 (40.0)	36 (47.4)	25 (36.8)	8 (34.8)	14 (25.5)
Age (yr)								
Mean ± SD	14.7 ± 1.7	14.9 ± 2.0	13.8 ± 1.8	14.5 ± 1.8	14.2 ± 2.1	15.0 ± 1.5	13.2 ± 2.1	13.4 ± 2.0
Median	15.0	15.0	14.0	15.0	14.5	15.0	13.0	13.0
Race								
American Indian	2 (7.7)	0	13 (22.8)	13 (21.7)	0	0	0	0
Asian	0	1 (3.3)	0	0	0	4 (5.9)	23 (100.0)	55 (100.0)
Black	5 (19.2)	5 (16.7)	2 (3.5)	0	1 (1.3)	3 (4.4)	0	0
Multiple	1 (3.3)	1 (3.3)	37 (64.9)	29 (48.3)	0	4 (5.9)	0	0
Native Hawaiian/ Pacific Islander	0	2 (6.7)	0	0	0	0	0	0
White	18 (69.2)	21 (70.0)	5 (8.8)	18 (30.0)	75 (98.7)	57 (83.8)	0	0
Ethnicity								
Hispanic	13 (50.0)	18 (60.0)	57 (100.0)	59 (98.3)	1 (1.3)	0	0	0
Not Hispanic	13 (50.0)	11 (36.7)	0	0	74 (97.4)	63 (92.6)	23 (100.0)	53 (96.4)
Unknown	0	1 (3.3)	0	1 (1.7)	1 (1.3)	5 (7.4)	0	2 (3.6)
Height (cm)								
Mean ± SD	165.7 ± 11.3	164.8 ± 9.2	158.0 ± 11.5	159.5 ± 9.9	164.9 ± 11.6	164.0 ± 8.9	157.5 ± 10.1	156.9 ± 8.5
Median	164.9	165.7	161.0	159.5	164.6	163.9	158.3	157.4
Weight (kg)								
Mean ± SD	110.8 ± 24.8	95.8 ± 30.5	76.4 ± 19.4	74.6 ± 20.3	87.3 ± 25.2	87.3 ± 27.4	77.4 ± 22.6	71.8 ± 18.1
Median	107.3	84.7	74.5	70.4	81.2	82.7	78.8	66.0
BMI (kg/m²)								
Mean ± SD	40.2 ± 7.7	35.0 ± 9.9	30.4 ± 6.6	28.9 ± 5.4	31.9 ± 7.4	32.4 ± 10.0	30.9 ± 7.4	29.2 ± 6.9
Median	41.8	31.8	29.6	27.5	30.8	30.3	29.6	27.5
BMI Percentile								
Mean ± SD	98.8 ± 1.8	95.3 ± 7.3	96.4 ± 7.0	94.4 ± 9.7	96.9 ± 8.5	92.7 ± 18.3	97.7 ± 3.3	95.4 ± 7.3
Median	99.5	98.5	99.0	98.7	99.6	99.4	99.5	98.5
Insulin Use	1 (3.8)	3 (10.0)	10 (17.5)	10 (16.7)	6 (7.9)	14 (20.6)	1 (4.3)	4 (7.3)
Duration of T2D (yr)								
Mean ± SD	0.3 ± 0.6	2.9 ± 1.9	0.7 ± 1.6	2.2 ± 1.7	0.6 ± 0.9	2.1 ± 1.5	0.8 ± 1.7	1.5 ± 1.6
Median	0.1	2.2	0.3	1.8	0.3	2.1	0.2	1.0
A1C (%)								
Mean ± SD	7.3 ± 0.9	7.8 ± 1.0	7.5 ± 1.0	7.9 ± 1.2	7.5 ± 1.1	8.1 ± 1.0	7.7 ± 1.1	8.1 ± 1.0
Median	7.1	7.8	7.2	7.7	7.2	7.9	7.4	7.9
<8%, n (%)	18 (69.2)	19 (63.3)	41 (71.9)	33 (55.0)	50 (65.8)	36 (52.9)	15 (65.2)	28 (50.9)
≥8% to <9%, n (%)	7 (26.9)	7 (23.3)	12 (21.1)	14 (23.3)	17 (22.4)	18 (26.5)	4 (17.4)	13 (23.6)
≥9%, n (%)	1 (3.8)	4 (13.4)	4 (7.0)	13 (21.7)	9 (11.8)	14 (20.6)	4 (17.4)	14 (25.5)
FPG (mg/dL)								
Mean ± SD	133.0 ± 34.9	139.4 ± 40.8	139.6 ± 54.5	143.7 ± 49.8	142.9 ± 43.6	155.5 ± 58.5	121.9 ± 31.5	142.1 ± 41.6
Median	127.5	131.5	123.0	125.5	130.5	143.5	118.0	137.0

Values are n (%) except as noted; BMI = body mass index, T2D = type 2 diabetes, FPG = fasting plasma glucose
[a]sitagliptin as initial oral therapy
[b]sitagliptin as add-on to metformin therapy

sitagliptin as initial oral therapy (IOT, NCT01485614) or as add-on to metformin therapy (AMT, NCT01472367, NCT01760447).

Methods: Demographic and baseline glycemic parameters of pts randomized in the US or Canada (NA), Latin America (LA), Europe or the Middle East (EM), or Asia Pacific (AP) were summarized by region (Table).

Results: The proportion of males varied by region. While racial and ethnic distributions were generally reflective of region, the proportion of Whites in NA was higher than in other reports (e.g. ncbi.nlm.nih.gov/pmc/articles/PMC3038479). AP pts were youngest. Consistent with age, pts in AP were shorter, with lower weight and BMI across trials; however, median BMI percentile was >98% across regions and trial types. Median A1C and FPG ranged from 7.1-7.4% and 118-130.5 mg/dL (IOT) and 7.7-7.9% and 125.5-143.5 mg/dL (AMT). Despite having the lowest FPG, pts in AP (IOT) had the highest A1C.

Conclusions: Despite regional differences in race, sex, and anthropometrics, pts were uniformly obese. Baseline glycemic parameters by region were generally comparable, although the younger age (all trials) and lower FPG and higher A1C (IOT) in AP pts may reflect a difference in the pathophysiology of T2D, with greater post-meal rather than fasting dysglycemia.

eP189 | Obesity due to topical steroids use: A case report

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Introduction: Background: Several topical corticosteroids are now available in different preparations, concentrations, and potencies. Their adverse effects depend on the duration of usage and potency of corticosteroids, Cushing's syndrome associated with hypothalamic–pituitary–adrenal (HPA) axis suppression is a probable systemic adverse effect caused by improper and prolonged usage of super potent topical corticosteroids.

Objectives: To report a case of obesity due to topical steroids use

Methods: A 9-months-old boy complained of obesity, rounded face with prominent cheek. On physical examination, he had a cushingoid appearance with a moon face. His weight was 8.5kg *(-0.47 SDS)*, *length=63 cm (-3.44 SD)*, BMI=*21.4k kglm2*. Thyroid functions were normal with low cortisol and low ACTH then we discovered that the mother used to apply Dermovate cream (clobetasol propionate 0.05%) which is a potent synthetic steroid on the napkin area for routine care which led to iatrogenic Cushing syndrome and hypothalamic-pituitary-adrenal axis suppression. Sonography of adrenal glands and kidneys was normal.

Results: We advised the mother to stop steroids and instructed her to give a stress dose of steroids if he suffered from any illness

Conclusions: The history of the use of topical steroids should be asked in every infant with obesity and short stature. High potency topical steroids should not be used in children. Lower-potency agents are preferred in infancy, with limited duration and dosage, under-supervision of a physician.

ePoster - 9: Diabetes in Developing Countries and Migrant Populations

eP190 | Improving Type 1 diabetes care in Southeast Asia through government partnership working with Action4Diabetes

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Introduction: There is minimal data of health outcomes for Type 1 Diabetes (T1D) in South-East Asia (SEA) where government funding of insulin and blood glucose monitoring kits either do not exist or is limited. Action4Diabetes (A4D) is a non-government organisation (NGO) initiated in 2016 and supports children and young people (CYP) with T1D in five countries - Laos, Malaysia, Vietnam, Cambodia and Myanmar in the SEA region. A4D is the only UK-registered charity that provides comprehensive partnership programmes with local hospitals through a Memorandum of Understanding (MOU) signed

Table

Country	No. of Type 1 patients (n=383)	*Mean Age in years (range)	HbA1c mmol/mol (%) between 2020-2021
Myanmar	80	11.1 (1,17)	67 (8.3)
Laos	45	13.3 (3, 24)	69 (8.4)
Vietnam	48	9.7 (3,17)	79 (9.4)
Cambodia	181	17.9 (8, 29)	95 (10.8)
Malaysia	29	14.7 (4,26)	82 (9.6)
Summary	**383**	**14.7 (1,29)**	**83 (9.7)**

**this represents the mean age (range) of current active patients recruited to A4D in 2020-2021*

with the governments in Laos, Vietnam and Cambodia which guarantees ongoing supplies of free insulin, blood glucose meter kits, HbA1c tests and hospital emergency funds.

Objectives: The objective is to determine the Hba1c glycaemic outcomes in the five SEA countries (Laos, Malaysia, Vietnam, Cambodia and Myanmar) between 2020-2021 through A4D partnership working with local government hospitals.

Methods: CYP with T1D were recruited to receive medical support from A4D in these five countries. HbA1c were tracked between 2020 to 2021 to ensure effective monitoring of A4D programme. We reviewed with local healthcare professionals the latest HbA1c of 383 CYP with T1D between 2020-2021 who remained active in the A4D programme. The duration of support by A4D for these patients ranged from 3 to 60 months. Patients lost to follow up or had died were excluded

Results: **Conclusions:** The average HbA1c within the five SEA countries were high at 83 mmol/mol (9.7%). In many low-to-middle income countries (LMIC), insufficient infrastructure and lack of universal health coverage are factors that affect T1D outcomes that adversely affect mortality and morbidity. The A4D programmes with local government partnership working to support CYP with T1D from diagnosis to adulthood are the first steps to improving T1D outcomes in SEA .

eP191 | Ability of TyG index as a marker of insulin resistance in Argentinean schoolchildren

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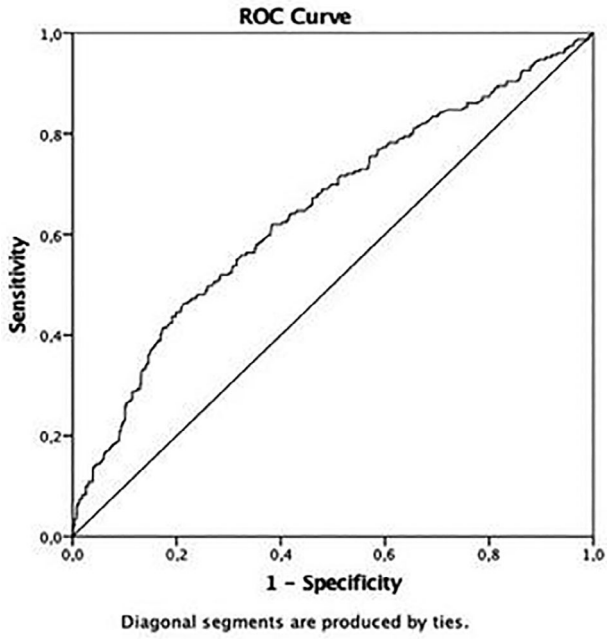
Introduction: The product of fasting triglyceride and glucose (TyG), was used as a marker of insulin resistance (IR). Compared with insulin measures, triglyceride and glucose tests are standardized, cheaper, and available in all laboratories. Therefore, the TyG index could be a more affordable index for IR

Objectives: To determine if the triglycerides and glucose index (TyG) is a marker for insulin resistance (IR) in Argentinean schoolchildren according to age and gender.

Methods: Anthropometric measures, glucose, lipids, and insulin levels were measured. The TyG index was defined by Ln [fasting triglyceride (mg/dL)* fasting glucose (mg/dL)/2). A comparison of the ability of TyG to identify children with IR was performed using receiver operating characteristic (ROC) curves and the area under the ROC (AUROC) curve. IR was defined as HOMA-IR>III quartile.

Results: A total of 915 (528, 57.7% males) apparently healthy schoolchildren, aged 9.3 ± 2.2, were evaluated. The AUROC curves were fair in all groups with low sensitivity and specificity ranging between 0.62 and 0.56. Furthermore, older females had a non-significant AUROC (0.53), suggesting that TyG was not a useful tool for IR in pubertal girls.

Conclusions: The TyG index had a significant and fair AUROC with low sensitivity and specificity to identify IR using the HOMA-IR>III quartile in apparently healthy Argentinean children. Therefore, because of the low sensitivity and specificity of the TyG index, its use for screening purposes seems limited in Argentinean schoolchildren. Further studies using the euglycemic–hyperinsulinemic clamp in apparently healthy children are required.



Table

	AUROC curve (95% IC)	Significance	Cut off	Sensitivity	Specificity
TyG (whole sample)	**0.65 (0.61-0.69)**	<0.01	8.0	0.62	0.62
TyG in Males	**0.69 (0.63-0.74)**	<0.01	8.0	0.62	0.60
TyG in Females	**0.60 (0.54-0.66)**	0.002	7.9	0.60	0.60
TyG in Males <10 years	**0.67 (0.59-0.74)**	<0.01	7.9	0.60	0.61
TyG in Females <10 years	**0.60 (0.51-0.68)**	0.03	7.9	0.60	0.60
TyG in Males >=10 years	**0.70 (0.62-0.79)**	<0.01	8.0	0.57	0.56
TyG in Females >=10 years	0.53 (0.42-0.63)	0.70			

eP192 | Knowledge of diabetes among Congolese children, adolescents and young adults with type 1 diabetes mellitus

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Introduction: Assessment of diabetes knowledge is of great importance. It is a prerequisite for adherence to treatment, which influences glycemic control and therefore optimizes management.

Objectives: To assess the level of knowledge of diabetes among children, adolescents and young adults with type 1 diabetes mellitus in Congo and to identify the determinants of poor knowledge.

Methods: Cross-sectional, descriptive and analytical study of 74 children, adolescents and young adults with type 1 diabetes. The Michigan Diabetes Research and Training Center's Revised Diabetes Knowledge Test was used to assess diabetes knowledge. CSPRO.7 and SPSS 19 software were used for data analysis.

Results: A total of 74 patients were collected, including 30 boys (40.5%) and 44 girls (59.5%), for a Male to Female ratio of 0.7. The mean age was 18 ± 4.1 years with extremes of 9 and 24 years. Overall knowledge was rated as good in 57 cases (77%) and poor in 17 cases (23%). Best levels of good knowledge were noted in exercise and glycemic control. However, diet represented the item with the worst level of knowledge. In all cases, no determinant of the poor level of knowledge was found.

Conclusions: Patients followed for T1DM in Congo have an overall good knowledge of diabetes. Need to intensify and perpetuate appropriate therapeutic education program adapted to patients.

eP193 | To assess the knowledge of Type 1 Diabetes (T1D) among students at the University of Mauritius and University of Reunion

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Introduction: Most of patients with type 1 diabetes attend educational institution in the world. It is a known fact that some of them face integration problems among their peers lack of knowledge on the disease.

Objectives: To assess the level of knowledge on Type 1 Diabetes (T1D) among students at the University of Mauritius and University of Reunion.

Methods: An online questionnaire was used with a randomly selected group of students in the University of Mauritius and University of Reunion. They answered questions about perception pertaining to knowledge of Type 1 Diabetes. The data collected was analyzed on Epi Info TM.

Results: 473 students (208 University of Mauritius) participated in the study. 124 males' students.

Questions pertaining to knowledge of Type 1 Diabetes.	University of Mauritius students (n=208)	University of Reunion students (n= 265)	Difference(%)
Is Type 1 diabetes contagious?			
Yes	6.7%	4.5%	+2.2
No	93.3%	95.5%	-2.2
Do you know someone diagnosed with Type 1 diabetes?			
Yes	54.8%	54.7%	+0.1
No	45.2%	45.3%	-0.1
What causes Type 1 diabetes?			
Lack of physical exercise	5.3%	29.1%	-23.8
Eating too much sugar or sweet foods	39.3%	61.5%	-58.2
The cause is unknown	54.8%	38.1%	+16.7
Who can get Type 1 diabetes?			
Children	34.1%	24.2%	+9.9
Adolescents	25.0%	22.3%	+2.7
Young adults	20.2%	20.0%	+0.2
Adults	6.3%	9.1%	-2.8
Everyone	67.3%	81.1%	-14.4
How is Type 1 diabetes treated?			
No treatment	6.3%	1.9%	+4.4
Oral anti diabetic drugs only	3.4%	4.5%	-1.1
Multiple Daily injections and anti diabetic drugs	40.9%	53.2%	-12.3
Diet only	6.7%	9.8%	-3.1
Physical activity only	4.8%	4.2%	+0.6
For how long will the patient be treated?			
For 24h only	1.4%	0.0%	+1.4
< 6 months	2.4%	1.5%	+0.9
1 year	3.8%	5.3%	-1.5
>1 year	9.6%	6.4%	+3.2
Lifetime	82.7%	86.8%	-4.1
Can Type 1 diabetes be prevented?			
Yes	50.0%	66.0%	-16.0
No	50.0%	34.0%	+16.0
What is the approximate percentage patient having Type 1 diabetes in a diabetic population?			
0-5%	20.2%	1.9%	+18.3
5-10%	26.4%	31.3%	-4.9
10-15%	18.3%	26.8%	-8.5
15-20%	13.5%	23.4%	-9.9

Average age 20.1 years (18-40 years). The table below show the differences in the level of knowledge of Type 1 diabetes in the two universities.

Conclusions: Our study found that despite the national diabetes campaign, participants' level of knowledge about T1D was inadequate. We had the same observations among the two universities. More campaigns must be carried out to improve health-related knowledge among students in order to eliminate misconceptions about T1D.

eP194 | Associated autoimmunity, immunological status and glycemic control in patients with type 1 diabetes mellitus of Eastern Nepal

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Introduction: Type 1 Diabetes Mellitus (T1DM) is an autoimmune disease which occurs as a result of insulitis. Many antibodies have been discovered with commonly five antibodies in frequent use.

Objectives: This study aims to determine the prevalence of autoantibodies namely glutamic acid decarboxylase-65 (GAD-65) and Insulin autoantibody (IAA) in Type 1 DM patients of eastern Nepal and correlate the autoantibodies and vitamin D levels with glycemic control.

Methods: A hospital based cross-sectional study was conducted among 54 patients diagnosed with T1DM attending the B.P. Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal. Convenient sampling was used to recruit the patients. Serum GAD-65 and IAA was estimated using chemiluminescence immunoassay (CLIA). Quantitative variables were expressed as a mean and standard deviation. Pearson's correlation was used to correlate the antibody levels with glycemic status. The level of significance was established as $P < 0.05$.

Results: A total of fifty-four patients (36 Female and 18 male) patients were enrolled. The mean age of the patient was 22.44 ± 9.69 years. GAD-65 positivity was present in 46.29% (n= 25) of the patients and IAA was positive in 54% (n=29) of the patients. Mean Vitamin D level was 15.53 ± 6.78 ng/ml in T1DM patients. Lower Vitamin D was significantly associated with poor glycemic control. Also, the higher autoantibody titers of GAD-65 and IAA was present in Vitamin D deficient T1DM patients.

Conclusions: Our findings shows that there is a high prevalence of autoantibodies in T1DM patients of eastern Nepal (GAD-65= 46.29%; IAA= 54%). There can be the possibility of other organ specific autoantibodies particularly thyroid and adrenal glands positivity in these patients as well. Hence, a regular screening of the possible autoimmune disease in T1DM should be done for better patient care.

eP195 | Barriers, opportunities, and solutions to improve the transition of emerging adults with type 1 diabetes (T1D) between pediatric and adult care settings: A formative qualitative study to inform the design of the first structured transition program in lower resource settings

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Introduction: There is an absence of studies in low-resource settings about patient and clinic-level factors that challenge and facilitate transition between pediatric and adult care providers among emerging adults with type 1 diabetes (T1D).

Objectives: We conducted formative in-depth interviews with stakeholders involved in the transition process across private and public care settings in Delhi, India, to inform the first trial in low-resource settings focused on improving clinical care engagement and self-management outcomes among emerging adults with T1D.

Methods: We performed a rapid qualitative analysis of patient, provider, and administrator interviews (n=38) to identify context-specific organizational and individual-level factors that could influence the implementation and effectiveness of a formal T1D care transition program, as well as to identify stakeholder suggestions for program design elements.

Results: Barriers and facilitators of self-management, care transition and engagement largely reinforced findings of studies published to-date. Proposed context-appropriate solutions included: overlap period during which patients see both pediatric and adult providers; formal age cut-off; transfer of psychosocial and physical health summary; diabetes educator as central transition coordinator and counselor; non-didactic care approach that emphasizes patient honesty and teaches self-management problem-solving amidst school, work, social, and economic pressures; intensive psychological, behavioral, and educational counseling for patients and parents; establishment of gradual diabetes management independence and expectation of transition from diagnosis.

Conclusions: Our synthesis of provider and patient perceived factors that shape T1D self-management and care engagement during transition between pediatric and adult care is a fundamental step in identifying key intervention targets and design components for future trials focused on improving the health of emerging adults with T1D in India and other lower resource contexts.

eP196 | Diabetic nephropathy in children and adolescents with type 1 diabetes during 2017–2019

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Introduction: Type 1 diabetes (T1D) is one of the most common chronic diseases in children, and nephropathy is a serious microvascular complication of T1D, which is associated with high mortality and morbidity.

Objectives: This study aimed to investigate the prevalence of diabetic nephropathy and comorbidities in children with T1D.

Methods: This cross-sectional study was conducted on 208 children (aged 1–18 years old) with T1D referred to the Qazvin endocrinology clinic during 2017–2019. Anthropometric, demographic, laboratory, comorbidities data were collected.

Results: The mean age at diagnosis of diabetes was 7.59, and the mean HbA1c level of the study subjects was 8.68 ± 1.42. Out of 208 diabetic patients, 64 (30.7%) had diabetic nephropathy, of which 53 (25.5%) had microalbuminuria, and 11 (5.3%) had macroalbuminuria. Among the studied diabetic patients, 30 (14.45%) had hypothyroidism, 12 patients (5.8%) had celiac disease, and 14 patients (6.7%) had anemia. Retinopathy was not found in any of the patients. Moreover, variables such as the duration of diabetes, puberty status, mean HbA1c levels, and age were significantly associated with diabetic nephropathy ($p < 0.05$).

Conclusions: The prevalence of microalbuminuria and macroalbuminuria was relatively higher than that in previous studies. Poor metabolic control due to late patient visits or the effect of genetic factors might be possible causes of this inconsistency. Moreover, mean HbA1c levels were significantly higher in patients with macroalbuminuria, which may corroborate the role of metabolic control of diabetes in the development of albuminuria.

eP197 | Epidemiological characteristics and clinical picture of type 1 diabetes during childhood and adolescence in a tertiary health care center in the oriental region of northeastern Morocco-Preliminary results-

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Introduction: The growing pandemic of type 1 diabetes is considered as an enormous multifactorial public health challenge. Many targeted interventions should be provided to improve its management especially during childhood and adolescence.

Objectives: The purpose of this study is to elucidate the epidemiological, clinical and management profile of type 1 diabetes in Moroccan children and adolescents followed up in our department.

Methods: This is a retrospective data analysis of children and adolescents with type 1 diabetes followed up in in the endocrinology department of Oujda's Mohammed VI university hospital.

Results: 112 children and adolescents with type 1 diabetes were involved in the study. The number of patients diagnosed with type 1 diabetes was higher during the cooler months of the year compared to the warmer ones and a positive family history in first-degree relatives was reported in 66%of patients. Diabetes duration was less than 5years in 67,5%of the patients. The overall mean age at diagnosis was 13,45years and the most commonly reported presenting symptoms were polyuria (85%) and polydipsia (82%). Diabetic ketoacidosis at initial presentation was diagnosed in 27%of patients and 45%of cases were admitted for unstable glycaemic control; with an average of initial hemoglobinA1c value of 11%. The classic b-cell autoimmune markers were surveyed in 57%of cases; and 66%were found positive for antiglutamic acid decarboxylase antibodies. All the included patients were screened for co-occurring autoimmune disorders; hypothyroidism was detected in 13%and coeliac disease in 12,5%of cases. Chronic degenerative complications were noticed in 15% of patients. Basal Bolus insulin regimen was adopted in 95,7%and 48,3%of patients were enrolled in flexible insulin therapy training programmes.

Conclusions: Our department offers a personalized healthcare, for each child or adolescent with type 1 diabetes in order to improve metabolic control, decrease the risk of hypoglycemia and enhance the quality of life.

ePoster - 10: Diabetes-Associated Diseases

eP198 | Compliance to a gluten-free diet in children with type 1 diabetes and celiac disease: associations with age, metabolic control and ketoacidosis

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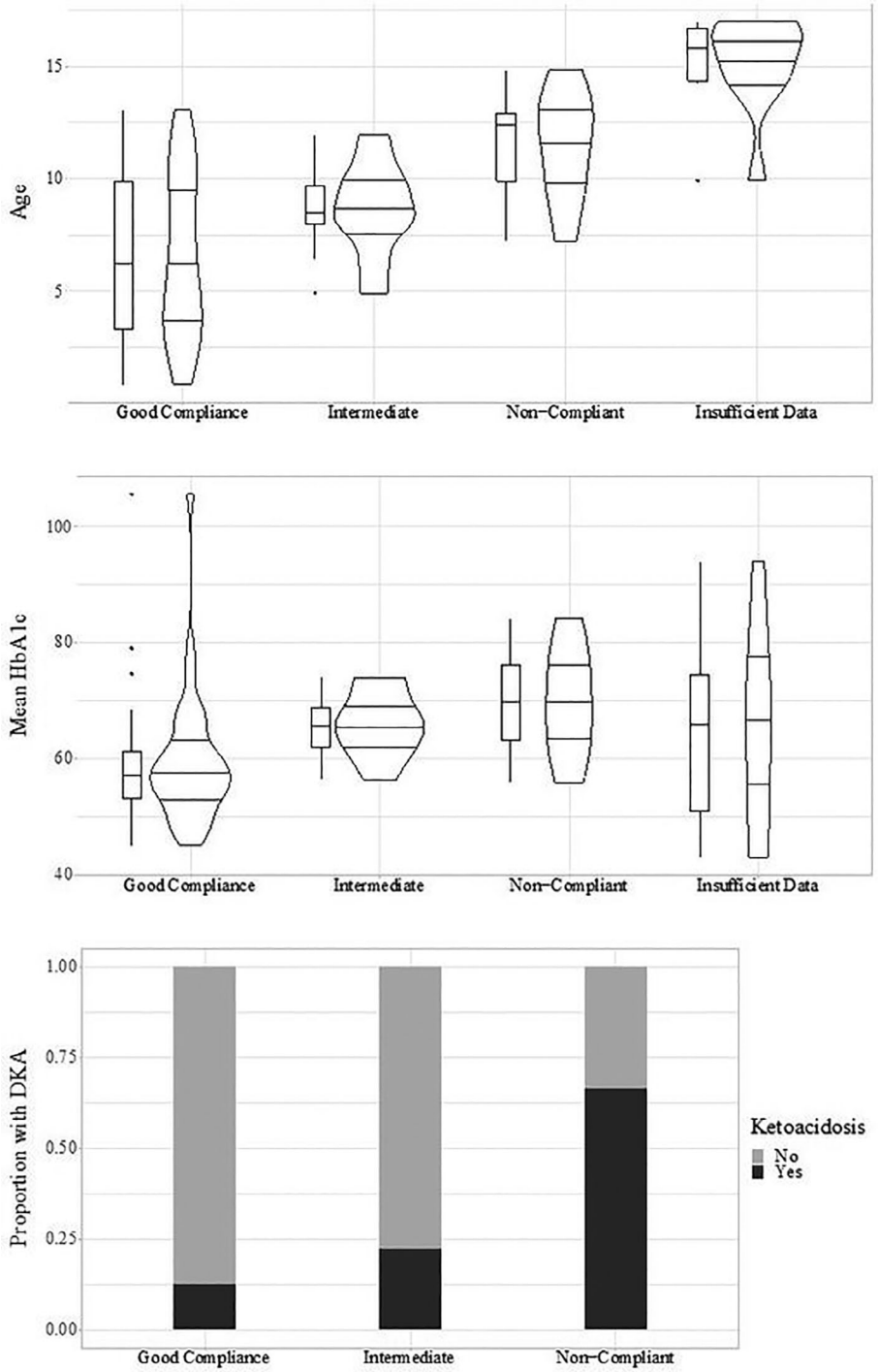
Introduction: Pediatric celiac disease (CD) and type 1 diabetes (T1D) often cooccur but whether compliance to a gluten-free diet (GFD) is affected in T1D and associated with sociodemographic and clinical factors is unclear.

Objectives: The present study examined levels of compliance and associations with age, sex, metabolic control, ketoacidosis, BMI and onset of CD in a representative sample of Swedish children with T1D and CD that were followed for 10 years after their T1D diagnosis.

Methods: Between 2005 and 2012, 743 children in Skåne County, Sweden were diagnosed with T1D. Sixty-four (9%) of these children also received a diagnosis of CD. tTGA was used to study adherence to a GFD and three compliance categories were formed: 1) Good compliance (all tTGA values <10); 2) Intermediate/varying compliance (≥1 tTGA value ≥10); 3) Non-compliance (all tTGA values ≥10). Included patients had ≥3 serological results ≥2 years after their CD diagnosis. Associations between the sociodemographic/clinical factors and compliance were examined using uni- and multivariable ordinal regression models.

Results: Fifty (78%) children with T1D and CD had sufficient data to be analyzed. 68% were classified as having good compliance, 18% as



having intermediate compliance and 14% as being non-compliant. Higher age, poorer HbA1c, and more DKAs were significantly (p=<0.05) associated with poorer compliance whereas BMI or whether CD was diagnosed prior to or after T1D were not.

Conclusions: Compliance to a GFD in children with T1D and CD is generally high. Older age, poorer metabolic control and more DKAs are associated with poorer compliance. Thus older children with CD and T1D is a vulnerable group that could need intensified support.

eP199 | Longitudinal follow-up of asymptomatic adults and children with type 1 diabetes and celiac disease: The CD-LiFE study

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Introduction: Longitudinal changes in asymptomatic celiac disease (CD) and type 1 diabetes (T1D) patients are poorly reported. A 1-year intervention, CD-DIET, measured the impact of standardized dietary counseling over the 1-year period.

Objectives: We wish to evaluate longitudinal data on dietary adherence and diabetes control in T1D and asymptomatic CD patients.

Methods: The Celiac Disease and Diabetes Longitudinal Follow-Up and Evaluation (CD-LiFE) followed a subset of individuals with T1D, screened as part of CD-DIET, to measure the impact of a 1-year standardized dietary counseling on outcomes over 3 years. We assessed 3 groups: 1) participants randomized to a gluten-free diet (GFD), 2) participants randomized to a gluten-containing diet (GCD) who received GFD dietary counseling at the end of CD-DIET and 3) participants who were CD screen-positive but non-randomized (NR), receiving no dietary counseling. After CD-DIET, participants selected their own diet. Dietary adherence was measured using self-reported dietary gluten quantification and serology. Changes in HbA1c were also assessed.

Results: 62 participants were included (GFD=15, GCD=16, NR=31). At baseline, mean age was 29.2±10.8 years, 53.2% female, with a diabetes duration of 17.5±10.0 years. Over 3 years, adherence to a GFD waned in the "GFD" participants from baseline to the end of CD-LiFE (93.3% (n=14) to 63.6% (n=7), P<0.001), increased in the "GCD" group (37.5% (n=6) to 64.3% (n=9), P<0.001) and remained low in NR participants (35.5% (n=11) to 33.3% (n=8), P=0.105). These changes were consistent with dietary gluten intake. While HbA1c levels remained stable for the GFD and GCD arms, there was a significant increase in NR patients from baseline (7.8%±1.7% to 8.6%±1.8%, P=0.009).

Conclusions: GFD adherence was significantly higher in T1D patients receiving dietary counseling. GFD or GCD randomization did not affect HbA1c levels, however, HbA1c worsened in NR participants. These results highlight the importance of dietetic support for patients with CD and T1D.

eP200 | Optimal frequency to screen celiac disease amongst patients with type 1 diabetic mellitus: A multicenter study

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Introduction: Celiac disease (CD) is common amongst patients with type 1 diabetes mellitus (T1DM). Since there is a disagreement on the optimal interval and frequency to perform screening tests for CD among diabetic patients, we, therefore, evaluated these issues amongst patients with T1DM.

Objectives: This study aimed to evaluate optimal frequency to screen celiac disease in patients with T1DM.

Methods: This retrospective cohort study was conducted in seven referral diabetic centers in different cities of Iran from January 2020 to January 2021. Information of 106 patients affected by both T1DM and CD was collected. The time interval between diagnosis of DM and CD, the age at onset of diabetes as well as any associated diseases, symptoms, and familial history of T1DM and CD were recorded and analyzed.

Results: Results show that 45% of the patients with celiac disease were diagnosed in the first year of diabetes onset; furthermore, 18% and 16% of patients with CD, were diagnosed in the second or third year after diabetes onset, respectively. In addition, another 18% of patients with celiac disease were diagnosed during the fourth till the eighth year after diabetes onset. Moreover, there was a negative relationship between the age of T1DM diagnosis and IBCD. Most participants were asymptomatic at the time of CD diagnosis.

Conclusions: Screening tests to detect CD amongst patients with T1DM should continue for at least eight years after the initial T1DM diagnosis, especially those who were affected at a younger age.

eP201 | A case-control study of the skin barrier in pediatric and adult patients with type 1 diabetes

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Introduction: The skin is a crucial barrier against external allergens and irritants. Eczema is a frequent reaction in pediatric patients with type 1 diabetes using insulin pumps and/or glucose sensors. Especially the vulnerability of the outer layer of the skin, epidermis determines the risk of eczema. Patients with for instance atopic dermatitis have been shown to have increased have been transepidermal waterloss (TEWL).

Objectives: The aim of present study is therefore to investigate the skin barrier in patients with type 1 diabetes.

Methods: This study is a case-control study of 45 patients with type 1 diabetes in different age groups (36 in the age of 4–19 years and 9 in the age of 39–75 years) compared with 45 healthy age- and sex-matched controls. For each participant TEWL, pH, sebum content and hydration have been investigated at the skin of both the volar forearm and the upper buttock besides a microbiological investigation of the skin. T-test or Kruskal -Wallis test have been used to determine a possible difference between cases and controls depending on normal or non-normal distributions.

Results: A significant difference between pH values on the forearm were found with a mean in cases of 5.4 and 5.7 in controls ($p = 0.0196$). No other significant differences were found between cases and controls among TEWL, sebum or hydration. The microbiological investigation found bacteria different from normal skin flora in three cases and four controls, gram-negative bacilli was found in one control and two cases.

Conclusions: These introductory data show that the overall skin barrier in patients with type 1 diabetes luckily is not very different from the skin barrier in healthy controls, but further investigations are still warranted.

eP202 | Islet, thyroid and celiac antibodies in newly diagnosed with type 1 diabetes children and adolescents – a single center experience (2019-2021)

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Introduction: Type 1 diabetes (T1D) is autoimmune disease most frequently associated with autoimmune thyroiditis (AIT) and celiac disease (CD).

Objectives: to assess the prevalence of diabetes related autoantibodies (Abs) and their correlation with thyroid thyroperoxidase antibody (anti-TPO) and CD at presentation of in patients with type 1 diabetes between 0 and 18 years of age.

Methods: A total of 68 patients for period of 18 months (January 2019 - June 2021) were tested for pancreatic islet cell antibodies - glutamic acid decarboxylase antibodies (anti-GAD65), tyrosine phosphatase antibodies (anti-IA2), and insulin autoantibody (anti-IAA). All participants were checked for anti-TPO antibody and transglutaminase antibodies (TTG-IgA-Ab, TTG-IgG-Ab) by ELISA. The "cut off" value for CD positivity was TTG IgA-Ab>100 U/ml, and for anti-TPO >34 U/ml.

Results: The mean age of the participants was 9±4.5 y.o., 56% were boys, 64.7% were prepubertal. At the onset of T1D 80.9% were with at least one positive diabetes related autoantibody while 19.1% were with negative Abs. At the time of diagnosis, 10.3% of patients were with 3 positive Abs, 42.6% had 2 Abs and 28% had 1 positive Ab; 70.6% of all patients were positive for anti-GAD65, followed by 50% for anti-IA2, and 17.6% for anti-IAA ($p<0.01$). Weak significant correlation was found between anti-GAD65 and anti-TPO ($r=0.279$, $p=0.021$). Out of all, 10.3% ($n=7$) were positive for anti-TPO, 4 of whom needed hormone replacement therapy. Only one participant had TTG IgA Ab positivity at diagnosis (1.2%). No correlation was found between islet autoantibodies titer and the presence of CD.

Conclusions: In Bulgarian population the incidence of positive anti-TPO and CD at diagnosis of T1D is less than the reported worldwide. Weak significant correlation was found between anti-GAD65 and anti-TPO and none between diabetes related antibodies titers and the presence of CD.

eP203 | Prevalence of the coeliac disease among patients with type 1 diabetes followed up at the endocrine clinic in the Lady Ridgeway Hospital for children Colombo Sri Lanka

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Introduction: Type 1 diabetes and Coeliac disease share common HLA markers and the prevalence of coeliac disease in type 1 diabetes ranges from 0.95-16% in the globe, and in India, it is 9.37%. Screening for coeliac disease in diabetes is a recommended practice, though it is not done in our country due to financial restrictions as the investigations are not available in the state sector. Hence, we conducted a study to find out the prevalence of Coeliac disease in patients with type 1 disease in our country to identify the disease burden.

Objectives: To describe the prevalence of positive coeliac screening in a cohort of patients with type 1 diabetes attending to the Pediatric endocrine clinic at Lady Ridgeway Hospital Colombo Srilanka.

Methods: This is a descriptive cross-sectional study, where the study population was type 1 diabetes patients who were serologically confirmed. Our sample size was 56 patients, aged 1-16 years, comprised of 29 females with 27 male patients from multiple sociocultural backgrounds attending the Endocrinology and diabetes unit, Lady ridgeway Hospital. The subjects were recruited randomly using a random number calculator. The demographic data of the subjects were

collected via a data collection sheet and blood was withdrawn for serum IgA level and tissue transglutaminase Ig A level.

Results: Out of the 56 children, only 2 were found to have positive coeliac screening. Thus, the prevalence was 3.5% in the above group. These children were referred to the gastroenterology team for further care.

Conclusions: The prevalence of the Coeliac disease among children with type 1 Diabetes in Srilanka is relatively low compared to the western population and some of the Asian countries. Further studies are needed to recruit a larger population to decide whether routine screening for coeliac disease is beneficial in our children.

eP204 | Seropositivity for celiac disease in T1DM patients in a multiracial Singapore Clinic

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Introduction: It is believed that celiac disease (CD) and non-celiac gluten sensitivity (NCGS) is rare in Asians but little data exists for Asian T1DM patients.

Objectives: To study the prevalence of CD in T1DM,84 patients (24 Singaporeans) out of 119 with Type 1 Diabetes Mellitus (T1DM) were screened for CD and NCGS at a private paediatric endocrine clinic between 2008-2020. Initially Ttg-IgA & Total IgA were tested, but as many patients had features of CD (eg glycemic variability, recurrent abdominal pain, bloating, muscle & joint pains, poor growth, headaches) but a negative TTg-IgA result, we switched to a panel of 4 tests: Tissue transglutaminase (tTg) IgA, tTg IgG, Deamidated Gliadin Peptides (DGP) IgA and DGP IgG to screen for CD and NCGS in our patients.

Methods: Of the 84 T1DM patients with CD serology data (M 26: F 44, age range 0-14yr; 50, 15-24yr; 11, >25yr; 9), 84 patients were tested for TTg-IgA, while 70 patients had ≥1 set of all 4 tests done. Testing was performed at a single government laboratory (TTSH CIL). Manufacturer's (Euroimmun, Orgentec) cut-offs were used to determine sero-positivity. Improved glycemic control on a gluten free diet confirmed clinical suspicions. Endoscopy was offered for those +ve.

Results: Of 14 with only Ttg-IgA tests done, none were positive
Of 46 patients with Total IgA data.

Conclusions: 1 Seropositivity for TTg-IgA is similar in Caucasians (20%) and Asians (17%) with T1DM

2. Seropositivity for markers of CD/NCGS is higher in Asian (42.2 %) vs Caucasian T1DM patients (20%)

3. Seropositivity for a CD/NCGS marker other than TTg-IgA was more likely for Asians (27%) vs Caucasians (4%).

4. Ttg-IgA should not be used alone for screening celiac disease as it will miss many patients with symptomatic gluten intolerance

eP205 | Neonatal diabetes mellitus with congenital hypothyroidism in a patient with a novel homozygous mutation in *GLIS3*

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Introduction: Mutations in GLI-Similar 3 (*GLIS3*), encoding the transcription factor *GLIS3*, is the reason of neonatal diabetes mellitus (NDM) with congenital hypothyroidism (CH), congenital glaucoma,

Table

	total	Any >1 test positive	Ttg IgA positive	TTg-IgG positive	DGP IgA positive	DGP IgG positive	Any positive except Ttg-IgA
Chinese	29	12(41%)	5 (17%)	6	9	0	7 (24%)
Indian/South Asian	8	4 (50%)	1	2	2	1	3(38%)
Malay/Indonesian	2	0	0	0	0	0	0
All Caucasians*	**25**	**6 (24%)**	**5 (20%)**	**1**	**5**	**2**	**1 (4%)**
All Asians	**45**	**19 (42%)**	**7 (17%)**	**10**	**12**	**1**	**12 (27%)**
Singaporeans	24	9 (38 %)	5 (20%)	3	7	1	4 (17%)
Whole group	70	25	12	11	17	3	13

- none had low Total IgA below the age range,
- 8 were positive for Ttg-IgA but 8 were positive for ≥'1 other marker: 4 Ttg-igG +ve, 5 DGP IgA +ve, 1 DGP IgG +ve
*EU 6 Non-EU 2, UK 6, USA/Canada 11

liver fibrosis and other abnormalities. The disease is called NDH syndrome (neonatal diabetes and hypothyroidism syndrome).

Objectives: The purpose of our research to present a clinical case of permanent NDM in combination with CH in a patient with a novel homozygous mutation in *GLIS3* gene.

Methods: It was used the next-generation sequencing for genetic analysis. The sequencing process was carried out on Ion PGM Sequencer (IonTorrent, LifeTechnologies, USA).

Results: Our patient was born as a result of a closely related couple. The child was born small for gestational age (SGA). Glucosuria, hyperglycemia up to 33,9 mmol/l were revealed on the second day of life. Insulin therapy was initiated at a dosage of 0,015-0,05 U/kg/hour. Neonatal screening on the fifth day showed CH: TSH 124,2 mIU/l, FT4 2,1pmol/l. It was prescribed levothyroxine treatment at a dose of 25 mg/day (15 mg/kg per day). Ultrasound investigation was revealed no pathology. Further observation showed a progressive decrease in growth rates from 10 months of life. Considering the combination of NDM, CH, SGA and closely related couple, it was suspected NDH syndrome. Genetic testing of 5 exon *GLIS3* gene (NM_001042413.2) identified homo(hemi)zygous variant c.1836delT, p.Ser612ArgfsTer33 . The sequence variants were rated according to American College of Medical Genetics and Genomics (ACMG) guidelines. Supporting evidence of pathogenicity (PVS1, PM2, PP4) the identified variant is classified as pathogenic.

Conclusions: This clinical case demonstrates that early genetic verification of NDH syndrome allows timely prescribing personalized treatment and improving the quality of life of patient.

eP206 | Neonatal outcomes in women with gestational diabetes

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Introduction: With the increasing rates of Gestational diabetes, the risks of adverse neonatal outcomes is also increasing.

Objectives: To study the occurrence of various outcomes amongst neonates born to women with gestational diabetes.

Methods: This was a prospective cohort study conducted at a government teaching hospital in India. All neonates (n=154) born to women with gestational diabetes diagnosed as per the American Diabetes Association Standards of Care 2021 were included in the study. Outcomes measured were gestational maturity, birth weight, congenital anomalies, hypoglycaemia, hypocalcemia, hyperbilirubinemia and neonatal ICU admissions.

Results: Twenty eight (18.1%) neonates were born preterm, 2 post term and 125 were born at term (81.1%). Hundred and six neonates were born appropriate for gestational age and 25 (16.2%) were born small for gestational age. Congenital anomalies were detected in 14 neonates with cardiac defects (n=5) being the most common. Hypoglycaemia was observed in 12 neonates (3 pre-term and 1 post term) – this was independent of the treatment with insulin or metformin. Hypocalcemia was observed in 18 (11.7%) neonates and hyperbilirubinemia in 29 (18.9%). Hyperbilirubinemia was seen mainly in neonates whose mothers were treated with metformin irrespective of insulin background. Forty Four (28.6%) required neonatal ICU admission for management of metabolic derangements. There were no differences in outcomes based on the gender.

Conclusions: Metabolic derangements requiring neonatal ICU admissions are common in neonates born to women with gestational diabetes.

ePoster - 11: Exercise

eP207 | Exercise management for young people living with type 1 diabetes in Mauritius

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Introduction: T1Diams, a non-profit organisation (NPO), committed to deliver Therapeutic Education (TE) for self-management of Type 1 Diabetes (T1D) Republic of Mauritius (Indian Ocean). Youth living with T1D benefit from regular physical activity (PA). However, PA restriction is often a result of challenges in blood glucose monitoring.

Objectives: Health literacy among youth living with T1D on how carbohydrate (CHO) intake before and during event; combined with basal insulin reduction prior to a moderate- intensity PA, help prevent hypoglycemia.

Methods: 21 adolescents and young adults of both genders (12 Male & 9 Female) with the following mean: age 19.6 years, HbA_{1c} (8.6 ± 1.6) %, BMI (22.2 ± 3.7) Kgm^{-2} and total daily insulin dose (1.03 ± 0.42) IU/Kg, were included in the study. There was a 20% reduction in basal insulin prior to the exercise. The hiking trail of 12.4 km was covered over 4 hours.

Blood glucose monitoring and CHO was provided hourly in the form of both low and high glycemic index snacks. TE on the importance of CHO intake during PA was imparted. On day before event, information was given on the need for basal insulin reduction.

Results: Mean CHO intake over the 4 hours was (61.0 ± 15.6) g which represents (0.25 ± 0.08) g/kg/h. The average blood glucose of the participants calculated was (6.8 ± 2.2) mmol/L. 85.7% of the participants (n=18) had an average blood glucose between 4.4 to 13 mmol/L, suitable to perform PA. On 107 GR recorded, 11.2% (n=12) were <4.4 mmol/L and no severe hypoglycemia occurred

Conclusions: The results is in line with ISPAD 2018 guidelines: CHO intake of 0.2 to 0. 5 g/kg/h and a 20% reduction in basal insulin contribute to maintaining adequate blood glucose level during moderate intensity exercise. Therapeutic Education through supported activities; about CHO intake and insulin adjustment greatly encourage people living with T1D to practice PA with less fear and apprehension about exercise-induced hypoglycemia.

eP208 | **Hypoglycemia is the most common problem among athletes with diabetes: a cross-sectional online survey of the international diabetes athletes association**

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Introduction: Managing diabetes in context with physical activity can be challenging for people with diabetes. Recent guidelines provide strategies for therapy adjustments to avoid hypoglycemia during and after sports.
Objectives: This survey assessed lived experiences of people with diabetes-related to physical activity and their perceived challenges.
Methods: We conducted a cross-sectional online survey amongst people with diabetes and caregivers of children and adolescents with diabetes (type 1, 2, other) during an online event, assessing information on exercise type and training, current diabetes management strategies related to physical activity, positive and negative experiences, perceived challenges and utilized resources, as well as wishes for improved support.
Results: Of the 65 participants aged 34.1 ± 15.3 years, 98% had type 1 diabetes, 48% were female, 43% take part in contests and trained on average 5.4 hours per week. Their self-reported fitness level was 6.1/10. Of them, 88% increase their carb intake and/or adapt their insulin dose to physical activity. 28% reported being significantly impaired by their diabetes during training and contests. Hypoglycemia during or after physical activity and estimating the right therapy adjustments were the most frequently reported challenges. The use of diabetes technology, peer-support, and sports-specific diabetes coaching programs were suggested to further improve current management strategies.
Conclusions: Maintaining glycemic levels, pre-planning, and therapy adjustments related to physical activity pose challenges to people with diabetes of various age groups. In particular, hypoglycemia during and after exercise is a significant safety risk. People with diabetes, especially professional athletes, may benefit from personalized support from peers and/or medical experts, better data and technology utilization to improve management strategies.

ePoster - 12: Genetics, Immunology and the Environment

eP209 | **Prevalence of islets autoantibodies in diabetic patients diagnosed before age of 30 years in Thailand**

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Introduction: Young-onset diabetes is a heterogeneous disease comprised of, but not exclusively to type 1 diabetes (T1D). Since autoantibodies to islets antigens are the hallmark of T1D, measurement is a valuable tool for differentiating T1D from other diabetic subtypes. Currently, there is no information on the prevalence of antibodies in diabetics diagnosed before age 30 years in Thailand.
Objectives: To determine the prevalence of islet autoantibodies in diabetic patients diagnosed before age 30 years in Thailand.
Methods: Diabetic patients diagnosed before age 30 years were enrolled from 53 hospitals nationwide. Age, gender, duration of diabetes, history of diabetic ketoacidosis (DKA), and clinical diagnosis of diabetes subtypes were recorded. Variables assessed included BMI, blood pressure, fasting plasma glucose, HbA1c, fasting C-peptide, creatinine, and lipid profiles were measured. Autoantibodies against GAD65A, IA-2A, and ZnT8 were assessed using the ELISA technique.
Results: A clinical diagnosis of 479 diabetic patients included T1D (67%), T2D cases (19%), maturity-onset diabetes of young (MODY) (5.6%), and unspecified types of diabetes (7.1%). The mean age at diagnosis of T1D was 13±7.8 years, T2D was 18.2±6 years, MODY was 8.2±7.8 years, and unspecified diabetes was 16.8 years ± 8.8. There were significant differences in age at diagnosis, duration, BMI, SBP, triglyceride, HDL ($P<0.05$) among these groups of diabetes. Patients with the clinical diagnosis of T1D developed more DKA than other types of diabetes. Fasting C-peptide levels were a significant difference between diabetes types ($P<0.01$). GAD65A, IA-2A, and ZnT8A were positive in 62.9% of clinical diagnoses of T1D, 3.1% in clinical diagnosis of T2D, and 20.6% of unspecified diabetes cases. None of the MODY cases had tested positive for these autoantibodies.
Conclusions: Measurements of islets autoantibodies were helpful in the classification of diabetes subtypes in patients diagnosed with diabetes before age 30 years in Thailand.

ePoster - 13: Monogenic and other forms of diabetes

eP210 | **MODY mutations in early-onset T1D patients – Overlapping phenotypes?**

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Introduction: MODY prevalence in pediatric diabetes populations is variable. Many cases are misdiagnosed as type 1 (T1D) or type

Table 1: EOT1D with deleterious mutations in MODY genes

Patients	Sex	Familiar history of DM	At diagnosis					Current TIDD (units/kg)	MODY gene
			Age (y)	Presentation	HbA1c (%)	C-peptide	Auto-antibodies		
1	M	No	2,8	Hyperglicemia	8,3	<0,1	IA2	0,8	HNF1B
2	F	Yes	3,2	DKA	7,7	0,5	No	0,9	HNF1A
3	M	Yes	5,7	Hyperglicemia	8,4	0,2	No	1	HNF1B
4	M	No	1,9	DKA	10,4	<0,1	GAD	0,6	HNF4A, GATA6

EOT1D patients harboring *in silico* predicted deleterious MODY mutations had T1D risk HLA II haplotypes (at least one DR3 or DR4 haplotype) as well as a T1D-GRS within the range displayed by the other EOT1D patients in our cohort.

2 diabetes. Moreover, diabetes types are not mutually exclusive, and it is not yet clear how they interact towards the clinical phenotype.

Objectives: To evaluate the presence of mutations in known MODY genes in a selected cohort of early onset T1D children (≤5Y, EOT1D) and to determine the genotype–phenotype associations.

Methods: This cohort is included in a study on the genetics of EOT1D versus later onset (≥8Y). DNA samples were processed for high resolution HLA II haplotyping and Single Nucleotide Polymorphisms (SNP) genotyping. T1D-Genetic Risk Score (T1D-GRS) was calculated using 36 non-HLA SNPs associated with T1D.

Results: Among EOT1D children (N=102), 12 patients (11,8%) had mutations in MODY genes. *In silico* evaluation of pathogenicity using 5 prediction tools was conclusive for the presence of likely deleterious mutations in HNF1A (n=1), HNF1B (n=2), HNF4A (n=1) and GATA6 (n=1) genes, in 4 of these patients (table 1). Other mutations were located in CEL (n=3), PDX1 (n=3) and INS (n=1) genes.

Conclusions: This study shows that *in silico* predicted deleterious mutations in MODY genes can be found in children with EOT1D, suggesting an overlap of diabetes subtypes and beta cell dysfunction mechanisms. MODY screening may be considered in children ≤5 years old with T1D phenotype, independently of auto-antibodies status. Accurate diagnosis of diabetes in young children allows for better understanding of disease pathophysiology and for implementation of specific interventions, representing an opportunity to apply precision-medicine approaches.

eP211 | The potential role of intermittent continuous glucose monitoring in a successful outpatient transition from insulin to glibenclamide in a patient with transient neonatal diabetes in the context of the COVID-19 pandemic

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Introduction: Neonatal diabetes mellitus (NDM) is a rare monogenic form of diabetes occurring mainly in the first 6 months of life. Approximately 30% of transient NDM cases have an activating mutation in the K_{ATP} channel genes *ABCC8* and *KCNJ11*. The majority of transfers from insulin to sulfonylureas in patients with *KCNJ11* mutations are done inside the hospital.

Objectives: To report a case of transient neonatal diabetes mellitus (TNDM) where precision medicine, defining treatment based on molecular diagnosis and technology (intermittent continuous glucose monitoring – iCGM) allowed to make treatment adjustments with the patient safely at home, in times of COVID-19 pandemic.

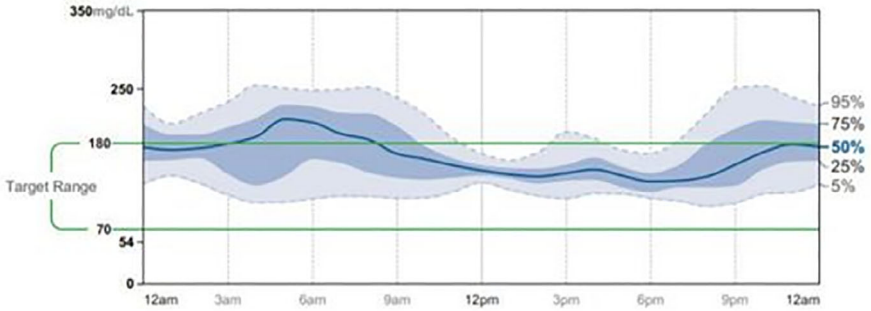
Methods: Case report of a patient with TNDM in use of iCGM.

Results: A boy with transient NDM due to the p.E227K mutation in the *KCNJ11* gene. Diabetes remitted at 30 months and relapsed at 6 years of age. Insulin was initiated and soon transition to glibenclamide was proposed with the use of iCGM, which allowed the patient to safely stay at home during the transition, especially important in the context of the COVID-19 pandemic. The data was uploaded to an online platform that allowed the medical team to perform remote daily checks on glucose levels and suggest treatment changes. During insulin therapy, the device's 14-day analysis revealed a glucose management index (GMI) of 7,2% and 72% of time in range (TIR). Patient's glucose profile improved rapidly after SU was initiated so that insulin therapy was discontinued. After four months of SU treatment, GMI was 6,2% with 93% of TIR (Figure 1).

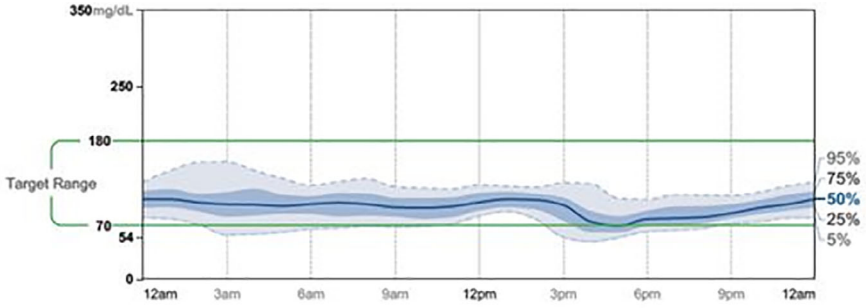
Conclusions: NDM is a model of a genetic disease that can benefit from precision medicine, where treatment is defined after molecular diagnosis, and that iCGM is a valuable tool that should be considered to monitor glucose, increase safety and speed up dose adjustments in outpatient transition from insulin to glibenclamide. As far as we understand the use of iCGM was not reported in this situation previously.

Figure 1: AGP reports during insulin treatment and transition to SU.

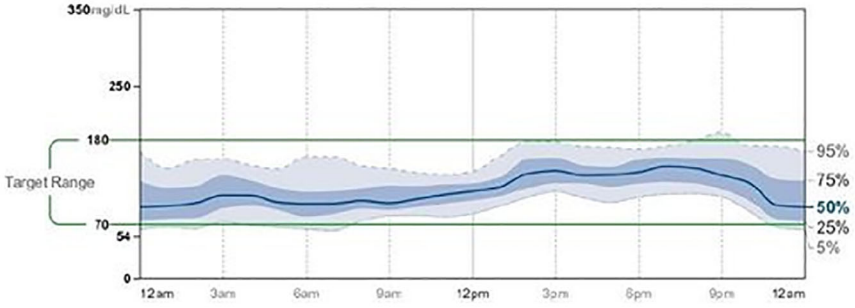
A) Two-week iCGM report using insulin. Time in ranges: 2% very high, 26% high, 72% target range, 0% low or very low.



B) AGP report representing initial SU titration phase. Time in ranges: 0% very high or high, 87% target range, 11% low and 2% very low.



C) After 4 months of SU treatment. Time in ranges: 0% very high, 3% high, 93% target range, 4% low and 0% very low.



eP212 | **Liraglutide use in Kearns-Sayre syndrome**

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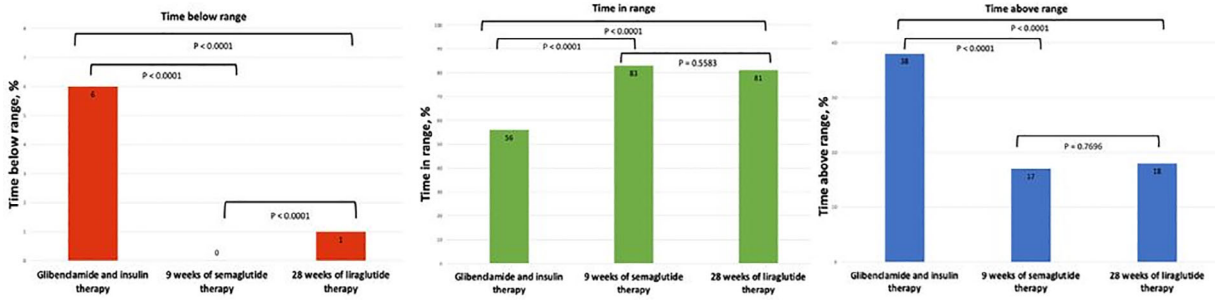
Introduction: Kearns-Sayre syndrome (KS) is a mitochondrial disease due to a DNA gene deletion affecting the oxidative phosphorylation pathway. Existing literature on glucagon-like peptide-1 receptor agonists (GLP-1RA) treatment of mitochondrial disease-related diabetes prompted us to start therapy with a GLP-1RA in a 19-year-old female with KS.

Objectives: To assess safety, tolerability and efficacy of GLP-1RA in KS.

Methods: After gradual suspension of daily glibenclamide (15 mg) and insulin glargine (8 units), informed consent was obtained and treatment with once-weekly semaglutide was started. Four weeks into semaglutide therapy, the patient presented significant gastrointestinal symptoms (nausea, vomiting, weight loss). Treatment was switched to liraglutide (LG) (max. dose of 1.8 mg/day). Glucometrics were recorded using Tidepool diabetes management software. Pearson's Chi-squared test was used to compare data at each time point.



Results: LG treatment was well tolerated. No gastrointestinal symptoms occurred. In addition, no alterations in the patient's weight, pancreatic enzymes, calcitonin, or thyroid hormones were recorded. Treatment shift to semaglutide showed significantly improved glucometrics which were maintained on liraglutide. See Figure 1 for glucometrics.

Conclusions: Our preliminary data show that GLP-1RA may be used effectively and safely for mitochondrial diabetes such as in KS. Glucometrics from baseline showed statistically significant improvement. The latter may be due to both improved beta-cell function and incretin effects on mitochondrial function and ER stress. This, to our knowledge, is the first patient with KS patient treated with LG showing optimal tolerance and significantly improved diabetes management. Further studies are warranted to assess improvement in both diabetes and neurodegenerative-related symptoms.

eP213 | Successful transition to sulphonylurea therapy in infant with DEND syndrome due to F132L *ABCC8* mutation

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Introduction: To our knowledge, only some cases of DEND syndrome due to *ABCC8* mutations are sulphonylurea-responsive

Objectives: we present a patient with DEND syndrome due to F132L mutation in *ABCC8* gene who was successfully switched from insulin to glibenclamide. Interestingly, two previously reported cases with identical mutation failed to respond to sulphonylurea treatment.

Methods: NGS with custom Ion Ampliseq ™ "Diabetes Mellitus" panel (28 genes) was used for molecular genetic analysis. NGS result was confirmed by Sanger sequencing.

Results: A 3-month-old boy was admitted to the hospital due to the failure to thrive, hyperglycemia, convulsions and developmental delay. DEND syndrome was diagnosed and insulin therapy was started.

At the age of 5 months the child was referred to our hospital because of poor glycemic control and ongoing seizures, unresponsive to increasing doses of anti-epileptic drugs.

Molecular genetic analysis revealed a heterozygous c.394T>C p. F132L mutation in exon 3 of *ABBC8* gene (NM_000352). Both parents were negative for this mutation.

The patient was started on oral glibenclamide six times a day with daily dose of 0.1 mg/kg. Gradually over a week the dose was increased to 0.4 mg/kg/day. Along with the increase in glibenclamide dose the insulin dose was gradually reduced and in 7 days insulin was discontinued.

Scheduled re-evaluations at 1,2 and 4 years showed improvement in glycemic control (HbA1c was 5,3-5,8%) without side effects. The glibenclamide dose remained unchanged (0,4 mg/kg/day).

Conclusions: our case showed improvement in glycemic profile when using glibenclamide monotherapy in a patient with F132L *ABBC8* mutation that was considered to be unresponsive to sulphonylurea treatment. These results highlight a need for establishing the diagnosis early to allow prompt initiation of therapy. They also may indicate that functional *in vitro* studies not always predict individual response to glibenclamide in patients with neonatal diabetes mellitus due to K_{ATP} channel mutations.

eP214 | Diabetes mellitus (dm) targeted panel exome sequencings in Korean children with suspected monogenic diabetes mellitus: A pilot study of a single center

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Introduction: Gene related to maturity onset of diabetes of the young (MODY) is hardly found in Asian people and there is a shortage of studies on MODY and monogenic DM (MDM). Previously, we have reported on the results of targeted panel sequencing to investigate mutation in possible MDM and MODY in Korean children and adolescents, and this study reports on further results and progress.

Objectives: This study, we used targeted panel sequencing to investigate pathogenic variants in Korean children and adolescents with DM with family history of DM.

Methods: We analyzed monogenic diabetes genes using targeted panel sequencing.

Results: Among the 39 patients with suspected monogenic diabetes, 18patients (46%) harbored mutations. Maturity-onset diabetes of the young (MODY) genes were identified in PAX4, RFX6, BLK and CEL, WFS1, ABCC8, HNF4A, SLC2A2, GLIS3. Among them, 15 positive patients using insulin compared to 17 negative patients using insulin, the dose of insulin per weight (and the HbA1c showed no significant difference compared to the time of diagnosis.

Conclusions: Using targeted panel sequencing, we were able to make molecular genetic diagnoses for 18 patients (46 %) with suspected monogenic diabetes. And then The follow-up study of these patients with insulin treatment, It could be confirmed that insulin treatment is constantly required in children with monogenic DM.

eP215 | The first report on MODY testing in children in Croatia

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Introduction: Maturity onset diabetes of the young (MODY) is a heterogeneous group of autosomal dominant disorders that result in β-cell dysfunction. It is often misdiagnosed as type 1 or type 2 diabetes. MODY-GCK is the most frequent form in children, followed by MODY resulting from HNF1A, HNF4A, and HNF1B gene mutations. Molecular diagnosis is essential because it leads to optimal treatment and follow-up, frequently allowing cessation of therapy in children and often correction of diagnosis and treatment in their parents.

Objectives: Molecular genetic testing for the four most frequent MODY types (GCK, HNF1A, HNF4A, and HNF1B) was introduced in Croatia in 2017. We present the first Croatian results of MODY testing in children.

Methods: Children presenting with fasting hyperglycemia, impaired glucose tolerance or overt diabetes, with measurable C-peptide levels and negative GAD and IA-2 antibodies, and preferably with a positive family history of hyperglycemia or diabetes were eligible for the genetic analysis. The *GCK*, *HNF1A*, *HNF4A*, and *HNF1B* genes were analyzed by Sanger sequencing.

Results: Eighty-five children were referred to MODY testing (median age 14 years (95%CI 12-15 years; 61% M); 65 were tested for MODY-GCK (37 positives, 56,9%); 24 for HNF1A (6 positives, 25.0%); 9 for HNF4A and 2 for HNF1B (no positive results). We identified 17 different mutations in the *GCK* gene, the most common being p.Thr228Met in exon 7. We have detected two novel variants (c.736G>C, pGly246Arg, c.982G>T, p.Gly328*) in GCK and one (c.66delC, p.Ser22Arg*9) in the HNF1A gene, that we presumed to be pathogenic according to clinical presentation. Upon confirmation of MODY-GCK, therapy was discontinued in nine patients.

Conclusions: In agreement with the literature, MODY-GCK was the predominant form of MODY in our children. The molecular diagnosis led to correction of therapy and follow-up regiment in children and suggested correction of diagnosis and therapy in their affected parent.

eP216 | An unusual presentation of monogenetic diabetes mellitus in Turner syndrome

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Introduction: Turner syndrome (TS) is a chromosomal disorder due to a total or partial absence of the X chromosome in germinal and somatic cell lines. Girls with Turner syndrome are at increased risk of both type 1 and type 2 diabetes mellitus (DM). In contrast, there have been no previous reports of monogenic diabetes associated with TS.

Objectives: We describe a 12 year girl with an unusual diagnosis of TS and monogenic diabetes.

Methods: Clinical Case: A 12-year-old girl presented with recurrent vaginal candidiasis and was diagnosed with DM based on an elevated random blood glucose and HbAlc. She was lean with a normal BMI of 20.8 kg/m^2 and had no features of insulin resistance. She was negative for anti-islet cell and anti-glutamic acid decarboxylase antibodies. She was short and pre-pubertal. Investigations showed hypergonadotropic hypogonadism and chromosomal karyotyping confirmed the diagnosis of mosaic Turner syndrome. She was started on insulin and was weaned off after 6 months with excellent glycemic control on dietary modifications alone. Genetic testing identified a novel variant in exon 8 of HNF4A gene, confirming the diagnosis of MODY 1.

Results: Discussion: There are postulates for the increased incidence of T1 DM in TS, including transcriptional silencing of genes in the X chromosome during embryonic development, leading to abnormal thymic deletion of autoreactive T-lymphocytes, with impaired immune recognition and tolerance. TS patients are also at increased risk of insulin resistance and T2 DM due to the negative role of haploinsufficiency of the genes on the Xp chromosome. In contrast, monogenic diabetes in TS has not been reported previously, as genetic testing is not routinely available and is likely to remain underdiagnosed.

Conclusions: Monogenic diabetes should be considered as a differential diagnosis in TS children who do not have obesity, insulin resistance and are negative for beta cell autoimmunity. It is important to screen for this as it has a significant impact on treatment and prognosis.

eP217 | Early remission of 6q24-related transient neonatal diabetes with sulfonylurea use: A case report

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Introduction: Transient neonatal diabetes (TNDM) is a rare genetic form of diabetes that is typically diagnosed within the first six months of life, resolves by 18 months, and often relapses later in life. Patients are traditionally treated with insulin. Those with select genetic mutations (specifically KCNJ11 or ABCC8 mutations) may be responsive to sulfonylureas (SU). SU have more recently been shown to be effective in treating 6q24-Related TNDM although these studies are limited. We present the case of an infant with 6q24-Related TNDM who went into remission after glyburide treatment.

Objectives: n/a

Methods: A female infant born at 35w3d via induced vaginal delivery due to poor fetal growth presented with hyperglycemia on DOL1. She was persistently hyperglycemic and was noted to have an inappropriately low insulin level. She was started on Novolog U10 insulin corrections on DOL5. Lantus was added on DOL13 for long-acting coverage with good effect. Genetic testing was sent due to suspicion for neonatal diabetes and showed 6q24-related transient neonatal diabetes due to paternal isodisomy of chromosome 6. She continued to have persistent hyperglycemia with transient episodes of hypoglycemia following insulin administration despite close titration of her insulin regimen. On DOL22 she was started on glyburide 0.2mg/kg/day and showed improvement in BG levels despite cessation of long-acting insulin. Glyburide was discontinued on DOL 30 due to hypoglycemia. She was discharged on DOL33 with no treatment. At follow-up at 7 weeks of age she was not requiring any treatment and was gaining weight appropriately.

Results: n/a

Conclusions: We present the case of a neonate with 6q24-related TNDM who underwent an eight day course of treatment with oral glyburide. To our knowledge, this is the shortest reported course of SU treatment required to achieve remission of TNDM. This adds to the growing evidence that SU are effective at treating 6q24-related TNDM and suggests a benefit to early SU initiation in these patients.

eP218 | Unwarranted delayed diagnosis of Wolfram syndrome

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Introduction: Monogenic diabetes is a rare type of diabetes caused by single gene mutation. It encompasses several conditions including Wolfram syndrome, which can be misdiagnosed as type 1 or type 2 diabetes.

Objectives: We present a case of Wolfram syndrome which was misdiagnosed initially as type 1 diabetes, to increase awareness of physicians of this type of diabetes for early accurate diagnosis and hence early appropriate management and family counseling.

Methods: A 12 year-old-female patient presented to our clinic as case of "Type 1 diabetes" since age 11 years and on insulin treatment. Thorough history revealed complaint of poor vision. Ophthalmic consultation showed bilateral optic atrophy. Glutamic acid decarboxylase antibodies, insulin autoantibodies and insulinoma-associated-2 autoantibodies were negative. She was suspected to have Wolfram syndrome.

Results: Genetic testing showed mutation in WFS1 gene confirming diagnosis of Wolfram syndrome type 1. Wolfram syndrome is an autosomal recessive condition of childhood-onset diabetes mellitus and progressive optic atrophy, in addition to other manifestations with variable frequencies including diabetes insipidus and deafness. Screening for associated systemic manifestations of this syndrome was done which showed no current disorders, and planned for periodic screening.

Conclusions: Careful evaluation of children and adolescents presented with diabetes is extremely important by taking full history, physical exam and laboratory tests to reach early accurate diagnosis and subsequently starting appropriate early management and proper family counseling.

eP219 | A novel heterozygous mutation in the insulin receptor gene in a boy with metabolic syndrome and diabetes onset: a case report

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Introduction: A 15-year-old boy was admitted to the Pediatric Emergency Room for recurrent presyncopes associated with vertigo and abdominal pain. Family history was positive for Type 2 Diabetes Mellitus, hypercholesterolemia and cardiovascular disease with early-onset.

Objectives: Initial laboratory investigations revealed elevated fasting glucose level (260 mg/dL) without ketoacidosis and HbA1c 11%, diagnostic for diabetes mellitus.

Methods: BMI was 23.6 kg/m2 (+0.65 DS) with centripetal fat distribution, waist circumference 96 cm, blood pressure 131/70 mmHg (systolic >95° percentile). First choice treatment was insulin (0.5 units/kg) with rapid improvement of glycemic control. Laboratory assessment performed during the follow-up showed negativity of Type 1 Diabetes Mellitus (T1DM) antibodies (ZnT8, GAD, IA2 and anti-Insulin), non-predisposing HLA, normal C-peptide level, permitted to exclude T1DM diagnosis.

Blood test also revealed high level of low-density lipoprotein (LDL) and, therefore, he started a 6-month trial of intensive lifestyle modification, focused on physical activity and specific dietary recommendation, together with the plant stanols/sterol intake. Genetic analysis, conducted for suspected familial hypercholesterolemia, showed a heterozygous mutation (c.894G>A, p.Gln298), with paternal inheritance, in the Lipa A gene (LIPA).

Due to persistently elevated blood pressure, he underwent assessments to exclude secondary hypertension (negative) and started treatment with Ramipril 2.5 mg once daily.

Results: Through the findings of clinical and laboratory examinations, type A insulin resistance syndrome was considered and INSR mutation analyses were planned: a novel heterozygous mutation (c.1483+5G>A), with maternal inheritance, was detected in the intron 7.

Conclusions: Metformin therapy was started while insulin was gradually discontinued and the boy's glycemic control remain optimal (HbA1c 6.8%).

eP220 | Mutation in the INS gene in boy with diabetes mellitus

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Introduction: The insulin gene (*INS*) encodes preproinsulin that is posttranslationally modified to insulin in the pancreatic beta cells. Homozygous and heterozygous mutations in the INS gene are a cause of neonatal diabetes mellitus. MODY is rarely caused by heterozygous mutations in the INS gene.

Objectives: To describe a case of diabetes mellitus caused by a mutation in the INS gene

Methods: Mutation in the INS gene was detected by genetic testing (NGS)

Results: The proband was diagnosed with asymptomatic hyperglycemia at age 7 years (glycaemia 10.2 mmol/l, HbA1c 7.6%, BMI 15.8 kg/m2). Pancreatic autoantibodies GAD, IA2 and ICA were negative. Glycaemia (oral glucose tolerance test): 0 min - 6.5 mmol/l, 60 min - 12.6 mmol/l, 120 min - 10.3 mmol/l. Insulin, C-peptide were preserved. The fasting insulin level - 3.23 U/l, 60 min - 13.4 U/l, 120 min - 12.5 U/l. The basal level of C-peptide was 0.7 ng/ml, 60 min - 13.4 ng/ml, 120 min - 2.5 ng/ml. HOMA 0.92. SU was prescribed. HbA1c 6.3% -7.6%. At the age of 12 (diabetes duration 5 years) because of a deterioration in carbohydrate metabolism (HbA1c - 8.5%, hyperglycemia - 21.9 mmol/l), SU therapy was stopped, insulin was prescribed (0.5 Un/kg/day).

The proband had positive family history of diabetes. The proband's father was diagnosed with diabetes at age 6 years, diabetes duration was 38 years. He was initially treated with SU up to 10 years, then with insulin (32 units/day). He had developed retinopathy. HbA1c 7.5-8.5%. Paternal grandmother was diagnosed with type 2 diabetes at 65 years old, HbA1c 6.0%, she was treated with SU.

The proband and his father were referred for genetic testing of MODY genes. In the proband, his father we detected a novel heterozygous mutation in the INS gene - p.C31W.

Conclusions: MODY-INS is a rare subtype of MODY. We detected previously undescribed mutation p.C31W had not been previously described. The detection of this mutation in two family members with the same course of diabetes indirectly confirms its pathogenicity.

ePoster - 14: Nutrition

eP221 | Participant attrition and perinatal complications risk in efficacy trials testing vitamin D supplementation in gestational diabetes mellitus patients: A systematic review and meta-analysis of randomized controlled trials

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Introduction: The maternal glycemic control and perinatal outcomes' risk among gestational diabetes mellitus (GDM) patients receiving vitamin D alone or with co-supplement/s or non-vitamin D supplements antenatally are not apparent.

Objectives: Therefore, this study aims to distinguish it. Additionally, it estimates the prevalence and risk of participant attrition in randomized controlled trials (RCTs) testing the efficacy of vitamin D supplementation.

Methods: A search for these RCTs ensued in PubMed, Embase, and Scopus databases, and the risk of bias of the included trials transpired utilizing the Cochrane tool. Frequentist method network meta-analysis (NMA), conducted for the primary aim, didn't include open-label and no-placebo-arm trials to minimize the intransitivity risk. The pooled prevalence of participant attrition among vitamin D supplemented arm/s and its risk compared to non-vitamin D supplement receiving arm/s were estimated by prevalence and pairwise meta-analysis (DerSimonian and Laird method and random-effect model), respectively. All analyses occurred in Stata statistical software, v16.

Results: This review included 13 publications with 1,109 GDM patients data from Iran and China. Except for one trial at a high risk of performance and detection bias, the rest primarily had a low risk of bias. On NMA, vitamin D and omega-3 fatty acid co-supplementation decreased the risk of newborn hyperbilirubinemia (risk ratio (RR): 0.30; 95% confidence interval (CI): 0.09,0.98) and hospitalization (RR: 0.30; 95% CI: 0.09,0.98) compared to omega-3 fatty acid alone. The remaining perinatal outcomes occurrence didn't vary between the different interventions. The pooled prevalence of participant attrition among vitamin D recipients was 6% (95% CI: 0.03, 0.10, I^2: 38.04%), and its risk didn't vary from the non-recipients of vitamin D.

Conclusions: Omega-3 fatty acid and vitamin D co-supplementation in GDM patients decrease the risk of neonatal hyperbilirubinemia and hospitalization.

eP222 | Nutrition experiences among caregivers of youth with type 1 diabetes

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Introduction: Many children with type 1 diabetes (T1D) do not meet nutritional guidelines. Little is known about how caregivers perceive the necessity of a dietitian (RD) visit or how satisfied they are with their nutrition care.

Objectives: To evaluate nutrition experiences and perceptions of RD care among caregivers of children with T1D.

Methods: We surveyed 838 families receiving T1D care at Boston Children's Hospital. Of 184 (22%) responses, 159 with complete data were analyzed. Using multivariable logistic regression, we assessed factors associated with caregiver perception of need for annual nutrition visits, satisfaction with RD care, and encouragement from a nurse/doctor to meet with a RD. Covariates included age (< 13 vs. ≥13 yrs.), T1D duration (≤ 3 vs. > 3 yrs.), gender, race/ethnicity, and pump/CGM use.

Results: Over half (55%) of children were ≥ 13 years old and 51% had T1D for ≤ 3 years. Over half of caregivers (56.6%) considered it necessary to see a RD annually. Older age (aOR=2.06, [1.01, 4.20]) and shorter T1D duration (aOR=2.50, [1.22, 5.12]) were associated with this finding. Less than half (47.8%) reported satisfaction with their nutrition care. Shorter T1D duration was associated with higher likelihood of satisfaction (aOR=2.24, [1.13, 4.42]). While 44% reported meeting with a RD in the past year, 61.4% reported encouragement from a nurse/doctor to do so. Of those who did not meet with a RD, the leading reasons were: "I am knowledgeable in nutrition and do not need to see a [RD]" (40%) and "I had a past visit with a [RD] that was not helpful" (37%). Topics of interest for future RD visits were supporting independent care in teens (55%) and understanding glycemic impact of foods (51%).

Conclusions: Our findings suggest caregiver satisfaction with nutrition care and its perceived need may wane with longer T1D duration. However, perceived need for nutrition services is higher in parents of teens. Future work includes the need for teen-focused T1D nutrition curricula and strategies for engaging families in nutrition care at later stages of T1D care.

eP223 | A qualitative analysis of nutrition experiences among caregivers of youth with type 1 diabetes

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Introduction: Many children with type 1 diabetes (T1D) do not meet nutritional guidelines. However, little is known about caregiver perceptions of nutrition care which may inform strategies for strengthening the patient-caregiver-provider alliance.

Objectives: To explore nutrition experiences and perceptions of the care provided by RDs among caregivers with children with T1D.

Methods: We surveyed 838 families receiving T1D care at Boston Children's Hospital. We received 184 (22%) responses. A multidisciplinary team applied deductive and inductive coding and conducted iterative, qualitative thematic analysis of 213 open-ended question responses from 116 survey participants.

Results: Four themes emerged from the qualitative free-text analysis: 1) *Perception of diminished utility of RD care over time*: caregivers perceive RD visits to be most useful at diagnosis and shortly thereafter but then diminish in usefulness over time; 2) *Ongoing nutrition services are too basic*: after initial diagnosis, caregivers perceive ongoing nutrition counseling as too rudimentary, while many caregivers perceive their own knowledge of nutrition to be sufficient; 3) *Enduring impact of negative interpersonal interactions*: initial suboptimal experiences with a RD impact caregiver decision to seek ongoing nutrition services; and 4) *Benefit of tailored counseling*: caregivers perceive increased benefit when nutrition services are non-judgmental, encouraging, and are patient/family-led.

Conclusions: Our results demonstrate challenges with nutrition care voiced by T1D caregivers. Of highlighted concern are decreased engagement on the part of more seasoned T1D families and the potential for imprinting of positive or negative RD experiences around the time of diagnosis. Future work should delineate strategies for identifying patient and family nutrition understanding and goals in order to provide nutrition education that is tailored to individual patients and families, particularly in the later stages of the T1D journey.

eP224 | Introduction of a gluten free diet in children with type 1 diabetes and celiac disease did not impact glycemic control, nutrient intake or quality of life at 3 months

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Introduction: Studies on how a gluten free (GF) diet in youth with T1D and CD impacts glycemic control, quality of life (QoL) and nutrient intake are limited.

Objectives: The study aim was to determine the effects of the introduction of a GF diet in children with T1D and newly diagnosed CD on glycemic control, nutrient intake, QoL and body mass index (BMI).

Methods: Subjects wore a continuous glucose monitor for 12 days and completed a 4-day food record at baseline and 3 months after

implementing a GF diet. Participants and one parent completed the PedsQL questionnaire at baseline and 3 months.

Results: Ten children participated (age 10.8y ± 3.3, 40% male, BMI Z-score 0.5 ± 0.6, diabetes duration 2.2y ± 2.6 (50% with diabetes duration of <12 months), 60% on multiple daily injections, 20% on insulin pump therapy and 20% on twice-daily injections, HbA1c 6.0 ± 1.1%). BMI Z-score (0.4 vs. 0.5, p=0.73), glycemic variability % CV (40.4% vs. 40.2%, p=0.94), HbA1c (6.0% vs. 5.8%, p=0.56), percentage glucose time above target range >180mg/dL (30.3% vs. 36.1%, p=0.09) and below target range <70mg/dL (7.2% vs. 7.9%, p=0.76) did not change significantly from baseline to 3-months, however time in range (TIR) 70-180mg/dL (62.6% vs. 56.0%, p=0.02) was significantly lower at 3 months. Intake of fibre (18g vs. 16g, p=0.40), iron (9g vs. 8g, p=0.35), calcium (826mg vs. 791mg, p=0.75) and saturated fat (13.5% vs. 14.0%, p=0.77) were not significantly different from baseline to 3 months. QoL score was not significantly different for parents (63.2 vs. 67.4, p=0.08) or children (56.8 vs. 63.5, p=0.08) from baseline to 3 months.

Conclusions: This study suggests that implementation of a GF diet in children with T1D does not adversely impact glycemic control, nutrient intake, QoL or BMI Z-score. The only change in glycemic control reduced TIR at 3 months which may represent changing insulin requirements with gut healing and the end of the remission phase of T1D.

eP225 | Diabetes and new technologies - The use of the nutritional app for food counting by children and adolescents with type 1 diabetes

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Introduction: Mobile nutritional applications are becoming an increasingly popular tool for counting meals among people with type 1 diabetes (DT1). The basic functions, combined with innovative solutions, bring hope that this method of food counting will contribute to the improvement in metabolic control and quality of life (QoL).

Objectives: Assessment of the prevalence and benefits of using mobile nutritional applications as tools for food counting by children and adolescents with DT1.

Methods: The study included 100 patients with DT1 from Upper Silesian Child Health Center. The surveyed patients answered questions included in the original questionnaire about monitoring their nutrition. Moreover, medical data coming from patients' databases was used (age, sex, diabetes duration, body measurements, last 3 HbA1c measurements).

Results: The most popular method of counting calories consumption was the use of mobile applications - 47%. 31% respondents counted calories "by eye", 17% used tables, 5% did not count calories. Patients who regularly used mobile applications obtained lower HbA1c levels than those who did not calculate the nutritional value of meals or do it by eye (median: 7.2% vs 7.8%). According to the subjective opinion, 67% of mobile applications users said the use of the application improved their QoL. The use of mobile applications correlated with younger age of patients (where caregivers are more often involved in treatment) and with shorter duration of the disease. Patients using mobile applications were more likely to have proper BMI (25-85 pc, 77% vs 55%).

Conclusions: Regular use of dietary mobile applications contributed with better metabolic control measured by the HbA1c value among children and adolescents with DMT1. Moreover, counting food with the use of mobile applications affects the subjective improvement of the QoL of patients with DMT1 and their caregivers.

eP226 | Nutritional profile of type 1 diabetic children on admission to the Endocrinology-Diabetology and Nutrition Department: About 105 cases

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Introduction: Nutritional education is a cornerstone in the management of patient with type 1 diabetes in combination with insulin and physical activity.

Objectives: The aim of our work was to explore the nutritional profiles of type 1 diabetic children during their first hospitalization.

Methods: This is a retrospective descriptive study involving 105 type 1 diabetic patients aged less than 15 years old hospitalized in the Endocrinology-Diabetology and Nutrition Department of the Mohammed VI University Hospital Center of Oujda. The data collected were analyzed using SPSS 21 software.

Results: The main age was 11.1±3.6 years with male predominance. The average BMI was 17.2±3.1kg/m2, with a mean duration of diabetes of 3.1±2.9years. The HbA1c was over 10% in 40.9% of patients. Analysis of the lipid profile revealed hypertriglyceridemia in 10.8% of cases, and hypoHDLemia in 26% of cases. Fifty-six percent of patients had three main daily meals associated with a snack in 52% of cases with a notion of snacking in 50%. The diet was normo-caloric in 41% of cases. Carbohydrate intake was unsuitable in 85% of cases, with a high carbohydrate index food intake in 53%, and a misunderstanding of carbohydrate equivalence in 93% of cases. Dietary fibre intake was inadequate in 75% of patients. Only 27% of patients practiced physical exercise.

Conclusions: Most children exhibit a high total energy intake with poor knowledge of carbohydrate equivalence, which is in agreement with the data in the literature. The presence of dyslipidemia can be explained by excessive lipid intake with insufficient nutritive fibre and lack of physical activity.

Therefore, nutritional advice should be individualized for each child with type 1 diabetes based on age, sex, physical activity and body size.

eP227 | Evaluation of alcohol consumption in relation to metabolic control in patients with long standing type 1 diabetes mellitus

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Introduction: Alcohol consumption has not been extensively studied in type 1 diabetes (T1D) patients.

Objectives: To assess alcohol consumption and drinking behaviors among T1D patients with long disease duration and its relation to diabetes control.

Methods: The study comprised of 183 participants, 124 with T1D (mean age 42.7±10.4 years, 53.2% male) and 59 age, sex and BMI matched controls (mean aged 45.1±9.1 years, 55.9% male), with an average age difference between the two groups of 2.45 years, p=0.11. Mean diabetes duration for the T1D patients was 25.3±8.2 (11-58) years. Previous cardiovascular incident was a major exclusion criterion. Food frequency questionnaire including drinking behavior validated from the Feel4Diabetes study was applied. Number of drinks, type and amount of alcohol (a standard drink being beer 330 ml, wine 125 ml, spirits 40 ml) per week were assessed for the last month. Anthropometric measurements, laboratory investigations and imaging studies related to metabolic control and cardiovascular risk were examined during two consecutive visits in 1 week.

Results: In the whole study group, 80.1% consumed alcohol, the intake correlating weakly with sex (r=0.21, p=0.021.). Frequency of alcohol consumption in T1D patients was 76.2%, with fewer women consumers than men (66.7% vs. 84.6%, p=0.032). There was no significant sex difference among controls (87.9% vs. 88.5%). Well-controlled T1D patients (HbA1c<7%) have a tendency to drink more (r=0.18, p=0.05), men consuming 11.4±12.2 drinks/week vs. 5.9± 5.3 drinks for well-controlled women. In poorly controlled patients (HbA1c>7%), more men than women had higher overall weakly intake of alcohol (p<0.0001), and drank strong alcohol (3.1 vs. 0.4 drinks/week, p=0.001). More of the male ex-smokers with T1D drink (92.9%) compared to smokers (85.5%) and non-smokers (78.3%), p=0.05.

Conclusions: The overall high alcohol consumption especially in poor controlled and former smokers T1D men warrants further elucidation and preventive action.

ePoster - 15: Psychosocial Issues

eP228 | Association of comorbid psychiatric disorders in childhood-onset type 1 diabetes with educational attainments: A population-based sibling comparison study

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Introduction: There is a lack of research on the comorbid psychiatric disorder in children with type 1 diabetes in relation to education outcomes.

Objectives: To investigate the influences of psychiatric disorders in childhood-onset type 1 diabetes on education attainments.

Methods: Sibling comparison study using multiple Swedish nationwide registers. Swedish-born individuals (1973-1998) were followed up to 2013. We estimated the association of type 1 diabetes and comorbid psychiatric disorders with education attainments using logistic and linear regression models. We also identified families with two or more full-siblings and did sibling comparison models to control confounding from shared familial factors.

Results: Of 2454862 individuals, 13294 were diagnosed with type 1 diabetes, and 1278 of them diagnosed with at least one comorbid psychiatric disorder, before 16 years of age. Compared to their peers, children with type 1 diabetes showed statistically significantly lower odds to achieve educational milestones, including being eligible to and finishing upper secondary school (OR [95% CI]: 0.81[0.75-0.87]; 0.82[0.78-0.86], respectively), starting and finishing university (0.85[0.81-0.89]; 0.81[0.77-0.86]). Such disadvantages were more profound in those with comorbid psychiatric disorders, with a much lower odds of achieving the milestones, including completing compulsory school (1.06[0.13-0.20]), being eligible to and finishing upper secondary school (0.25 [0.21-0.29]; 0.20[0.17-0.23]), starting and finishing university (0.33 [0.26-0.42]; 0.28[0.18-0.43]). They were less likely to pass school subjects and graduated with lower grade average points. These associations remained statistically significant in the sibling comparison models.

Conclusions: Children with type 1 diabetes, especially when comorbid with psychiatric disorders, can experience long-term education underachievement. Attention needs to be paid to these children, and targeted educational adjustments and supports are warranted.

eP229 | "If you know what to do then do it. If you don't, ask for help": Desired advice of youth and their parents after T1D diagnosis

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Introduction: A T1D diagnosis can have a profound psychosocial impact on families. Adaptation is critical to ensure long-term well-being of youth and their parents.

Objectives: This study sought to better understand the lived experience of families during the first year post diagnosis and what advice they wish they received that would have improved their experience.

Methods: A series of focus groups and interviews were conducted via videoconferencing to examine the common challenges and successes during the first year post diagnosis and ask what advice participants would give other families. Participants were 1 to 3 years post T1D diagnosis and included youth (N=21) ages (8-12; n=10), teens (13 and above; n=11), and parents (N=39) of youth ages under 8 (n=12), children 8-12 years old (n=15) and teens 13 and above (n=12). Transcript analysis was conducted using deductive coding and thematic analysis

Results: Parents, teens, and children wished they had been told that diabetes management becomes easier, perfect glucose values are impossible, and diabetes should never limit children's activities. Parents recommended seeking support and making time to plan and prepare for diabetes management tasks to minimize limitations/negative impact of diabetes on everyday life. Teens advised not limiting their food choices (they realize there may be more thought regarding food involved), working collaboratively with parents, and developing self-awareness and independence. Children encouraged active problem solving with parents prior to social events and asking for help when feeling overwhelmed.

Conclusions: These findings reveal the unique challenges children and their parents experience the first year post T1D diagnosis and their advice to help families thrive their first year. By understanding the lived experience of families, diabetes education may be altered to address how and what information is shared at diagnosis and what might need to be later targeted to better address families' needs.

eP230 | The emotional well-being of parents with children at genetic risk for type 1 diabetes

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Introduction:/

Objectives: This study explores the impact of the information of a high genetic risk for type 1 diabetes (T1D) on the emotional well-being of parents and the differences in levels of depression and anxiety between the participating study centers, parents with or without a first-degree relative (FDR) with T1D and mothers and fathers.

Methods: In this observational, cross-sectional cohort study, all parents of children participating in the Freder1k study who were informed of the high genetic risk, were asked to fill in a "well-being questionnaire" that screens for symptoms of depression and anxiety. Data were collected from 7 clinical trial centers in 5 European countries: Germany (Munich, Hannover, Dresden); the UK (Oxford); Poland (Warsaw); Belgium (Leuven), and Sweden (Malmö).

Results: Data were collected from 1741 parents of 951 children. Regarding total depression score (TDS), 80,6% of parents reported to have no symptoms, 19.3% reported to have mild/moderate/moderate-severe symptoms. Regarding total anxiety score (TAS), 92,9% reported to have no anxiety symptoms, 4,9% reported they did. A difference in sex was found in TDS ($p < 0.001$) and TAS ($p < 0.001$), with women reporting a higher mean for TDS and TAS than men. Regarding FDR, a difference in levels of depression was found ($p < 0.001$), however this was not found for TAS ($p = 0.582$). Additionally, a significant association was found between expecting a positive result and having a FDR ($p < 0.001$). Only 12.4% of the parents with no FDR expected a positive result, in contrast with 65.3% of the parents with a FDR.

Conclusions: Depression and anxiety symptoms in this study population were similar to those in the general population, meaning that a positive test result leads to low psychological stress in parents, except for some individual cases. Women reported more symptoms, which is also similar in the general population. Psychological screening and further research are however important for the follow-up of these families.

eP231 | A pandemic perspective: analyzing the impact of COVID-19 on diabetes management and mood through the lens of family conflict

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Introduction: The COVID-19 pandemic has significantly affected daily life, and for teens with type 1 diabetes (T1D), these changes are compounded by an intensive medical regimen. Such changes may influence teen's mental health and diabetes management. The impact of mood on diabetes management has been previously examined, but less is known about the association among diabetes management, family conflict, and teen mood during COVID-19.

Objectives: We examined the impact of COVID-19 on diabetes management, teen mood, and family conflict.

Methods: 79 teens ages 13-17 (M_{age}= 15.4±1.3, 57% female, 62% White) and 78 parents (82.3% female, 78.5% Married, 67.1% White) completed surveys in an ongoing multi-site clinical trial. At baseline, dyads completed the Revised Diabetes Family Conflict scale, and a survey measuring the impact of COVID-19 on teens' mood and diabetes management. The impact of COVID-19 on diabetes management, teen mood, and family conflict was examined.

Results: Positive correlations were found between parent- and teen-reported impacts of COVID-19 on diabetes management and teen mood. Higher levels of parent-reported family conflict were related to greater parented-reported impact of COVID-19 on diabetes management and teen mood. These findings translated to the teen's point of view as well – higher teen-reported family conflict was related to greater parent-reported impact of COVID-19 on teen mood. All p<0.05. No significant associations were found amongst other teen-reported impact measures.

Conclusions: COVID-19 had a moderate association with teen diabetes management and mood, and these impact measures were related to family conflict. The relationship between teen mood and family conflict highlights the role mood may play in conflict development. Our results are clinically applicable, lending support for mental health interventions targeting teens with T1D affected by COVID-19 and monitoring the long-term glycemic and psychosocial effects of the pandemic.

eP232 | Mental health during pregnancy and post-partum in mothers with and without type 1 diabetes: the ENDIA study

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Variables	1	2	3	4	5	6
1. Parent-Report Diabetes-Specific Family Conflict	--	--	--	--	--	--
2. Teen-Report Diabetes-Specific Family Conflict	.210	--	--	--	--	--
3. Parent-Report Impact of COVID-19 on Diabetes Management	.356**	.216	--	--	--	--
4. Teen-Report Impact of COVID-19 on Diabetes Management	.163	.144	.504**	--	--	--
5. Parent-Report Impact of COVID-19 on Teen Mood	.285*	.312**	.474**	.392**	--	--
6. Teen-Report Impact of COVID-19 on Teen Mood	-.013	.176	.253*	.415**	.496**	--

* = p<0.001; ** = p<0.05

Table 1. EPDS and PSS during the third trimester and post-partum

	Non-T1D (EPDS)	T1D (EPDS)	Non-T1D (PSS)	T1D (PSS)
Trimester 3	5.8 [5.2, 6.3]*	5.7 [5.3, 6.1]	19.4 [18.4, 20.4]	19.9 [19.2, 20.7]
Post-partum	5.4 [4.9, 5.9]	5.2 [4.8, 5.6]	19.2 [18.3, 20.2]	19.4 [18.7, 20.1]

* Predicted mean [95% CI]

Introduction: We aimed to compare the mental health of mothers, with and without type 1 diabetes (T1D), during pregnancy and post-partum, and to examine the relationship between glycaemic control and mental health in T1D.

Objectives: We hypothesised that mental health in trimester 3 (T3) and post-partum is less favourable in mothers with T1D, and that poorer mental health scores relate directly to glycaemic control.

Methods: Participants were 800/946 women enrolled in the Environmental Determinants of Islet Autoimmunity (ENDIA) study, an Australia-wide pregnancy-birth prospective cohort following children with a first-degree relative with T1D, from 2016-2020. Women with and without T1D (n=518, 282) completed the Edinburgh Postnatal Depression Scale (EPDS) and Perceived Stress Scale (PSS) during T3, (median [IQR], 34 [32, 36] weeks) and early post-partum (median 14 [13, 16] weeks). Linear mixed regression models were adjusted for parity.

Results: Women without T1D were aged mean (SD) 33.1 (4.4) years; 31.9 (4.4) years with T1D. Pre-existing mental health issues requiring psychotropic medications were of similar number in non-T1D n=17 [6%] and T1D n=41 [8%]. EPDS and PSS scores did not differ between non-T1D and T1D mothers at T3 or post-partum (all p≥0.5; Table 1). EPDS scores were less favourable at T3 compared with post-partum (p=0.01), independent of T1D status, and by post-partum 12/47 women had improved to below the threshold (=12) recommended for intervention. HbA1c during pregnancy in 398/518 women (76.8%) with T1D did not relate to EPDS (r^2=0.01, p=0.2) or PSS (r^2=0.02, p=0.4) scores. Median [IQR] HbA1c was 6.3% [5.8-6.9].

Conclusions: Overall, mental health in late pregnancy and post-partum was not adversely impacted by T1D. Glycaemic control did not relate to mental health scores in mothers with T1D. A generalised improvement in mental health between T3 and post-partum was independent of T1D status.

eP233 | Sleep changes in parents with children with type 1 diabetes (T1D) during the COVID-19 pandemic

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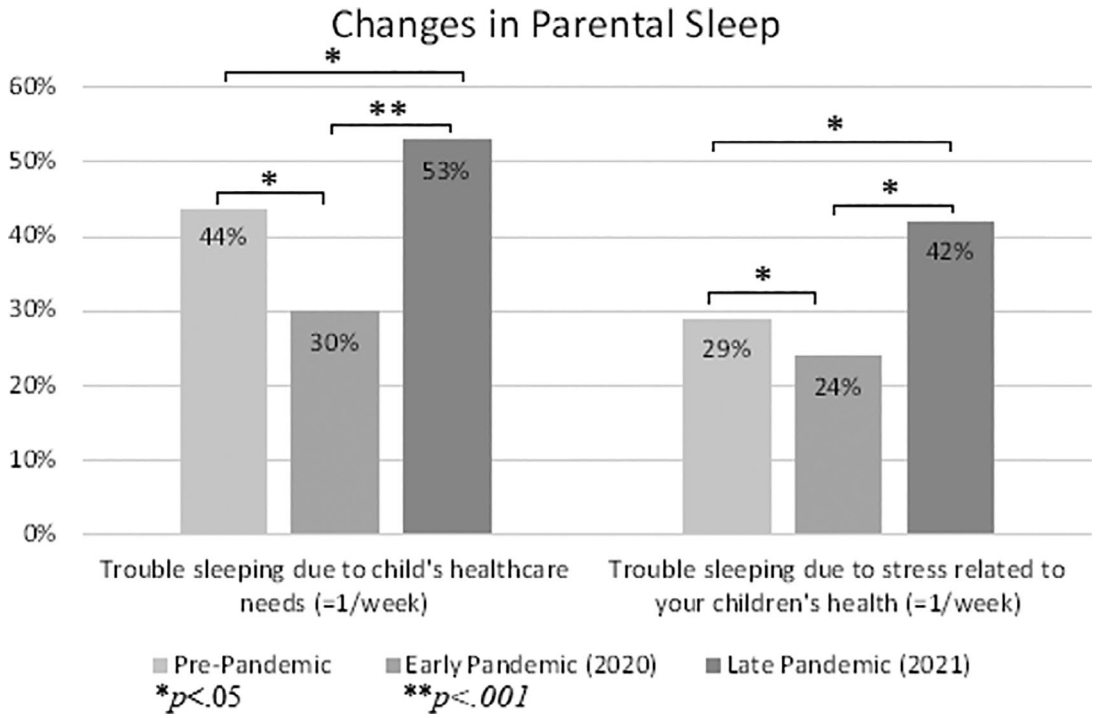
Introduction: Parents of children with T1D experience sleep difficulties. During the COVID-19 pandemic, families experienced new stressors and routines which may have further impacted sleep and T1D management.

Objectives: We compared parental sleep across three time-points (1 prior to and 2 during the pandemic).



Methods: Parents (n=123, 93% mothers) of youth with T1D (M_{age} =6.5±1.7 yrs, $M_{duration}$=2.7±.7 yrs) in a behavioral RCT completed surveys at: RCT completion, June/July 2020, and February/March 2021. Parents completed the Pittsburgh Sleep Quality Index (PSQI) with T1D-related sleep questions and 2 sleep items from a COVID-19 experiences survey. We compared sleep difficulties pre-pandemic to 2020 and 2021 data using χ^2 tests.

Results: Many parents (61%) endorsed clinically significant poor sleep in 2021 compared to pre-pandemic (46%) or earlier in the pandemic in 2020 (45%). Similarly, diabetes-specific sleep disruptions (i.e., difficulty sleeping due to child's healthcare needs, due to stress related to child's health) initially decreased in the early pandemic then significantly increased later in the pandemic (Figure). Parents endorsing moderate-to-extreme difficulty sleeping overall also significantly increased throughout the pandemic from 29% in 2020 to 43% in 2021, p=.012.

Conclusions: Parents of children with T1D experienced changes in sleep during the pandemic. While some aspects of sleep appeared to improve initially, diabetes-specific sleep disruptions have increased as the pandemic has progressed. Sleep difficulties in parents of children with T1D may have been delayed or may have compounded as people adjusted or as pandemic restrictions loosened. As parental sleep impacts psychosocial wellbeing and T1D management, it warrants clinical attention especially in the context of stressors such as the COVID-19 pandemic.

eP234 | High satisfaction and acceptability of a stepped-care behavioral intervention for parents of young children with type 1 diabetes

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Introduction: A type 1 diabetes (T1D) diagnosis in young children is stressful for parents, and more family-based supports are needed.

Objectives: We explored satisfaction and acceptability, and their association with parent demographics, with a new stepped-care behavioral intervention aimed at supporting parents soon after their child's T1D diagnosis.

Methods: Participants were 157 parents of children (M_{age}=4.46 ±1.64 years) randomized within 8 weeks of T1D diagnosis into a stepped-care intervention (n=115) or usual care (n=42). All intervention participants were first paired with a parent coach (peer mentor). Those who did not meet targets for parent depressive symptoms or child HbA1c progressed to more intensive intervention levels (behavioral interventionist, diabetes educator, and psychologist). Parents reported on post-study satisfaction and demographics such as race, education, marital status, and child CGM use. Acceptability was defined by retention rate. Descriptive analyses, chi-square analyses, and independent t-tests were computed. Qualitative interviews (n=18) of parent experiences in the intervention were conducted.

Results: There was high retention (97.5%) and satisfaction, with ≥95% of parents in both groups noting they were glad to have participated and would recommend the study to others. In the intervention group, parents with a college degree or higher were more likely to report high satisfaction with study (p=0.01). 84% of parents in the intervention group found their parent coach to be helpful. Interview themes included improved confidence in T1D management, lessened anxiety, and decreased feelings of isolation.

Conclusions: This study was found to help parents through a difficult period and was highly satisfactory and acceptable, indicating potential for uptake as part of routine care. Results suggest that higher educated parents may have had more engagement and benefit from our intervention. If the intervention is deemed efficacious, future directions should explore its translation into clinical care.

eP235 | Modified E-Delphi process for selection of patient-reported outcomes (PRO) for children and young adults with type-1 diabetes and their families

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Introduction: Type 1 Diabetes (T1D) management is complex and is associated with significant psychosocial burden. Continuous glucose monitors (CGM) can improve disease management and outcomes but also introduce new, or exacerbate existing, psychosocial concerns. Patient-reported Outcomes (PROs) can be used to capture this information, but there is no consensus on which PROs should be used in pediatric CGM research.

Objectives: We conducted an asynchronous and electronic Delphi process (e-Delphi) to identify appropriate PROs for patients with T1D and on CGM.

Methods: After performing a literature review, we recruited a group of experts representing endocrinologists, psychologists, diabetes educators, social workers, nurses, and representatives from device manufacturers across the United States. The 3-round e-Delphi process was conducted via a study website (www.delphikit.com). Experts provided opinions on usefulness of instrument, feasibility, time of administration, and administration frequency.

Results: Twenty-one out of twenty-five experts agreed to participate in the e-Delphi process. A total of 12 experts attempted at least one round and 4 experts completed all 3 rounds. Our literature review identified 104 potential instruments for inclusion, which were narrowed to 62, 25, and 11 after each round, respectively. The final list of 11 PRO instruments is shown in Figure 1 categorized by domain (Diabetes Distress, Autonomy, Quality of Life, Psychosocial, Technology Acceptance), age of validation and administration, and recommended administration schedule.

Domain	Instrument	# of items	Age (years)	Scheduled
Diabetes Distress	Problem Areas in Diabetes Scale (PAID)			Annually, ED visit, Hospitalization
	Child	20	8-12	
	Youth	26	>12	
	Parent	26		
	Diabetes Distress Scale (DDS)	17	≥18	Annually
	Fear of Hypoglycemia Survey (HFS)			Hospitalization
	Child	25	6-18	
	Parent			
	Blood Glucose Monitoring Communication (BGMC) Questionnaire			Hospitalization, ED visit, Worsening glycemic control on labs
	Youth	8	8-18	
	Parent	8		
Autonomy	Diabetes Knowledge Test (DKT-2) The Mercy What I Know About Diabetes (M-WIKAD)	19, 23	12-18, >18	Baseline and transitional milestones
General Health and QOL	Type 1 Diabetes and Life (T1DAL) Measures			Annually
	Child	21	8-11	
	Adolescent	23	12-17	
	Parent	22		
Psychosocial	Patient Health Questionnaire-9 (PHQ-9)	9	>12	Annually
	Diabetes Family Responsibility Questionnaire (DFRQ)			Annually
	Child	17	8-18	
	Parent	17		
	Diabetes Strengths and Resilience Measure (DSTAR)			Annually
	Child	12	9-12	
	Youth	12	13-17	
	Young Adult	16	18-22	
Technology Acceptance	Diabetes Technology Attitude			Annually
	Youth	5	≥12	
	Parent	5		
	Glucose Monitoring Satisfaction Survey (GMSS)	15	≥12	Baseline

Conclusions: PRO measurements can provide critical insights into the psychosocial well-being of patients. The specific instruments identified here are particularly well suited for pediatric patients with T1D and on CGM. Clinical implementation could help healthcare providers, patients, and families engage in more patient-centered and comprehensive disease management.

eP236 | Motivation: A missing link in the association between executive function and self-management in youth with type 1 diabetes?

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Introduction: Self-management behavior requires executive function (EF; goal-directed behavior) skills. Behavior regulation (BR), a subcomponent of EF has been linked to diabetes self-management. Additionally, motivation may be key for changing and sustaining self-management behaviors in youth with type 1 diabetes (T1D), but is understudied in pediatric diabetes.

Objectives: Against the background of the Self-Determination Theory, we investigated the dynamics between motivation of youth for self-management, BR and HbA1c using network analyses.

Methods: Youth with T1D completed questionnaires. The Self-Regulation Questionnaire assessed motivation on three dimensions of internalization (external regulation, introjection, identification) and a rebellion scale. BR (inhibition, behavioral evaluation, emotion regulation, shift) was assessed by the Behavior Regulation Index (BRI) of Executive Function (BRIEF) composite scale. Self-management was assessed with the Diabetes Self-management Profile and by HbA1c. Network analyses in R explored partial correlations between BR, motivation and self-management, controlling for all other connections.

Results: 134 youth (11-18 y/o) with T1D (mean age 14.4±2.1; 54% female; mean HbA1c 7.4%±1.0) participated. In the network analyses (Figure), BR was not directly linked to self-management; motivation was shown to be a bridging concept. More BR-shift problems related to more rebellion against self-management guidelines (r=0.2) and more BR-inhibition problems to more external regulation of motivation (r=0.24). More identification with self-management guidelines related to better self-management behavior (r = 0.24) and more rebellion to higher HbA1c (r=0.28).

Conclusions: Results uncovered the importance of the clinically well-known concept of rebellion against diabetes self-management in its associations with both BR as well as HbA1c. This emphasizes the importance for families and clinicians to focus on motivation in youth with T1D.

eP237 | Association between WHO-5 Wellbeing Questionnaire and clinical outcomes in children and young adults with type 1 diabetes

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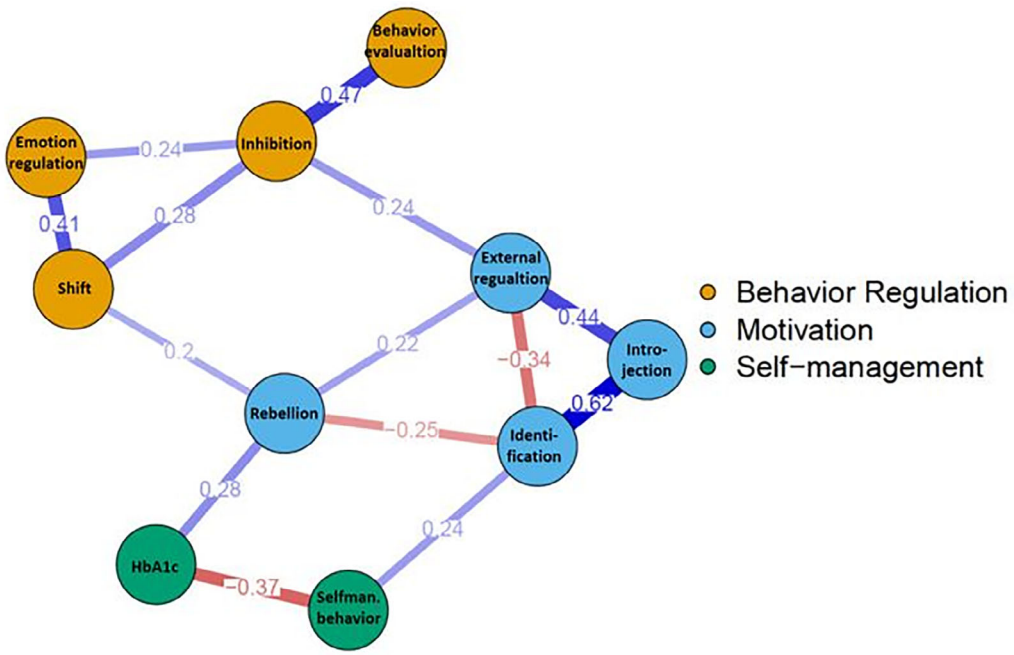

Table1: Adjusted odds ratios with 95% confidence intervals

	Score <13	Score ≥13	Odds ratio [95% confidence interval]
BMI-SDS (reference „≤1“)	469	1,504	
>2	74	176	1.37 [0.96 – 1.94]
>1-2	209	573	1.16 [0.92 – 1.41]
HbA1c [%] (reference „≤7.5“)	457/366	1,159/1,387	1.33 [1.12 – 1.58]
Injection therapy vs. Insulin pump	532/273	1,602/876	1.17 [0.98 – 1.40]
GISD (reference „low deprivation“)	210	739	
Medium	369	1,172	1.09 [0.86 – 1.37]
High	255	661	1.39 [1.07 – 1.79]
Clinical depression [y/n] (reference “n“)	61/774	89/2,483	2.10 [1.49 – 2.95]

Median age of the cohort was 13.2 years [10.0 – 16.3] with a diabetes duration of 3.0 years [0.7 – 6.5] (51.0% male, migration background in 24.2%). The overall median WHO-5 score was 17.0 [13.0 – 20.0].
HbA1c >7.5% resulted in higher odds for a score <13, but not for the stricter cutoff of ≤7; in contrast, therapy regimen yielded no significant differences for pathological scores. Using patients from affluent regions as the reference group, only patients with high deprivation (3rd tercile) had higher odds for a WHO-5 score <13. Clinical depression (n=150) was also associated with a pathological WHO-5 score (Table 1).

Introduction: The WHO-5 Wellbeing Questionnaire is an established tool for early recognition of depressed mood or clinical depression.
Objectives: To analyze the association between the score and characteristics of type 1 diabetes (T1D) in patients from the DPV registry.
Methods: We included 3,407 T1D patients (age 6 to 25 years, T1D duration >3 months) from the German DPV registry with questionnaires between 1995 and 2020. Patient data were aggregated ± 6 months around the first available questionnaire. Data are presented as median [Q1 – Q3] or as percentage. We calculated odds ratios with 95% confidence intervals from logistic regression models for the outcome “WHO-5 score <13” associated with BMI standard deviation score (SDS) (≤1, >1-2, >2), HbA1c (≤/> 7.5%), insulin therapy, the German Index of Socioeconomic Deprivation (GISD) (terciles), and diagnosis of depression. Models were adjusted for age (<12, 12-<18, ≥18 years), sex, diabetes duration (</≥ 3 years), migration background (patient or parent born outside Germany/Austria/Switzerland/Luxembourg), and for multiple group comparisons via Tukey-Kramer method.
Results:
Conclusions: The WHO-5 Wellbeing Questionnaire might be useful for detecting possible clinical depression in young patients with established T1D. High HbA1c and high area-level deprivation was associated with reduced wellbeing.

eP238 | 'My mood is worse than my blood sugar'. A web-based qualitative study investigating the impact of hypoglycaemia on quality of life in adolescents with type 1 diabetes

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Introduction: Though hypoglycaemia remains a common experience for adolescents with type 1 diabetes, its impact on quality of life (QoL) is still unclear.
Objectives: The aim of this study is to explore the impact of hypoglycaemia on QoL in adolescents with type 1 diabetes.
Methods: Adolescents (aged 12-17 years old) with type 1 diabetes from Denmark, Germany, the Netherlands and the United Kingdom completed a qualitative online survey. This included the novel 'Wheel of Life' activity, in which adolescents nominated domains of life that were important for their overall QoL. Then they described, in their own words, if and how hypoglycaemia impacted on these domains. Thematic analysis was used to analyze the responses.
Results: In total, 75 adolescents (mean age [±SD], 14.9±1.7 years) completed the survey. The five most frequently nominated domains of life were school, friends, family, sleep and sports. QoL was impacted by both hypoglycaemia episodes and living with the risk of hypoglycaemia. In relation to the impact of hypoglycaemia, five major themes were identified: 1) physical impact; 2) emotional impact; 3) social impact; 4) cognitive impact; and 5) behavioral impact. In relation

to the impact of the risk of hypoglycaemia, five additional themes arose: 1) being worried, 2) others being worried, 3) suboptimal diabetes management, 4) having to take precautions, and 5) reduced freedom. Eight participants reported that hypoglycaemia did not have an impact on at least one of the domains of their lives. Three participants described a positive impact of hypoglycaemia on their self-confidence or their relationships with friends.

Conclusions: Both experiencing hypoglycaemia and living with the risk of hypoglycaemia impacts on young people's QoL in various measurable ways. These findings indicate the importance of exploring the impact of hypoglycaemia and the need to address this in personalized, clinical care.

eP239 | Elevated depressive symptoms, stress, and parent diabetes self-efficacy among parents of young children newly diagnosed with type 1 diabetes

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Introduction: Type 1 diabetes (T1D) is increasing in children ≤6, and diabetes management during this developmental stage predominantly falls on caregivers. Lower parent diabetes self-efficacy is related to poorer child T1D care and health outcomes. However, little is known about how parent diabetes self-efficacy in parents of newly diagnosed young children changes over time.

Objectives: Parent diabetes self-efficacy at 12- and 18- months post-diagnosis was compared between parents experiencing clinical vs. normative levels of depressive symptoms/stress at diagnosis.

Methods: 157 primary caregivers (91.7% Female, 76.5% Married, 62.2% White, non-Hispanic) of children ages 1-6 with T1D enrolled within ≤2 months of diagnosis (M=29.03±15.39 days) completed a multi-site, behavioral RCT. Parents self-reported on depressive symptoms (Center for Epidemiological Studies–Depression Scale; ≥16=elevated) and stress (Perceived Stress Scale; ≥19=elevated) at baseline, and self-efficacy (Self-Efficacy for Diabetes Scale-Parents) 12- and 18-months later. Mann-Whitney U tests compared associations among depressive symptoms, stress, and self-efficacy. Site and treatment arm were examined as confounds.

Results: Site/treatment arm were unrelated to parent diabetes self-efficacy (p>.05). At 12- and 18-months, parents with clinically elevated baseline depressive symptoms/stress had significantly lower parent diabetes self-efficacy than parents experiencing normative depressive symptoms/stress (p's<.05).

Conclusions: T1D diagnosis in young children is very challenging, and distress may impact parental confidence in their diabetes management abilities over the next 1-2 years. Though parent depression has received more attention, screening for elevated parent stress is also needed. Targeted interventions for parents with clinically elevated symptoms at child T1D diagnosis may be warranted to help improve parent diabetes self-efficacy and promote positive child health outcomes.

eP240 | Protective and risk factors of resilience in adolescents with type 1 diabetes: A test of the resilience model

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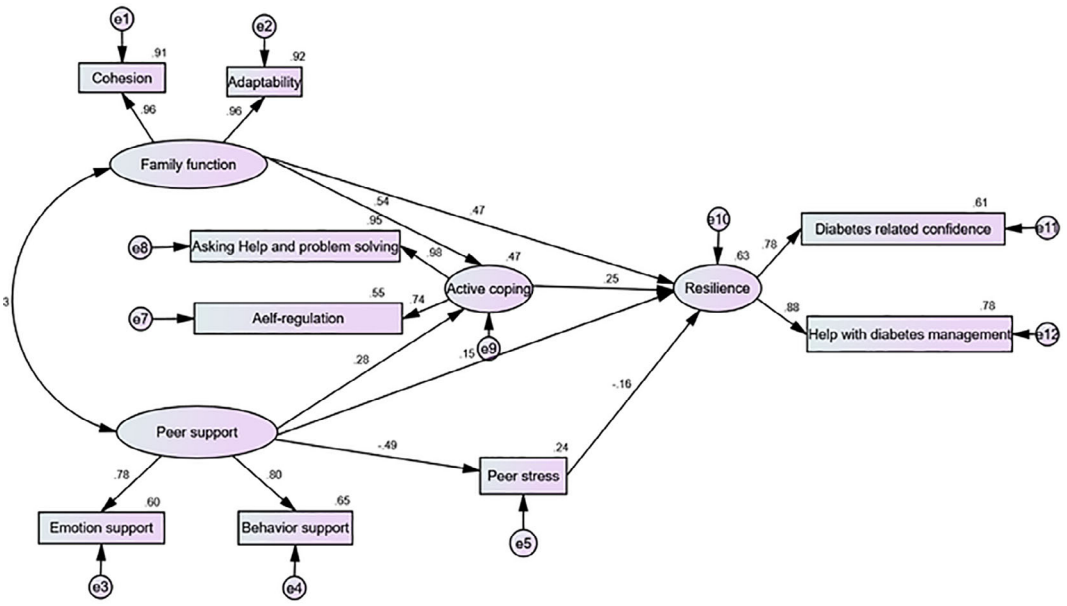

Introduction: Deteriorating diabetes management and control are common among adolescents with type 1 diabetes, while some resilient youth do remarkably well. Although resilience has been gradually recognized as a psychosocial indictor that can lead to positive diabetes outcomes, little is known about the factors that influence it.

Objectives: To increase the understanding of how resilience is positively and negatively affected by individual and environmental factors, we developed The Resilience Model for Adolescents with Type 1 diabetes (RMA-T1D).

Methods: A total of 360 adolescents with Type 1 diabetes (mean age 14.0 ± 3.3 years; 54.2% male; 73.1%; diabetes duration 4.2 ± 3.4 years; 73.1% using insulin pens) completed a cross-sectional survey about protective and risk factors of resilience. The latent psychosocial variables and demographics of participants were evaluated using structural equation modeling (SEM) and logistic regression.

Results: The majority of goodness-of-fit indices indicate that the SEM of RMA-T1D was a good model, and family functioning, peer support, peer stress and coping style accounted for a high level of variance in resilience (63%). Logistic regression revealed that three demographic variables, age, family income, educational level of the primary caregiver, accounted for 14.3% of this variance.

Conclusions: RMA-T1D allows for a better understanding of what adolescents experience while live with of type 1 diabetes. Our results indicate that RMA-T1D would be an effective structure by which to develop interventions to build or strengthen resilience related to diabetes and its management.

eP241 | Clinical and demographic characteristics of Hispanic youth and young adults with type 1 diabetes who screen positive for depressive symptoms

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Introduction: Individuals with Type 1 Diabetes (T1D) are at increased risk for depression and suicide as compared to the general population; however few studies have focused on understanding depression and suicide in ethnically diverse youth with T1D, including Hispanic youth and young adults (YYA).

Objectives: This study compares the rate of depressive symptoms and suicidal ideation (SI) in Hispanic versus non-Hispanic YYA with T1D and describes the Hispanic population who have depressive symptoms or SI.

Methods: English speaking patients at a large academic diabetes center, aged ≥10 years, were administered the Patient Health Questionnaire 9 (PHQ-9) in clinic annually to assess for depressive symptoms (PHQ-9 score ≥10) and SI. Retrospective chart review identified Hispanic patients who were administered the PHQ-9 between January 2016 and April 2021 (N=269).

Results: A total of 36 patients (13.3%) scored positive for depressive symptoms; 6 patients (2.2%) endorsed SI. Hispanic youth did not have a significantly increased rate of depressive symptoms compared to white, non-Hispanic youth ($p = 0.29$), but were found to have a lower rate of SI than white, non-Hispanic youth ($p = 0.0002$). Hispanic patients with depressive symptoms had higher HbA1c levels (10.8% vs. 9.5%, $p = 0.005$) and were more likely to report SI ($p < 0.001$) compared to those who scored negative. There was no difference between the two groups in age, sex, insurance status or diabetes duration. 42% of Hispanic YYA scoring positive for depressive symptoms had a depression diagnosis at time of screening, 25% had evidence for treatment of depression at time of screening, and 56% had evidence for mental health treatment following screening.

Conclusions: Overall, these results emphasize the importance of conducting routine depression screens during clinic visits and providing mental health resources to patients/families. Future studies should include a larger and more representative population of Hispanic patients, including Spanish-speaking families.

eP242 | Milestones, medical system, and mental health: A call for a paradigm shift in type 1 diabetes adolescent transition care

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Introduction: Despite ongoing development and evaluation of novel transition interventions, clinical outcomes of adolescents with type 1 diabetes transitioning to adult care remain poor.

Objectives: The objective of this study was to obtain perspectives of healthcare providers on the gaps in the type 1 diabetes adolescent transition process and preferences for future program design.

Methods: We conducted 27 semi-structured interviews with healthcare providers (13 nurses, 9 physicians, 5 dietitians) who work with adolescents and emerging adults with type 1 diabetes. Participants also completed an embedded survey where they rated various transition interventions. Thematic content analysis of interview transcripts was conducted using line-by-line coding via the grounded theory approach. We determined that saturation was reached after the third iteration.

Results: We identified 3 themes: (1) Milestones: Adolescent transition developmental milestones in type 1 diabetes care (subthemes: lack of standardized adolescent transition processes, development of transition milestones will help address current care gap); (2) Medical system: Barriers to optimal adolescent transition in type 1 diabetes care (subthemes: barriers related to diabetes care teams and barriers related to the healthcare system); and (3) Mental health: Integrated supports to address the chronic disease burdens of type 1 diabetes (subtheme: social and emotional burdens in adolescence). The top-rated interventions from the survey were mental health resources, discussion with the adolescent in advance regarding personalized transition timeline, and identifying an adult care team that could provide the best "goodness-of-fit" with the patient.

Conclusions: The design of future interventions for the pediatric-to-adult transition in type 1 diabetes care should consider adolescent

transition developmental milestones, the organizational structure of healthcare systems, and mental health burdens of this chronic disease.

eP243 | Adapting an evidence-based mental health app for adolescents with type 1 and type 2 diabetes: a qualitative study

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Introduction: Adolescents with diabetes have an increased risk for psychological disorders compared to their healthy peers, yet routine diabetes care often lacks the ability to provide adequate psychological support to prevent mental health issues. A digital mental health intervention delivered using a smartphone app would allow for a more cost-effective and scalable intervention, which if effective, could more feasibly be integrated into day-to-day diabetes care. In 2020, we developed a mental health app for healthy youth without diabetes with recent findings from a RCT demonstrating improvements in wellbeing and reductions in depression and anxiety.
Objectives: This current qualitative study is adapting our mental health app for the needs of adolescents aged 12-16 years with diabetes.
Methods: 20 adolescents with type 1 or type 2 diabetes, 10 parents, and 10 healthcare professionals were interviewed or attended focus groups to explore their views of the mental health app and how it could be tailored for youth with diabetes. Adolescents were recruited from the Paediatric Diabetes Service at Starship Children's Hospital, Auckland. The interviews/focus groups were audio-recorded, transcribed and analysed using content analysis.
Results: Participants' views were largely very positive regarding the mental health app, with key suggestions focusing on adding diabetes-specific examples and videos into the modules. The adolescents reported that the modules which focus on teaching coping/psychological strategies and relaxation techniques were both relevant and engaging to them. Healthcare professionals emphasised the need to include diabetes-related self-care behaviours into the 'Look after your body' and 'Goal Setting' modules.
Conclusions: The next step will be to incorporate this feedback into the next prototype of the app and pilot the app for youth with diabetes to explore usability, acceptability, and efficacy for improving mental and physical health outcomes in youth with diabetes.

eP244 | Depression & anxiety screening for adolescents with type 1 diabetes: a quality improvement project

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Introduction: Symptoms of anxiety and depression are more common in adolescents with type 1 diabetes (T1D) than in their peers and annual screening for psychological comorbidities is recommended in these patients.
Objectives: We aimed to increase the clinic-specific rates of screening for depression and anxiety using validated tools to demonstrate the practicality and value of such screening and establish the need for regular mental health screening, which was not being performed.
Methods: This is a quality improvement study using the plan-do-study-act design. Adolescents with T1D aged 14 to 18 years who were not currently accessing psychological services were screened using the Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder Assessment (GAD-7) to identify if they could benefit from referral to psychological services. The outcome measure will be the clinic-specific proportion of patients identified as at-risk (PHQ-9 score and/or GAD-7 score is > 4).
Results: 105 patients were identified. 76 patients who were not currently engaged with any psychological services were screened using the screening tools. 18% of these patients had moderate or severe symptoms of depression, 12% had moderate or severe symptoms of anxiety and 4% had severe symptoms of both anxiety and depression. They were all offered referral to psychological services. 20% of the patients screened had mild depressive symptoms and 12% had mild symptoms of anxiety. Those with mild symptoms were offered psychoeducation by the clinic social worker. Furthermore, use of these screening tools identified patients in need of urgent intervention who were taken to the hospital emergency department.
Conclusions: Some patients are already using psychological services. However, our results indicate the importance of using validated screening tools in a speciality setting on a regular basis to capture all the patients who would benefit from referral to psychological services.

eP245 | Demographic and glycemic factors linked with diabetes distress in teens with type 1 diabetes

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Introduction: Diabetes distress is a negative emotional response related to the burdens of living with type 1 diabetes (T1D) and is linked with diabetes outcomes, such as A1c.
Objectives: However, less is known about how other blood glucose indicators, average blood glucose (BG) and time in range (TIR), as well as demographic risk factors are associated with diabetes distress.

Methods: 325 teens (M_{age} 15.7 ± 1.3, 51% female, M T1D duration 6.7 ± 3.7 years) screened for diabetes distress using the Problem Areas In Diabetes– Teen Version scale to determine eligibility for an ongoing multi-site behavioral trial. Demographics were extracted from electronic medical charts and glycemic data were gathered through routine diabetes clinic appointments or at-home A1c kits. The associations of diabetes distress with demographic risk factors and glycemic indicators (A1c, BG, and TIR) were analyzed using nonparametric tests.

Results: 29% of teens (N=95) scored above the clinical cut off (>44) for diabetes distress indicating trial eligibility. Females (M=38.57) scored significantly higher on average than males (M=31.25). Black, non-Hispanic youth screened significantly higher (M=39.6) compared to White, non-Hispanic, Hispanic, and other youth. Diabetes distress scores were positively associated with A1c (r_s=.24) and average BG levels (r_s=.25), and negatively with TIR (r_s=-.18). All p < 0.05. Age and diabetes duration were not significantly associated with distress.

Conclusions: Building on previous findings showing the link between diabetes distress and A1c, our results showed that other BG indicators are also significantly related to diabetes distress. Results also demonstrated that diabetes distress symptoms are most prevalent in Black, non-Hispanic and female teens. Further investigation into the social determinants of health influencing these risk factors is warranted to promote optimal health outcomes.

eP246 | Weight control behaviors are associated with elevated glycemic outcomes in adolescents and young adults (AYAs) with type 1 diabetes

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Introduction: Overweight status and engagement in weight control behaviors are common among adolescents and young adults (AYAs), including AYAs with type 1 diabetes (T1D). However, less is known about how weight behaviors are associated with glycemic control in AYAs with T1D.

Objectives: The current study examines differences in demographics characteristics, including age and gender, and A1c based on objective/subjective overweight status, engagement in weight control and maladaptive weight control behaviors (e.g., restricting food/insulin, using pills/laxatives).

Methods: Seventy-six AYAs (*M*age=17.8±1.22 years; 46% male; 50% non-Hispanic white) with T1D (*M*A1c=8.7±2%) enrolled in a longitudinal study evaluating AYA health communication across 18 months (4 time points). AYAs self-reported baseline demographics; subjective overweight status, weight control, and maladaptive weight control were self-reported at each time point using the Youth Risk Behavior Survey. Objective overweight status (BMI) and 18-month A1c were extracted from medical records.

Results: Subjective overweight status was more common among younger AYAs and females compared to older AYAs and males, respectively (p<.05). Further, females endorsed engaging in weight control more often than males (p<.05). AYAs with objective overweight status (n=27; 35.5%) had marginally higher A1c levels than AYAs with normal-range BMIs (9.3% vs. 8.4%; p=.09); there were no differences in A1c based on subjective weight status. AYAs reporting weight control and maladaptive weight control behaviors evidenced higher A1c levels than those who did not (weight control: 9.2% vs. 7.9%; maladaptive: 10.2% vs. 8.3%; p<.05).

Conclusions: Health care professionals should be aware of associations between weight control behaviors and glycemic control and routinely screen for such behaviors. Future research should further explore subjective weight status and potential interventions to reduce maladaptive weight control behaviors.

eP247 | Sociodemographic factors are associated with adverse psychosocial and health outcomes in adolescents and young adults with type 1 diabetes

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Introduction: Stress and risk behaviors (e.g. alcohol use) are common among adolescents and young adults (AYAs) with type 1 diabetes (T1D) and are associated with elevated glycemic control. However, not all AYAs engage in risk behaviors, and elucidating demographic correlates of such adverse outcomes are needed.

Objectives: This study evaluates differences in binge drinking, elevated diabetes distress, and elevated glycemic outcomes based on sociodemographics.

Methods: Seventy-six AYAs (*M*age=17.8±1.22; 46.1% male; 64.6% married parents; 43.4% parental income <$99,999; 50% non-Hispanic white) with T1D ($M_{duration}$=8.2±4.4 yrs; 18-month A1c=8.7±2.0) enrolled in a longitudinal, observational study evaluating health communication. AYAs self-reported on baseline demographics (age, gender, parental household income, marital status, diabetes duration; all dichotomized). At 4 time points over 18-months, AYAs completed items on binge drinking (≥5 drinks in one sitting; Youth Risk Behavior Scale; 23.7% ≥1x over 18-months) and the Diabetes Distress Scale (DDS-2; 47.4% elevated (≥3) ≥1x over 18-months). 18-month A1c was extracted from medical record. χ^2 tests examined associations between baseline demographics and binge drinking and DDS-2 elevations; *t*-tests were used to examine differences in 18-month A1c based on demographics.

Results: AYAs ages 18+ were more likely to report binge drinking than AYAs ages 16-17 (33% vs. 11%, $\chi^2(1)$=3.9, p=.05), and AYAs from lower income families were more likely to experience elevated diabetes distress than AYAs from higher income families (62% vs. 34%; $\chi^2(1)$=5.1, p=.02). AYAs with single parents had higher 18-month A1c than those with married parents (*M*=9.5% vs. 8.3%, p=.03).

Conclusions: This developmental period can be associated with adverse health and psychosocial outcomes, and AYAs with

demographic risk indicators (e.g., lower income, single-parent households) may need more support. Results should be replicated in a more diverse sample to further inform key themes relating to AYA health.

eP248 | Differences in depression and distress between adolescents with type 1 and 2 diabetes

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Introduction: We have demonstrated that diabetes distress (DD) and depression (DEP) are closely related in adolescents with type 1 diabetes and both are closely related to hemoglobin A1c with diabetes distress being more closely related.

Objectives: The goal of this study was to assess differences in DEP and DD between adolescents with type 1 (T1D) and type 2 (T2D) diabetes and their relationships to glycemic control, sex, insurance state and race in T2D.

Methods: DEP (PHQ-9) and DD (PAID-T) screening was routinely performed in all adolescents 13 to 17 years of age attending the diabetes clinic. hemoglobin A1c (A1c), body mass index (BMI), method of treatment, insurance status and race were taken from the electronic medical record. Results are reported as median and 25 and 75% confidence intervals.

Results: Complete data was available in 41 individuals with T2D and 285 with T1D. Age was not different between T1D and T2D. BMI was significantly higher in T2D ($p<0.001$). A1c was lower in females with T2D than with T1D [6.9 (5.9-11.1) vs 8.5 (7.4-9.9), $p=0.017$] but did not differ in males. PHQ-9 was greater in females with T2D versus T1D [6 (2.2-11.5) vs 2 (0-6), $p=0.007$], but did differ in males or between females and males [2 (0-7)] with T2D. The PHQ-9 difference in females persisted when BMI was included in the analysis. PAID-T tended to be higher in males with T2D than T1D [24 (15-37) vs 20 (16-29), $p=0.072$], but did not differ in females, or between females [29 (19-45)] and males with T2D. PHQ-9 and PAID-T did not differ in adolescents with T2D by treatment method, insurance status or race. PHQ-9 and PAID-T in T2D were correlated ($r_s=0.65$, $p<0.001$) but were not related to A1c.

Conclusions: DEP is higher in females with T2D than in T1D and this difference is not due to differences in BMI. DEP and DD in adolescents with T2D are closely related but unlike T1D are not related to glycemic control.

eP249 | Clinical cut-off for the Finnish diabetes-related quality of life questionnaire

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Introduction: FinDiab Quality of Life Questionnaire (FDQL) is a new, valid quality of life measure for children and adolescents with type 1 diabetes (T1D). It is based on the acceptance-commitment theory and the strength and resource orientation, and it is intended to aid discussions with the children and adolescents at clinic appointments.

Objectives: To evaluate sensitivity and specificity of the FDQL, and to find out a clinically significant cut-off score for the questionnaire.

Methods: Youths with T1D (n=100, aged 10–17 years) completed the FDQL and the Strengths and Difficulties Questionnaire (SDQ). T1D measures (HbA1c, complications, treatment type) were obtained from the medical records. SDQ total difficulties scale (normal vs. raised or high risk) was used as the golden-standard measure in ROC analysis to evaluate sensitivity and specificity of the FDQL and to determinate an appropriate cut-off score. The SDQ subscales and T1D measures were compared between the groups below and above the cut-off with t- and X^2-tests.

Results: FDQL total score was able to differentiate youth with normal vs. raised risk (AUC=.87, p<.001). The score 70 (15^{th} percentile on the scale of 0-104) was the most optimal cut-off (with sensitivity 91%, specificity 50%). The youth below the FDQL cut-off had more emotional and conduct problems, hyperactivity, and higher HbA1c than the youth above the cut-off. Girls were more likely than boys to score below the cut-off. There were no group differences in age, T1D treatment method or complications.

Conclusions: FDQL has good concurrent validity for identifying youth with T1D at risk for problems in social-emotional well-being. In addition to qualitative use of the FDQL, a clinically meaningful cut-off value can assist with the decisions for further evaluation and interventions.

eP250 | Mental health screening in pediatric diabetes clinic: benefits of utilizing caregiver proxy and anxiety screening measures in addition to standard of care

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Introduction: Depression and anxiety among youth with type 1 diabetes (T1D) is associated with poor management. Psychosocial screening is recommended during routine visits for 12-17 years old. Screening for anxiety and acquiring caregiver perceptions of psychosocial functioning are not routine; but could identify youth in need of mental health supports.

Objectives: Differences between reporter format and parallels between depression and anxiety scores were examined.

Methods: Youth 8-17 years old with T1D (n=61; M=13.1 years; 59.0% female; 62.1% white) completed the PROMIS anxiety and

depression screener. Caregivers (n=55; 68.9% mothers) completed corresponding PROXY forms. Youth 12 to 17 years (N=24) also completed routine PHQ-9.

Results: In summary, 44.3% of youth had at least one elevated score on self or caregiver report PROMIS measures, 30% of youth self-reported scores in the elevated range, while 26% of elevated scores were from caregiver report. When examining the PROMIS measure domains, 31% and 35% of youth reported elevated scores for depression and anxiety. When screening for depression, 20% of youth and 7.7% of caregivers reported scores in the elevated range. Whereas, 9.1% of youth and 12.7% of caregivers scored in the elevated range for anxiety, with 12.7% of participants having elevated scores on both formats. When examining anxiety, 4.9% of youth and 14.8% of caregivers reported scores in the elevated range for anxiety, accounting for a portion of youth who would not be identified if only depression-screening measures were utilized. Further, 32.4% of youth under the age of 12 who are not routinely screened were identified as having an elevated anxiety or depression score.

Conclusions: Utilizing anxiety and proxy measures identified a sizeable portion of youth in need of mental health supports who are not routinely screened. Further research in larger samples could identify if broadening administered screening measures enhances the identification of mental health concerns among youth with T1D.

eP251 | The lived experiences of resilience in adolescents living with type 1 diabetes: A hermeneutic phenomenological study

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Introduction: Deteriorating diabetes management and control are common among adolescents with type 1 diabetes, while some resilient youth do remarkably well. Contemporary diabetes care practice primarily focuses on risk factors for poor diabetes outcomes, and working with resilience has not generally been a consideration.

Objectives: This qualitative study was conducted to explore the phenomenon of resilience in the lives of adolescents with type 1 diabetes.

Methods: A hermeneutical phenomenological study was carried out. A total of 15 adolescents with type 1 diabetes were recruited purposefully from the outpatient and inpatient in the Endocrinology departments of a Public Hospital and a Children's Hospital. Sampling lasted from 2019 to 2021 and continued until new themes were no longer emerging. Information was gathered through in-depth individual interviews which were tape-recorded and subsequently transcribed. Benner's thematic analysis method was used for data analysis.

Results:

The following themes were identified: "Resistance to type 1 diabetes", "maintain a normal life", and "gain hope and strength".

Conclusions: To create and promote adolescents' resilience, Healthcare works should encourage disease comprehension and provide high-quality care to support adolescents' inner resilience. The three theme formed three stages: preparatory resilience, resilience process and resilience outcomes. The presence of diabetes related stressors were necessary prerequisites for the generation of resilience.

eP252 | The impact of hypoglycemia on quality of life and related outcomes in children and adolescents with type 1 diabetes: a systematic review

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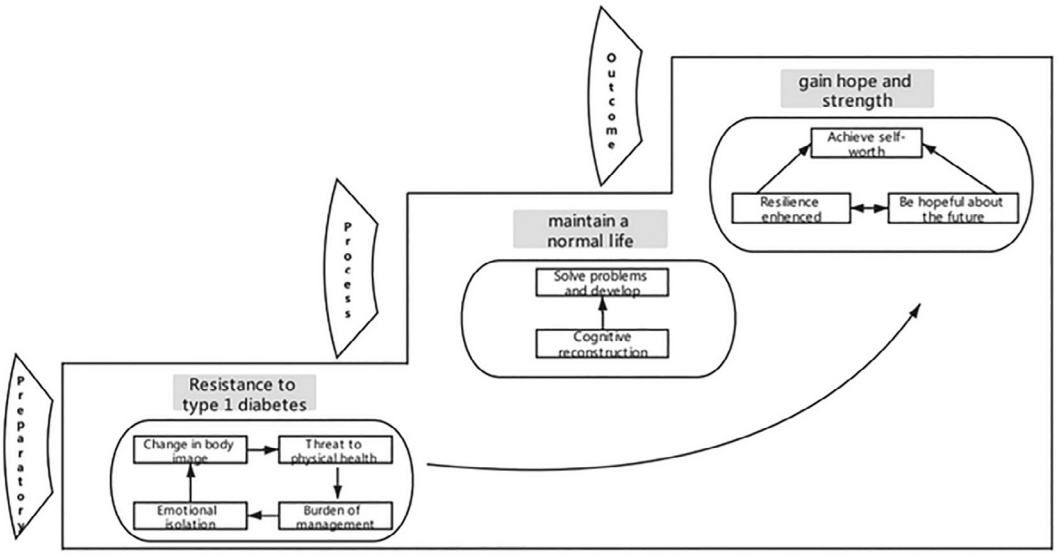

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Introduction: One of the main goals of pediatric diabetes management is to achieve and maintain optimal quality of life (QoL), but the impact of hypoglycemia on QoL in young people with diabetes is still unclear.

Objectives: To conduct a systematic review to examine associations between hypoglycemia and quality of life (QoL) in children and adolescents with type 1 diabetes.

Methods: Four databases (Medline, Cochrane Library, CINAHL, PsycINFO) were searched systematically in November 2019. Studies were eligible if they included children and/or adolescents with type 1 diabetes, reported on the association between hypoglycemia and QoL (or related outcomes), had a quantitative design, and were published in a peer-reviewed journal after 2000. Studies were evaluated using the Joanna Briggs Institute's critical appraisal tool. A narrative synthesis was conducted by outcome and hypoglycemia severity.

Results: No hypoglycemia-specific measures of QoL were identified. Evidence for an association between SH and (domains) of generic and diabetes-specific QoL was too limited to draw conclusions, due to heterogenous definitions and operationalizations of hypoglycemia and outcomes across studies. SH was associated with greater worry about hypoglycemia, but was not clearly associated with diabetes distress, depression, anxiety, disordered eating or posttraumatic stress disorder. Although limited, some evidence suggests that more recent, more frequent, or more severe episodes of hypoglycemia may be associated with adverse outcomes and that the context in which hypoglycemia takes places might be important in relation to its impact.

Conclusions: There is insufficient evidence regarding the impact of hypoglycemia on QoL in children and adolescents with type 1 diabetes at this stage. There is a need for further exploration of this relationship in future research, ideally using hypoglycemia-specific QoL measures.

DOI: 10.1111/pedi.13270

AUTHOR INDEX