Diabetes Acute and Chronic Complications I

P/WED/01

Reduced endogenous secretory advanced glycation end product receptor (esRAGE) in young people with type 1 diabetes developing microalbuminuria

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Objectives: Advanced glycation end products (AGEs) have been implicated in the development of diabetic complications by interacting with the AGE-specific receptor (RAGE). A circulating C-truncated form of the RAGE (esRAGE) exists and it seems to work as a scavenger for AGEs, and in this way it might be implicated in the pathogenesis of diabetic complications. However, there is very little information on the role of esRAGE in the development of diabetic nephropathy (DN). The aim of the present study was to perform a longitudinal evaluation of esRAGE in young subjects with type 1 diabetes (T1D) in relation to the development of MA.

Methods: esRAGE was measured in longitudinally collected blood samples from 48 T1D young subjects developing microalbuminuria (MA+) and 48 age-, sex-, and duration-matched normoalbuminuric subjects (MA-), followed in the Oxford Regional Prospective Study (an inception cohort of 527 children with T1D followed up for a median of 10.3 (range 0.9–19.2) years). esRAGE levels were compared between MA+ and MA- subjects in the relation to the time of onset of MA, by calculating mean levels before and after MA onset in MA+ subjects and, at corresponding years, also in MA- subjects.

Results: Overall levels of esRAGE were significantly lower in subjects developing MA when compared with those with normoalbuminuria (0.76 ± 0.41 vs. 0.93 ± 0.53 ng/ml; $P = 0.001$). These differences between the two groups were present both before (0.73 ± 0.41 vs. 0.94 ± 0.58 ng/ml; $P = 0.02$) and after the onset of MA (0.77 ± 0.40 vs. 0.93 ± 0.49 ng/ml; $P = 0.02$). In subjects developing MA, mean esRAGE levels were comparable before and after MA onset ($P > 0.05$). In a longitudinal analysis there was no effect of age, duration, HbA1c or body mass index (BMI) on esRAGE levels (all $P > 0.05$). esRAGE levels significantly influenced the risk of developing MA (Exp(B)[95%C.I.]: 0.31 [0.11–0.90]; $P = 0.03$), even though this association was only of borderline significance after adjusting for potential confounders, such as gender, duration, BMI and HbA1c ($P = 0.06$).

Conclusions: In this longitudinal study of young subjects with T1D, esRAGE levels were reduced in MA+ subjects, already before the onset of MA, and appeared to be related to its development, thus suggesting a potential role of this plasma marker in the pathogenesis of DN.

P/WED/02

Bone status in adolescents with type 1 diabetes mellitus (T1DM) - a case-matched study

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Alterations in bone characteristics are well recognized in adults with T1DM. However the data according children and adolescents is unequivocal.

Objectives: The aim of the study was to assess bone quality in adolescents with T1DM by means of Quantitative Ultrasound (QUS).

Methods: Group 1(G.1) consisted of 99 children with T1DM (50 ♂, 49 ♀), during puberty or post pubertal (aged 9–19 years; Tanner stage 2–5; mean T1DM duration 4.8 ± 2.55 years). Group 2 (G.2): 297 subjects (150 ♂, 147 ♀) was case-matched from a population of healthy children examined for screening purposes.Anthropometrical measurements and QUS (Ad-SoS - amplitude dependent speed of sound [m/s]) were performed in G.1 and G.2. Additionally daily insulin requirement (DIR U/kg/24 h) and mean HbA_{1c} from the whole period of diabetes duration (T), the last year (Y) and the day of the examination (D) were statistically analyzed in G.1.

Results: We observed statistically significant differences in mean BMI SDS and Ad-SoS SDS between G.1 and G.2 (respectively 0.82 [0.54–1.10] vs. 0.06 [–0.16–0.04], $p < 0.001$ and –0.34 [–0.57 to –0.11] vs. –0.03 [–0.15–0.08], $p < 0.05$). Boys with T1DM presented significantly lower BMI SDS, HbA_{1c} D, Y and T than girls (respectively 1.65 [1.29–2.00] vs. –0.03 [–0.31–0.25], 7.53 [7.20–7.87] vs. 7.17 [6.70–7.63], 7.36 [6.96–7.76] vs. 6.94 [6.45–7.44] and 7.39 [7.11–7.67] vs. 7.04 [6.68–7.39]; $p < 0.05$), however there were no differences in mean Ad-SoS SDS (–0.35 [–0.68 to –0.01] vs. –0.34 [–0.66 to –0.01]). Significantly lower Ad-SoS SDS was observed in patients with mean HbA_{1c} Y > 7.5, in relation to patients with mean HbA_{1c}Y ??7.5 and G.2 (respectively –0.80 [–1.38 to –0.21] vs. –0.35 [–0.60 to –0.10] and vs.–0.03 [–0.14–0.09]; $p < 0.05$) and in patients with HbA_{1c} T and D > 7.5 only in comparison with G.2 (respectively –0.80 [–1.38 to –0.21] vs. –0.03 [–0.14–0.09] and –0.72 [–1.15 to –0.30] vs. –0.04 [–0.15–0.08]; $p < 0.05$). In G.1 a negative relation between Ad-SoS SDS and BMI, HbA_{1c} T, diabetes duration was revealed (respectively $p = 0.001$, $p = 0.019$, $p = 0.038$). DIR as well as episodes of diabetic ketoacidosis or severe hypoglycaemia did not influence the bone quality.

Conclusions: Bone status in adolescents with T1DM differs from the one observed in healthy subjects and seems to be associated with insufficient metabolic control. Low bone quality might be an indication for life-style and dietary changes.Supported by Grant KBN 3T11F01029.

P/WED/03

Gradual decrease of hs-CRP during prospective study comparing continuous subcutaneous insulin infusion (CSII) and multiple daily insulin injections (MDII)

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Objective: High sensitivity C-Reactive Protein (hs-CRP) as a marker of chronic inflammation has been studied extensively.Plasma levels over 1 mg/l are considered to represent sub clinical vasculitis promoting chronic complications It is of considerable interest to identify treatment conditions in type 1 diabetes whereby CRP would decrease below such level other than by diminishing hyperglycemia and/or BMI.

Methods: An open, parallel randomized controlled prospective comparative study between MDII and CSII was completed by 38 children with type 1 diabetes (mean age 9.5 ± 3.3 years and duration of disease 4.4 ± 2.9) (Pediatric Diabetes 2008 in press). The present report is on CRP. Study duration was 10.5 month; 3 phases of 3.5 month. First a run in phase on MDII, secondly a randomization phase (CSII or MDII) followed by a CSII phase for all patients. CRP, Body Mass Index SDS (BMI SDS), Hba1c and

insulin/kg/day were measured at start of the run in phase, at the start of CSII (for 19 patients after 3.5 month and for 19 patients after 7 month) and at the end of the study after 3.5–7 months CSII. CRP was determined by rate-turbidimetry on the immage immunochemistry system. Interassay variation was 5 %, the lower limit of sensitivity 0.20 mg/l. Statistical analysis was done with paired t test.

Results: In 38 children Hba1c, BMI SDS and insulin dose/kg/day was obtained. In 29 children 3 CRP samples were obtained, in 8 two and in 1 one (no or not enough material). 1 CRP measurement was omitted (CRP level >10 mg/l and clinical features of flue). An gradual decrease of CRP was seen from 1.03 mg/l at start of the run in to 0.76 mg/l after CSII ($p = 0{,}035$, $n = 33$) while BMI SDS increased significantly from 0.40 to 0.52 ($p = 0.05$) and Hba1c decreased significantly from 8.34% to 7.65% ($p < 0.001$). In the CSII phase CRP decreased further ($p = 0.1$, $n = 30$) while Hba1c decreased 0.15 % and BMI SDS increased 0.05 with 30% less insulin. No significant influence of Hba1c, insulin dose en BMI SDS was found on the decrease of CRP in regression analysis.

	Start run in phase(MDII)	Start CSII	after 3, 5–7 month CSII
Hs-CRP (mg/l)	1.03 ± 1.06	0.94 ± 0.98	0.76 ± 0.86
Hba1c	8.34 ± 0.93	7.8 ± 0.70	7.65 ± 0.88
BMI SDS	0.40 ± 0.89	0.47 ± 0.89	0.52 ± 0.91
Insulin dose (U/kg/day)	1.04 ± 0.35	1.04 ± 0.29	0.74 ± 0.18

Conclusions: A gradual decrease of CRP was seen during an intensive insulin treatment study, the greatest decrease during CSII. Does CSII have an effect on CRP? Further research is needed.

P/WED/04

Prevalence of atherogenic risk factors in children and adolescents with type 1 diabetes

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Introduction: Cardiovascular disease, cerebrovascular disease and peripheral vascular disease resulting from atherosclerosis are leading causes of morbidity and mortality in diabetes. Atherosclerosis develops early, and is more prevalent in diabetic children than age-matched healthy controls.

Aim: To determinate the prevalence and correlates of selected cardiovascular disease (CVD) risk factors among lithuanian children and adolescents with Type 1 Diabetes Mellitus (T1DM).

Methods: A total 539 children with T1DM were investigated. Total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride (TG), HbA1C were determined. Cardiovascular risk factors such as obesity, hypertension, dyslipidemia, poor glycemic control were analyzed.

Results: A cohort of 539 children (240 boys and 299 girls) suffering from type 1 diabetes were investigated. The mean age of patients was 13.4 ± 3.8 years and the mean duration of diabetes was 5.2 ± 3.9 years. The mean HbA1c was 8.5 ± 1.8%. Hypercholesterolemia (TC) was diagnosed in 120 (22.5%) patient, decreased HDL in 22(4.1%), high LDL levels were diagnosed in 79(14.8%), high TG levels were diagnosed in 96(18%) patients. 72(13.4%) patient were obese, 113(21%) had hypertension. There was a positive correlation between TG and high HbA1c ($r = 0{,}192$; $p < 0{,}001$); between LDL and high HbA1c ($r = 0.238$; $p < 0{,}001$).The prevalence of having two CVD risk factors was 14.3%, three CVD risk factors 6.9%, four CVD risk factors 2.4%, five CVD risk factors 0.9%. The prevalence of having at least two CVD risk factors was 2.4% among children aged 1–9 years and 22.3% among adolescents aged 10–17 years ($p < 0.0001$).

Conclusions: Early attention to all CVD risk factors is important and intervention is indicated in high risk patients from adolescence.

P/WED/05

Oxidized low density lipoprotein antibodies in pediatric patients with obesity and type 1 diabetes mellitus

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Objective: The oxidation of low-density lipoprotein (LDL) is considered as a key event in the initiation of atherosclerosis. We aimed to study oxLDL antibody levels in pediatric patients with type 1 diabetes.

Methods: The study involved age-matched 21 children who have type 1 diabetes without albuminuria, and 20 healthy controls. Serum levels of lipid and oxLDL were studied in all subjects. HbA1c levels in type 1 diabetes group were also measured at the same time.

Results: The mean age of diabetics and controls were 11.4 ± 3.4 and 12.9 ± 3.7 years respectively. Serum total cholesterol, high, low, very low density lipoprotein cholesterol, and triglyceride levels were not different between groups. The mean of the oxLDL in diabetics was 954.5 ± 711.6 (median: 667.1, 146.0–221.9) mU/ml and in controls 559.0 ± 452.6 (median: 385.3, 119.0–1500.0) mU/ml. Serum oxLDL antibody level was higher in type 1 diabetes than the controls, ($p = 0.04$).

Discussion: In our preliminary results showed that In patients with type 1 DM, serum oxLDL antibody levels were significantly higher than controls. This result might impress that oxLDL has an additive role in vascular changes in diabetes. Further and larger group studies are needed to understand exact relationship between these parameters.

P/WED/06

Thyroid function alterations and thyroid autoimmunity in Turkish children with newly diagnosed type 1 diabetes

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Objectives: Type 1 diabetes (DM1) is frequently associated with autoimmune thyroid disease. Euthyroid sick syndrome (ESS) is an alteration of thyroid hormone values in the absence of a thyroid disease, which is seen in patients suffering from serious diseases such as diabetic ketoacidosis (DKA). Our aims were to evaluate the prevalences of thyroid-related antibodies and euthyroid sick syndrome (ESS), and to compare thyroid function of DKA group with non-DKA one.

Methods: Thyroid hormones, thyrotropine (TSH), and thyroid-related antibodies (antibodies against thyroglobulin; anti-Tg and peroxidase; TPOAbs) were studied in 175 children and adolescents (93 girls, 82 boys) with newly diagnosed DM1. Measurements were performed within two days of the initial diagnosis of DM1 and

follow-up tests were performed the day 15th (except thyroid-related antibodies) and after one year. We classified the patients according to the presence (DKA group, n = 87) or absence (non-DKA group, n = 88) of DKA at initial diagnosis.

Results: The mean age of diagnosis was 8.6 years. Among 175 patients with DM1, 30 (17.1%) were positive for anti-TPO and/or antiTg. Eight of the 30 thyroid autoantibodies-positive patients suffered from subclinical hypothyroidism and one had clinical hypothyroidism. Positivity of thyroid autoantibodies was more common in girls (67%) than in boys (33%). Fifty-four (30.9 %) of the 175 patients had alterations of the thyroid hormones in accordance with ESS. There was significantly difference in HbA1c levels between patients with and without ESS. Among 54 patients with ESS, 40 (74%) were in DKA-group ($p < 0.05$).

Conclusions: Our study confirms the association between ESS and DKA, thus thyroid function alterations during DKA should be evaluated cautiously. The frequency of positive thyroid autoantibodies was not higher in patients with DM1 than in healthy children in our region, thus we do not recommend screening thyroid autoantibodies at diagnosis in patients with DM1, instead, TSH determination could be recommended to detect subclinical hypothyroidism.

P/WED/07

Cataracts in children and adolescents with fibrocalculous pancreatic diabetes in Bangladesh

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Background: Cataracts have been infrequently reported in Fibrocalculous pancreatic diabetes (FCPD) which is a form of diabetes secondary to chronic, non-alcoholic pancreatitis in tropical countries. Metabolic cataracts are more likely to occur in children who present with prolonged duration of symptoms before diagnosis or who have prolonged poor control.

Objective: To find out frequency of cataracts in children and adolescents with FCPD admitted in the Paediatric Unit at BIRDEM.

Methodology: A retrospective study was carried out between 2000 and 2007. Subjects were children with FCPD with or without cataracts. Data were retrieved from case records of the patients during the course of hospital stay. Cataract was detected by slit lamp examination. Statistical analysis was performed by significant tests (SPSS–12.0).

Results: Eighty-three patients with FCPD were admitted during the study period. Among them twenty patients (24%) had bilateral cataracts (Group I). Sixteen patients in Group I were newly diagnosed. The remaining four were known diabetics; they developed cataract 12 to 45 months (Mean 29.7 ± 14.1) after diagnosis. Sixty three patients did not have cataracts (Group II). Groups I and II were compared. There was no difference in the mean age at presentation of diabetes in the two groups. All (except two in Group I) were females. The mean duration of symptoms before diagnosis was significantly longer in patients with cataracts i.e. 15.0 ± 10.2 months in Group I vs. 8.0 ± 7.6 in Group II respectively ($p < 002$). Two patients out of four with known diabetes in group I had other complications. One had nephropathy and nonproliferative diabetic retinopathy and the other had neuropathy. Mean HbA1c was higher in group I which was statistically significant ($p < 012$).

Characteristics	Group I	Group II	p value
Age at presentation	13.9 ± 1.7	13.4 ± 2.0	p < 358
Duration of symptoms before diagnosis (months)	15.0 ± 10.2	8.0 ± 7.6	p < 002
HbA1c	18.4 ± 5.1	15.8 ± 3.0	p < 012

Conclusion: Twenty (24%) children with FCPD developed cataract in this study population. Most of them were newly diagnosed. All of them had high blood glucose and presented with prolonged duration of symptoms which were statistically significant.

P/WED/08

The relationship between mean platelet volume and clinical outcome and laboratory parameters in children with type 1 diabetes

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Objectives: Platelets play an important role in developing vascular diseases. Inreased risk of micro and macrovascular complications are well known in type 1 diabetes. Mean platelet volume (MPV) is a determinant of platelet functionality. Large platelets are more thrombogenic and thus put the patient at a higher risk status.It has been shown that MPV was significantly higher in Type 2 diabetes; however, the effect of type 1 diabetes on MPV in children has not been studied. The aim of this study was to investigate the relationship among MPV, glycemic control in children with type 1 diabetes.

Methods: Twenty-nine children and adolescents (aged 3–20.8 years) with type 1 diabetes were included the study. None of them was on honeymoon period. They were free of diabetic complications. All the patients were on intensive insulin therapy and they were educated for carbohydrate counting. Four cases were using NPH/insulin aspart, 6 cases were on insulin pump therapy with insulin aspart and 19 cases were using glargine insulin/insulin aspart. Diabetic patients were grouped into those with glycated hemoglobin (HbA1c) levels < 7.5% (group 1, n = 14 patients) and those with HbA1c >7.5% (group 2, n = 15 patients). Two groups were compared with regard to MPV and insulin doses.

Results: The median of the diabetes duration was 3.8 years (0.3–17.5 years), HbA1c was 7.7% (5.5–11.4) and basal/bolus ratio of insulin doses was 1.1 (0.4–3). The mean of the total insulin/weigth ratio was 1.0 ± 0.2 (0.6–1.5). Although mean MPV values in group 2 was higher than group 1 (8.9 ± 0.9 and 8.5 ± 1.4, respectively), that difference was not statistically significant ($p > 0.05$). Only diabetes duration was different between group 1 and 2 (3.0 ± 1.9, 6.1 ± 4.4 respectively, $p = 0.03$). There was not any correlation between MPV and HbA1c, age, total insulin doses, total insulin/kg ratio, basal/bolus doses ratio, diabetes duration.

Conclusion: Higher MPV value might be a quick and easy parameter for the control of diabetes. Larger studies are needed in children with type 1 diabetes for understand the relationship between MPV and diabetic vascular complications.

P/WED/09

Cardio-metabolic risk factors in children and young people (CYP) with type 1 diabetes mellitus (T1DM) are influenced by insulin treatment regimen

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Intensive insulin regimens are associated with lower HbA1c and reduced risks of macro and micro vascular disease in adults. Macrovascular disease is the major cause of death in patients with T1DM reducing life expectancy by 20–25 years suggesting that in addition to HbA1c consideration must also be given to mode of insulin delivery on cardio-metabolic risk factors. To determine the impact of insulin modality on cardio-metabolic risk factors we measured fasting lipids, blood pressure and body mass index (BMI) in CYP with T1D and related results to estimates of diabetes control and insulin dosing and treatment regimens.

99 CYP age 13.1 (3.4) years) (44M) underwent an Annual Review examination representing 49.5% of the clinic population. Growth and cardio-metabolic parameters were expressed as standard deviation scores (SDS) using appropriate standards.

Mean height and weight of the CYP were 0.17 (1.23) and 0.60 (0.90) SDS respectively. Average insulin dose was 0.97 (0.38) U/kg with 15.5% using twice daily, 45.4% MDI and 39.1% CSII regimens. In multiple regression analysis insulin dose and treatment regimen but not age, sex and BMI were the principle determinants of HbA1c ($r = 0.54$, R^2 26.8; $p < 0.001$).

Insulin Regimen	BMI SDS	Insulin Dose U/kg	Serum Cholesterol SDS	Serum Triglyceride SDS	HbA1c (%)	Systolic Blood Pressure SDS
Twice Daily	0.42 (0.82)	1.05 (0.52)	0.64 (1.28)	0.34 (1.69)	10.7 (2.3)	0.58 (0.46)
MDI	0.71 (0.93)	1.05 (0.34)	0.81 (1.22)	0.98 (2.38)	10.6 (2.3)	0.43 (0.54)
CSII	0.67 (0.89)	0.77 (0.26)	0.06 (1.04)	–0.41 (0.80)	7.9 (1.1)	0.39 (0.71)
p Value	0.56	0.01	0.02	0.004	< 0.001	0.64

$p < 0.05$ significant*

CSII at a lower insulin dose achieved lower HbA1c, cholesterol and triglyceride concentrations without an increase in BMI.

These data suggest that CSII leads to lower HbA1c, cholesterol and triglyceride concentrations. The reduced insulin dose required using CSII may contribute to the lack of effect on BMI that often results from intensified therapies. Risk factors for cardio-metabolic disease should be incorporated into the assessment of therapeutic efficacy and become part of the annual assessment of all children with type 1 diabetes.

P/WED/10

A case-report of type 1 diabetes mellitus associated to Evans syndrome and other immune disorders

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Objective: To report a case of type 1 diabetes mellitus (T1DM), Evans syndrome and other immune disorders.

Case: Children and adolescents with T1DM are at increased risk of developing other autoimmune diseases. Here we report the case of a 13-year-old male, born to Maghrebian non-consanguineous parents and bearer of haemoglobin D Ouled Rabah trait. Family history revealed one case of T1DM and two of type 2 diabetes mellitus but no auto-immunes diseases. A previously healthy boy who was diagnosed of type 1 diabetes mellitus at the age of 3. On September 1998, he was diagnosed with T1DM after a usual presentation of diabetic ketoacidosis and treated with IV insulin. At diagnosis, he had positive anti-insulin antibodies (25.6%) but negative GAD, IA2 and ICA. HLA typing revealed a high risk genotype. The search for celiac disease, systemic lupus, thyroid and adrenals antibodies, viruses (EBV, CMV and Hepatitis) and cow milk allergy was negative. At the age of 6, he progressively developed erythema, oedema and pruritus at the insulin injection sites followed by atrophy of the subcutaneous adipose tissues. Tissues biopsy of these areas showed sparse infiltrates of CD3/CD4 without signs of activation. Lipoatrophies subsequently generalized complicating insulin injections. At the age of 12, he consulted for jaundice and mild oedema of lower legs. Abdominal ultrasound showed homogenous hepato-splenomegaly. The chest X-ray was normal. Antibodies again red blood cells and platelets were positive. Mild proteinuria and hypoprotidaemia were also noticed but resolved after a few weeks.

Conclusion: This case emphasizes a very rare association of T1DM, Evans syndrome and haemoglobin D trait. The additional insulin allergy and transient renal involvement are suggestive of a complex immune disorder which remains to be clearly identified.

Diabetes Care, Education, Psychosocial Issues I

P/WED/11

Predictors of hospitalizations and eye examinations in youth with diabetes after transition to adult care: a population-based study

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At transition to adult healthcare many adolescents with diabetes (DM) "drop out." However, there is very little documented as to which factors influence health outcomes. We aimed to

1) describe rates of DM-related hospitalizations (hyperglycemia/DKA and hypoglycemia) and eye examinations after transition to adult care and
2) assess the association of method of transition and other demographic factors to these outcomes.

We used

(i) health administrative data including the Ontario Diabetes Database to identify our cohort and outcomes, and
(ii) a survey of all of the pediatric diabetes centers in Ontario (5 tertiary and 29 secondary centers) about modes of transition.

All young adults with DM for > 5 years by age 16 years between 1996 and 2006 ($n = 1507$) were assigned to the nearest diabetes centre. Outcomes were DM hospitalizations and eye examinations from ages 18–20 years. Transition methods were defined as those in which new physicians and health care teams were involved in ongoing care versus those in which some elements of care remained constant. DM hospitalization rates increased from 12.6/100 patient.yr in the 2 years prior to, to 14.0 in the 2 years after transition ($p = 0.03$). Prior DM hospitalizations between age 16–18 years ($p < 0.01$), lower SES ($p < 0.01$), female gender ($p = 0.02$) and lower physician supply ($p = 0.02$) were predictive of increased DM hospitalizations after transition. All but 0.4 hospitalization/100 pt.yr were due to hyperglycemia/DKA. After

controlling for all other factors, patients who were transitioned to a new physician and health care team were more likely to be hospitalized than those who had continuity with at least part of the team (RR 1.64, p = 0.01). Similar, but suboptimal frequencies of eye examinations were documented prior to and after transition (72 and 70% respectively, p = 0.06). Higher SES, female gender and eye examinations prior to transition (both p's < 0.01) were the only significant predictors of post-transition eye examinations. Female gender, previous DM hospitalizations, lower SES and lower physician supply were predictive of DM hospitalizations after transition. Methods of transition to adult care that include continuity with some part of the pediatric health care team were associated with fewer DM hospitalizations after transition. Eye exminations post-transition were predicted by SES and prior history of these procedures. These data have important implications in planning transition programs for youth with DM.

P/WED/12

Psychological adjustment of well siblings of children with type 1 diabetes

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To examine psychological adjustment of physically well siblings of children with type 1 diabetes, including both negative (emotional and behavioural difficulties) and positive (prosocial behaviour) adjustment outcomes. Psychososcial factors that may contribute to sibling adjustment were also examined.

Methods: Well siblings (n = 99, 10–17 years, mean duration of sibling TIDM M = 59.7, SD 42.3 months) of children with T1DM, managed at the Royal Children's Hospital, Melbourne formed the study population. Participants completed standardised measures of emotional and behavioural functioning, child temperament, quality of sibling relationship and family environment.

Results: Siblings rated themselves as having no more behavioural and emotional difficulties than norms while parents rated siblings as having fewer difficulties (t = –3.72, p < 01). Self and parent report of prosocial behaviour did not differ from norms.

Siblings perceived their families to be less expressive (t = –5.58) and more controlled (t = 2.60) than normative families, while parents reported higher levels of cohesion (t = 3.39) and organisation (t = 3.54) and feeling more regimented by rules (t = 4.84) [all p < 01]. On a measure of temperament, siblings rated themselves as less active (t = –3.53) and more approachable (t = –2.82), flexible (t = 4.52) and positive in mood (t = 3.62), with parents reporting similar findings and, in addition, perceiving the siblings as exhibiting higher levels of rhythmicity (t = 8.53) and being more task oriented (t = 2.72) (all p < 01). Duration of illness was positively correlated (r = 22, p < 05) with sibling prosocial behaviour. Multivariate analyses indicated that child temperament was the best predictor of sibling adjustment, with family cohesion, conflict and organisation playing a lesser role.

Conclusions: The findings indicate that siblings of children with T1DM do not have more behavioural or emotional problems than children in the general population, nor are levels of prosocial behaviour higher. However, sibling prosocial behaviour increased with duration of diabetes, suggesting that helpful and supportive behaviours increase with greater familiarity with the illness. The findings underline the importance of intrapersonal factors, such as temperament, in sibling adaptation to diabetes. Findings may lead to better identification of children at risk of adjustment difficulties following diagnosis of TIDM in a sibling.

P/WED/13

Do teenagers and young adults agree to clinical contact by text or email messaging?

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Objectives: Many teenage and young adult patients have unacceptable levels of glycaemic control, evidenced by high HbAic values. This usually emanates from poor adherence to insulin injections, self monitoring of blood glucose (SMBG) values, diet and exercise. However, patients are reluctant to admit to non-adherence. New technology could promote adherence by prompting patients to perform SMBG, exercise and take their insulin using mobile text and email messaging. SMBG results can be returned to clinicians by Bluetooth/mobile phone and email. Prior to evaluation of these technological innovations in a clinical setting, this study aimed at assessing their availability in a clinic cohort of 16–25 year old patients, and whether they were willing to use them for this purpose.

Methods: Consecutive patients attending a teenage/young adult teaching hospital clinic were invited to self complete a structured questionnaire.

Results: 52 consecutive patients (29M, 21F, 2 unknown sex; mean age 18, range 14–24; mean duration of diabetes 12, range 1–22 years) agreed to complete the questionnaire. All had a mobile phone, 87% of them Bluetooth enabled. 88% had computer access at work, school or college, and 92% had access at home. 58% possessed a laptop or PDA (personal digital assistant). All but one patient had internet access; 87% at home, 27% at school and 38% at college. Only 58% were willing to have their SMBG results monitored, while 42% were either unwilling or unsure about this. Only 48% were agreeable to receive text messages to remind them to adhere to their treatment, but 46% would not agree to this and 2 were unsure. Regarding advice via email, 67% were in favour of this, but the remainder were against this or unsure.

Conclusions: The teenagers and young adults surveyed here had a high availability of access to communication by mobile phone and email, thus potentially enabling easy transfer of SMBG results to clinicians, advice to patients and messaging reminders to adhere to their treatment plan. However, about half the subjects were unwilling to have their SMBG values monitored or receive prompting to adhere to their therapy. This may reflect a reticence to be repeatedly reminded about their condition or provide information about their adherence to their treatment and their glycaemic control.

P/WED/14

Impact of a diabetes camp on glyceamic status in children and adoscents in Bangladesh

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Background: Diabetes camps provide an educational as well as recreational experience for children and adolescents with diabetes

mellitus away from hospital and home. The first camp for diabetic children and adolescents was organized by BIRDEM, a tertiary care centre in Bangladesh.

Objectives: To evaluate the effect of diabetes camp on glycaemic control of children & adolescents.

Method: The first camp was organised for children and adolescents with diabetes registered at BIRDEM. Twenty nine children aged between 10 to 16 years with DM were enrolled. Their mean duration of diabetes was 26 months. They participated in a 2 day residential camp along with their caregivers in a non-health care setting in a resort-like environment. The camp programme included educational and recreational activities. A pre-structured questionnaire was filled in by the children before and after the camp to assess knowledge and skills. The education session provided basic information about diabetes, its complications, sick day management, insulin injection techniques and self-monitoring of blood glucose. Video film on diabetes, interactive discussion between children, their caregivers and the diabetes team and practical sessions were highlights of the education sessions. Self-care skills were especially emphasized. Recreational activities included simple aerobic exercises, art competition and a magic show by a professional magician. The children were asked to come for follow-up after 3 to 4 months. HBA1c was done at the beginning of the camp (pre-camp) and at follow-up.

Results: There was some improvement in knowledge and skills as assessed during post-test. Twenty four out of 29 children came for follow up. HBA1c improved in most children (see figure below).

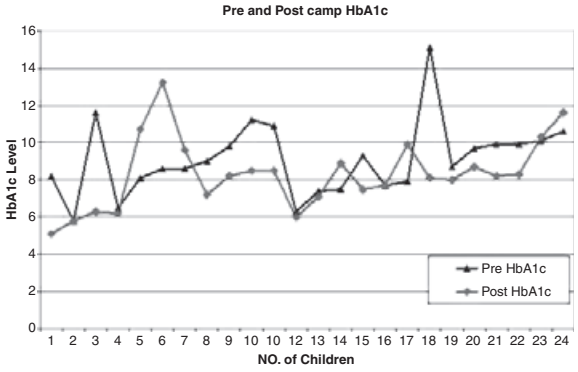

Figure 1. Pre and Post camp HbA1c

Conclusion: A single well organized diabetes camp has been shown to have a positive impact on glycaemic control. Regular camps of longer duration can have a longer-lasting effect.

Ackowledgement: Novo Nordisk stake holder relations.

P/WED/15

A national survey of social circumstances, medical fees, and life style including summer camp of children/ young people with diabetes and their families in Japan

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A survey of social circumstances and life-style of patients with diabetes aged 18–25 years (A) was performed by the Japan Association for Diabetes Education and Care (JADEC) in order to compare to the previous survey in 1997 and to that in other countries as a part of DAWN YOUTH study (supported by WDF, IDF, ISPAD, and Japan Diabetes Society). This survey had another characteristics to ask queries according to same issues to their families (B) whose patients were aged under 18 years as that to the patients. The nationwide survey was done from the end of Jul. to the middle of Oct. in 2007. Survey A had 247 (withdrawal rate 73.7%) responses and B had 268 (86.7%). There was no geographical deviation in responses of both surveys. In survey A, the averaged HbA1c was 7.3%, 70% did 4 time injections of insulin, 50% showed a feeling of satisfaction for present diabetes care, 44% showed no discrimination against diabetes, and 51% showed no barrier of diabetes against friendship and social circumstances. Amount of medical fees were expensed app. 9% of income of working patients. 66% had attended to summer camp once at least in order to meet friends with diabetes mainly. In survey B, 84 % were their mothers. Patients were diagnosed in 6.5 years old, averaged 11.7 years old, and 7.3% on averaged HbA1c. 35% showed no impact on child's performance in school, and 74% showed no prevention from participation in school activities. 80% or more answered that child could rely on class teachers or school nurses when requiring help to manage diabetes at school. Taken together, the present survey suggests the improvement of social circumstances and life-style around patients and their families.

P/WED/16

Effects of poverty in diabetes care in India

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All aspects of diabetes care are affected by poverty. In India 250 million people live below the official poverty line. Technological advances and marketing strategies have further marginalized these patients. The public health system is not geared to handle chronic disorders, focusing largely on infections/vaccinations/reproductive issues/nutrition. High prevalence of T2DM leads to the assumption that diabetes is a problem of the affluent.

Some issues:

a) Diagnosis: may be delayed/missed due to lack of awareness/ blood glucose (BG) test strips, with some children in DKA dying before diagnosis.

b) Insulin:
   a. Cold chains: may fail because of erratic electricity.
   b. Poor access to refrigerators. We showed that even in a hot tropical climate, insulin can survive for 2–4 weeks immersed in water in mud pots, but this awareness is not widespread.
   c. Cost: Animal insulins were cheaper than human insulins, but have practically been phased out.
   d. Availability: is limited in remote areas.
   e. Communication: no product inserts in regional languages in India.
   f. Insulin syringe reuse: information is not widely disseminated.
   g. Safeclips: for safe disposal of needles are unavailable in India. Weak liability regulations allow syringe/insulin companies to ignore safety aspects.

c) Monitoring
   a. BG testing: Meters are expensive, need special batteries, and are difficult to repair. Strips are expensive, and cost cutting is difficult. Strips, no longer available, using color changes (eg. Boehringer), were cut into two or three, and color matched visually. This approximation cost half/third, and also eliminated need/cost of meter/ batteries. Even fair glycemic control cannot be aimed at.
   b. A1c and other tests: are expensive and often unavailable.

d) Complications: both acute and chronic, are commoner and have higher mortality. Employability, income, and quality of life are worsened, and cost of care increased.

e) Social issues:
   a. Discrimination: exists in educational avenues, employment, and marriage because of low awareness and chronic ill health.
   b. Social security: is unavailable to > 90% population.
   c. Quacks: are sought since modern medicine is expensive.
   d. Gender: discrimination worsens all these handicaps for girls/women.

Low costs options are being ignored by corporates and Government. This makes the lot of the child with diabetes in such a scenario truly bleak.

P/WED/17

Improving diabetes programs in resource limited areas like Mutengene, Cameroon

J.N. Menang[1] & P. Ful[2], ``Coaster roller'' regular FBS clients, diabetics ulcers, both type 1 and 2, persistent Abnormal HbA1Cs

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Objectives: Re-assessing existing strategies for diabetes education, advocacy, care and management programs in attempt to improving the guidelines for better diabetes programs in a resource limited nation like Cameroon.

Method: About 15% of the 300 registered diabetics of this clinic were observed either with one or more of the problems: 'coaster-roller' fasting blood sugars (FBS), albuminuria, abnormal glycated sugars (HbA1Cs above 7) or ulcers. About 10% of the 45 diabetics were counseled and enrolled for 2 weeks each group for close follow-up using: interviews, their diet plan assessment, blood sugar checks-all from July-December 2007. Other areas of assessment were their compliance to lessons on: medication, exercises and diet plan compliance. Special attention was given to diet plans.

Results: Despite regular and highly simplified lessons and teachings at the clinic involving: medication, exercises and most importantly diet, most of them in the assessment group were observed not adhering to the lessons. Although almost all testified compliance to these domains of teachings; they were with poor diet plans and eating habits-observed during the clinical research. At the end of the care, treatment and study programs, about 75% of them greatly improved in blood sugars, HbA1Cs, and ulcers confirming diet as the foundation of diabetes control. Furthermore, dietary issue here is influenced by poverty, culture, misconceptions and others BUT education on tête-à-tête basis though very difficult and proper psychosocial support accounted for up to 75% of the success.

Conclusion: Rapid evolution on science and medicine are excellent BUT of insignificant importance in this issue because of the factors like: high poverty, poor governance and inaccessibility of diabetes supplies; hence education remains the cheapest and most efficient tool for diabetes advocacy and empowerment to the masses of deveolping nations like Cameroon. Re-assessment of available guidelines is therefore very vital for diabetes programs in developing nations.

P/WED/18

Macronutrient intake amongst type 1 diabetic patients attending the paediatric and adolescent diabetes clinic at Johannesburg Hospital

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Aim: Optimal blood glucose levels can only be achieved when a balance is obtained between insulin action and carbohydrate availability. We suspected that carbohydrate intake in our population exceeded ISPAD and ADA recommendations and this was contributing to poor diabetes control. Our aim was to assess the macronutrient intakes and dietary composition of a group of type 1 diabetic patients attending the paediatric diabetic clinic at the Johannesburg hospital, and to compare their intakes to the recommended ISPAD consensus guidelines of 2000.

Methods: Interviews with each of the 43 consenting, cross-cultural, male and female type 1 diabetic patients, aged 3–18 years, who attended the Johannesburg Hospital paediatric diabetic clinic patients and their caregivers were performed by the same qualified dietician (A.P) Dietary intake was assessed using a detailed 24 hour recall with the aid of flash cards and paper-based portion models. The reported intake was analysed using Food Finder 3®.

Results: The average carbohydrate and protein contributions to total intakes were higher, while the fat contribution was within or below the ISPAD recommendations.

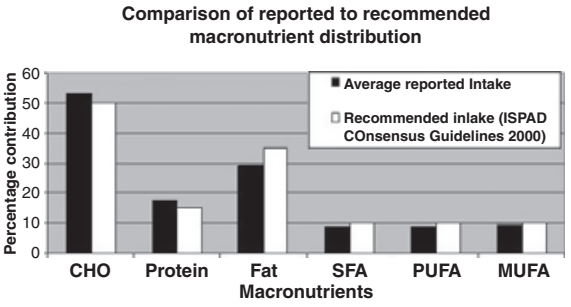

Figure 1. Macronutrient Distribution

Energy (kJ) intake compared to RDA showed a predominance of total energy deficits while BMI SDS scores were positive.Median HbA1c was 11.1%.

Discussion: The macronutrient distribution of reported intakes in our diabetic population are aligned with both the ISPAD and ADA consensus guidelines. While global underreporting is suspected it was not limited to any particular macronutrient. Our study did not show excessive carbohydrate intakes to be the cause of elevated HbA1c levels, rather non-compliance with insulin administration seems to be the major obstacle to successful management.

P/WED/19

Bedside monitoring of blood β-hydroxybutyrate can shorten hospitalization for diabetic ketoacidosis in children and lower the cost

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Bedside monitoring of blood b-hydroxybutyrate (B-OHB) is gaining popularity in treatment of diabetic ketoacidosis (DKA). Previously, we demonstrated that the levels of B-OHB correlate closely with time-dependent levels of venous pH, bicarbonate, and pCO_2. The purpose of this study was to evaluate the effect of bedside monitoring of blood B-OHB levels on duration of hospital stay and the cost of admission for DKA.

Methods: All children admitted to our hospital for DKA during a period of 20 months were treated using a standard treatment protocol. DKA and its severity were defined using the 2007 ISPAD criteria. Bedside monitoring of blood B-OHB, on average every 2 hours, using the Precision Xtra™ (Abbott Diabetes Care, Abbott Park, IL) was added to the protocol in 53 randomly

selected patients with type 1 diabetes admitted for DKA. Patients who received iv fluids or insulin prior to admission to our hospital were not included. The direct hospital cost and the length of admission in the B-OHB group were compared to those of 53 DKA control patients treated concurrently but without B-OHB monitoring (no B-OHB). Controls were frequency matched on age (median 12 years vs. 12 years in the B-OHB group), severity of DKA (pH 7.17 vs. 7.16) gender (female 60% vs. 57%) and duration of diabetes (newly diagnosed 57% vs. 51%).

Results: Table 1 summarizes comparisons of the length of stay (LOS) and cost of hospitalization between study groups. The length of hospital stay was slightly shorter in the B-OHB group, compared to the No B-OHB group, but the difference did not reach the level of statistical significance. The cost of hospitalization was borderline lower in patients whose B-OHB levels were monitored at the bedside.

Study group	Median LOS (range)	Mean LOS (SD)	Median Cost (range)	Mean Cost (SD)
B-OHB	24 (4–106)	29 (21)	10.657 (1.581–31.983)	11.526 (6.301)
No B-OHB	26 (4–145)	36 (31)	14.358 (2.154–40,657)	14.441 (8.738)
p-value	0.22	0.17	0.11	0.05

While this preliminary evidence suggests benefit, the exact mechanisms of lower cost are unclear. The B-OHB results were not part of routine hospital documentation and sometimes unknown to the provider who ordered laboratory tests, treatment and the timing of discharge.

Conclusions: The results of this unmasked intervention suggest that addition of blood B-OHB monitoring to standard DKA treatment protocol may reduce the length and the cost of hospitalization. Future randomized trials should evaluate overall cost-effectiveness and outcomes of such a modification.

P/WED/20

Diabetes duration is an important factor for HbA1c values in children with type 1 diabetes

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We aimed to investigate relations between hbA1c and diabetes duration, insulin doses, basal/bolus insulin ratios in children with type 1 diabetes.

Methods: Twenty-nine children and adolescents (aged 3–20.8 years) with type 1 diabetes were included the study. None of them was on honeymoon period. They were free of diabetic complications.All the patients were on intensive insulin therapy and they were educated for carbohydrate counting. Four cases were using NPH/insulin aspart, 6 cases were on insulin pump therapy with insulin aspart and 19 cases were using glargine insulin/insulin aspart.

Results: The mean of the total insulin/weigth ratio was 1.0 ± 0.2 (0.6–1.5). The median of the diabetes duration was 3.8 years (0.3–17.5 years), HbA1c was 7.7% (5.5–11.4) and basal/bolus ratio of insulin doses was 1.1 (0.4–3). HbA1c values were found to be correlated only with diabetes duration ($p = 0.07$, $r = 0.49$ spearman's correlation). There were not any correlation between hbA1c and age, total insulin doses, total insulin/kg ratio, basal/bolus doses ratio.

Conclusion: It seems that diabetes duration is an important factor for HbA1c values in type 1 diabetes children. We suggest that closer monitoring of patients with longer duration for diabetic complications is important.

Diabetes Care, Education, Psychosocial Issues II

P/WED/21

Parent-reported social, psychological, and health care factors associated with youth self-care success in the multi-national DAWN Youth Survey

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Objectives: This study assessed parent-reported social, family, psychological, and health care factors associated with perceived self-care success of their children with diabetes.

Methods: Data are from a cross-sectional internet survey of independent national samples of parents of youth (age 0–18) with diabetes (n = 4099) from the Diabetes Attitudes, Wishes and Needs (DAWN) Youth Survey. Respondents from the US, Japan, Brazil and 5 countries in Europe provided self-report data for all measures. Self-care success was a 7-item scale measuring success in controlling blood glucose, taking medications, SMBG, diet and exercise (alpha = .83). Hierarchical multiple regression was used to assess the correlates of self-care success.

Results: All factors were associated ($p < 05$) with self-care success (multiple r-squared = .40). There was significant variation among countries and with parent and youth demographic and disease characteristics. More information at diagnosis and more communication among health care team members were associated with more success. Greater perceived physician support, physician understanding of the difficulties of living with diabetes, and physician discussion of non-medical aspects of diabetes were associated with more self-reported success, and these factors mediated the relationships of self-care success with information at diagnosis and health care team communication. Parent involvement in physician visits and medical decision-making were associated with more self-care success. The two strongest correlates of self-care success were: (1) the degree to which there was clear agreement within the family about diabetes care responsibilities, and (2) patient's diabetes coping success; these factors accounted for 60% of the model's explanatory power.

Conclusions: Self-care success of youth with diabetes is multifactorially determined by social, health care, parent and patient factors. These results suggest that promising strategies for improving self-care outcomes include enhancing greater provider empathy and support, parent participation in health care, parent-child collaboration in self-care, and patient psychological coping with diabetes. Health care providers should seek to facilitate effective parent and patient participation in diabetes self-care.

P/WED/22

Burden of type 1 diabetes mellitus in children aged less than 6 years old in a UK region

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There is growing concern regarding provision of care for children with Diabetes especially in younger age groups.

Objectives: To assess current clinical practice in children aged 0 to 5.99 years with Type 1 Diabetes Mellitus (T1DM).

Methods: All Paediatric Diabetes centres (n = 17) within a single UK region (with a total population of children aged 0 to 15 years of 912, 047) were asked to provide retrospective data for the year ending 01/12/07. 15 (88%) centres responded. The data included information on presentation, initial and current insulin regimens, and HbA1c. Questionnaires from the centres on care provision and current clinical practice were completed by the Paediatric Diabetes Nurse Specialists at each centre.

Results: T1DM children aged 0–5.99 years comprised 6.4% (n = 168) of all children under Paediatric Diabetes Care in this region (n = 2629). Within the 97 T1DM children aged 0–5.99 years with duration of diabetes longer than 12 months, mean HbA1c over the previous 12 months was [median, (IQR)] 8.3%, (7.7–9.1%). 29% experienced one or more acute diabetes-related hospital admissions (i.e. severe hypoglycaemia/DKA) within the previous 12 months (other than at presentation of diabetes). Younger age was associated with higher mean HbA1c (B ± SE = –0.21 ± 0.09 % $year^{-1}$, p = 0.03) and with more frequent acute diabetes-related hospital admissions (B ± SE = –0.17 ± 0.08 episodes $year^{-1}$, p = 0.03). Mean HbA1c and frequency of acute diabetes-related hospital admissions also varied significantly between the 15 centres (both $P < 0.05$).

Conclusion: T1DM children aged < 6 years comprises a significant clinical burden, and the difficult clinical challenges increase with younger ages. Differences in outcomes measures between centres could relate to clinical practice, clinical provision, or geographical differences in deprivation rates.

P/WED/23

Does more frequent visits at the outpatient clinic improve metabolic control in children and adolescents with a high HbA1c?

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Objectives: The metabolic control in children and adolescents is often not satisfactory. Many present at the 3-monthly visits with HbA1c values higher than recommended, a few with very poor control, others with HbA1c values just above the acceptable limit. We hypothesised that families with good knowledge and understanding of diabetes due to a busy lifestyle loose focus on their child's diabetes and prioritise other activities than those that could help to maintain good metabolic control even if they have the resources and possibilities. We therefore wanted to evaluate whether the group of children/adolescents with a moderate or a high HbA1c would obtain an improved metabolic control by offering control-visits in the outpatient clinic more often.

Methods: Children with a HbA1c value above 8.0% were offered visits every 6 weeks. When and if the value decreased to below 8.0% they were again seen 3 monthly. Data from the year preceding the inclusion were collected retrospectively. From the day of inclusion data were collected prospectively.

Results: 79 of the 160 patients followed in the outpatient clinic were included as they had a HbA1c ≥ 8.0%. The 44 obtaining a HbA1c less than 8.0% (group I) were compared to the 35 who did not (group II).

Group I vs. group II (* indicates that the difference was statistically significant with $p < 0.05$):

HbA1c 12 months prior to inclusion.*: 8.4 (6.8–12.3) vs. 9.5 (8.1–14.1)

HbA1c at inclusion*: 8.5 (8.0–12.5) vs. 9.4 (8.1–14.1)

Number of injections at inclusion: 4 (2–7) vs. 4 (2–5)

Changes in HbA1c*: –0.9 (–4.6 – –0.1) vs. –0.3 (–4.3–1.0)

Changes in BMI: –0.8 (–5.5 – 0.7) vs. –0.8 (–4.3–1.0)

Changes in number of injections: 0 (0–4) vs. 1 (0–4)

Period followed every 6 weeks*: 4.9 months vs. 12.6 months

The likelihood of obtaining a HbA1c below 8.0% was 80%, 26% and 19% for children with an initial value below 9.0%, between 9.0% and 9.9%, or ≥ 10.0%, respectively.

Conclusions: During the 12 months preceding the inclusion the HbA1c remained high. During the period with 6-weekly controls both HbA1c and BMI decreased. The higher the initial HbA1c the more difficult it was to obtain acceptable metabolic control. By having the families focusing more on the diabetes a significant part of the children with moderately elevated HbA1c values can obtain an acceptable control. However, special interventions are needed for the ones with very poor control not responding to the more frequent visits.

P/WED/24

The effects of pilates exercise on metabolic control, physical performance and body composition in children with type 1 diabetes mellitus

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Pilates, which can be performed at home easily, consists of a variety of basic exercises and activities using both the aerobic and anaerobic energy metabolism of the body.

This study aims to observe the influence of Pilates exercise among children with type 1 diabetes and its effect on metabolic control, lipid profile and exercise capacity.

Anthropometric measurements, metabolic control and physical performance of 17 type 1 diabetic children aged 14.2 ± 2.2 years with a 5.2 ± 4.1 years of diabetes were studied before and after a 12 week Pilates exercise period. Anaerobic capacity of the patients was determined by peak and mean power (Wingate test) and vertical jumping test, aerobic capacity was determined by PWC170 test.

No significant difference was found at the end of 12 week Pilates exercise period in the body mass index SDS (0.04 ± 1,2 vs. 0.18 ± 1.22 kg/m^2); body fat percent (18.49 ± 8.25 vs. 18.06 ± 8.01%); HbA1c (8.5 ± 1.3 vs. 9.0 ± 1.5%); insulin doses (1.05 ± 0.3 vs. 1.04 ± 0.24 U/kg) and total cholesterol, HDL-C and LDL-C (169.29 ± 23.94 vs. 165.62 ± 25.98 mg/dl, 53.82 ± 11.14 vs. 57.31 ± 9.41 mg/dl 88.29 ± 17.85 vs. 83.12 ± 16.6 mg/dl respectively) of the patients.

Peak and mean power of the patients improved significantly (491.18 ± 236.48 vs. 509.56 ± 226.8 watt p:0.028, 362.21 ± 177.7 vs. 386.46 ± 180.75 watt $p < 0.005$) at the end of 12 weeks. Vertical jumping of the patients improved from 35.7 ± 10.28 cm to 39.17 ± 10.0 cm $p < 0.005$. Aerobic capacity of the patients decreased nonsignificantly from 1.75 ± 0.58 to 1.69 ± 0.35 watt/kg.

Flexibility of the patients increased significantly at the end of the exercise period (0.4 ± 5.1 vs. 8.4 ± 5.2 cm $p < 0.005$).

Although this preliminary study showed no benefit of Pilates exercise on the metabolic control of type 1 diabetes mellitus in short term, it clearly increases physical performance of the patients and could effect the metabolic control in the long run.

P/WED/25

International Diabetes Federation "*Life for a Child*" program

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In developed countries, people with diabetes generally have ready access to care, so they can lead healthy and productive lives. In contrast in many developing countries, particularly in Sub-Saharan Africa, insulin is often unavailable or unaffordable. Clinics and health centres may not be able to measure blood glucose. Few people are able to self-monitor. Some countries do not have any capacity to measure HbA1c. Many children with diabetes in developing countries die soon after diagnosis, or have poor control and quality of life and develop early and devastating complications. The International Diabetes Federation *Life for a Child* Program aims to help these children by assisting diabetes centres to provide insulin and other essential components of care.

The program commenced in 2000, and is run from Sydney Australia with the assistance of Diabetes Australia-NSW and HOPE *worldwide*. Core funds come from individual donors in Australia, the Netherlands, USA, and other countries. Most donors contribute an equivalent of "a dollar a day". In addition, funds are donated by companies and diabetes associations. Partners include Insulin for Life and Rotary International.

We now support the care of almost 1,000 children in 17 countries around the world: Tanzania, Rwanda, D.R. Congo, Nigeria, Mali, Zimbabwe, Sudan, Azerbaijan, Uzbekistan, Nepal, India, Sri Lanka, Philippines, Papua New Guinea, Fiji, Bolivia and Ecuador. Support is provided to recognised diabetes centres. Priority needs (insulin, syringes, monitoring, education) are determined, a budget defined, and a specific list of the most needy children are supported. The cost to support a child for a year is US$200–400. The goal is to provide best-practice cost-effective care for that country. Health outcomes of the children, and financial trails are carefully monitored.

Disbursed funds have grown from US$12,276 in 2001 to a projected US$170,000 in 2008. Some highlights include: country-wide approaches, implementation of self-monitoring, extension of support from capitals to provincial centres, provision of HbA1c and biochemistry machines, establishment of registers and clinical data collation, recognition of children with type 2 diabetes, and supporting inaugural diabetes camps. The Program is also involved in research and advocacy at numerous international fora.

Support from new donors, and requests for assistance are welcome - please see www.lifeforachild.idf.org or contact the authors.

P/WED/26

Cross-sectional survey into quality of life issues for adolescents with type 1 diabetes using insulin pump therapy and other insulin regimens

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Objective: To explore quality of life differences between adolescents using insulin pump therapy versus other insulin regimens.

Methodology: Cross-sectional clinical data were collected and questionnaires were completed by 11–18 year old adolescents with t1dm across 21 centres in 19 countries. Quality of life was assessed using the Diabetes Quality of Life Youth Scale along with additional well-being measures (HBSC). HbA1c (DCCT adjusted) was measured centrally.

Results: Only centers with pump treatment were included (n = 1688, 15 centers). CSII group was slightly younger with longer diabetes duration compared with basal bolus, BD/TD or other insulin regimens. HbA1c, DKA, hypoglycaemia nor BMI differed significantly between them. After controlling for age, whether parents live together, whether mother is employed, and language difficulties, adolescent well-being ($F = 4.67$; $df = 3$; $p < 005$), parental burden ($F = 4.59$; $df = 3$; $p < 005$), parental rating of child's health ($F = 11.54$; $df = 3$; $p < 001$) and quality of life ($F = 4.99$; $df = 3$; $p < 005$) remained significantly different between the pump group and the other insulin regimens. Adolescents on intensive treatment (CSII and Basal-bolus) report lower well-being, whereas parents report improved health and quality of life for the CSII group.

Conclusions: Adolescents with pumps appear to report better Quality of life than participants using other insulin regimens, but without significant Quality of Life differences between intensive insulin regimens. Parents of adolescents using CSII therapy also report better Quality of Life. Center differences, age and selection criteria for pump use may contribute. Longitudinal follow up is recommended.

P/WED/27

Twenty years of multiple daily injections from the onset of diabetes in children and adolescents

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Results from the DCCT study suggest that persons using intensive insulin therapy have a better longterm outcome even when compared to persons with the same HbA1c using conventional therapy (Diabetes 1995;44:968–83). From 1987 we have routinely used multiple daily injections (MDI) from the onset of diabetes in all age groups. The aim of this retrospective population based study was to investigate the risk of short- and longterm complications in patients with ≥ 8 years diabetes duration. 106 consecutive patients with type 1 diabetes have been followed (101 began with MDI at diagnosis and 5 within 1 year of diagnosis). They are today 24.4 ± 6.6 years (± SD, range 10.5–36.3) with a diabetes duration of 14.9 ± 4.4 years (range 8.1–23.3). Thirty-three (31%) use pumps and 2 (2%) use indwelling catheters (Insuflon). 32/105 (30%) had retinopathy (28 non-proliferative and 4 proliferative, all with preserved vision). Five were treated with laser. The youngest person with retinopathy was 20.9 years and the shortest diabetes duration was 8.1 years (diagnosed at 18 years). Six out of 101 (6%) had nephropathy (5 microalbuminuria, 1 macroalbuminuria and in dialysis). The youngest person with microalbuminuria was 26.1 years and the shortest diabetes duration was 15.3 years. 10/101 (10%) had systolic blood pressure (BP) > 130 mmHg, and 10/101 (10%) had systolic BP > 80 mmHg. Three were treated with drugs for microalbuminuria and 4 for hypertension without microalbuminuria. Sixteen patients experienced severe hypoglycemia in 2006, and 27 in 2007. There was no difference in HbA1c between patients with and without severe hypoglycemia in 2006 (8.8 vs. 8.3%) or 2007 (8.1 vs. 8.2%). Mean of last HbA1c was

8.1 ± 1.6% (DCCT-equivalent numbers) and mean HbA1c over the entire diabetes duration was 8.3 ± 0.9%. Patients with retinopathy had higher mean yearly HbA1c (8.7 ± 0.9 vs. 8.1 ± 0.8%, $p < 0.001$) and higher HbA1c load (added mean yearly HbA1c), 148 ± 39 vs. 111 ± 33 HbA1c-years ($p < 0.001$). Patients with proliferative retinopathy had mean HbA1c of 10.0% and 196 ± 29 HbA1c-years ($p = 0.003$ and 0.006 vs. non-proliferative retinopathy). Patients with nephropathy also had higher HbA1c load (154 ± 23 vs. 118 ± 37 HbA1c-years, $p = 0.034$) and slightly higher HbA1c (8.9 ± 1.0 vs. 8.2 ± 0.8%, $p = 0.059$). A longer follow-up is needed but so far this non-selected patient group using MDI from the onset of diabetes has a low risk of long-term complications with an acceptable rate of severe hypoglycemia.

P/WED/28

Factors affecting postsurgical blood sugar levels in children and youth with type 1 diabetes (T1D) undergoing surgical procedures

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Surgery and anaesthesia are considered as stress factors and are expected to cause hyperglycemia in T1D patients undergoing procedures.

Objectives: To assess factors affecting postanaesthetic blood sugar (Post BSL) levels in children and youth with T1D undergoing surgical procedures.

Methods: Retrospective analysis of all T1D patients who underwent anaesthesia and surgery from Dec 2002–Dec 2006 (n = 78) was conducted.There were 28 males (36%).The mean ± SD preanaesthetic blood sugar levels (Pre BSL) were 10.8 ± 4.5 mmol/l, age 11.8 ± 4.3 years, A1C 8.5 ± 1.6%, duration of T1D 5 ± 3.5 years, duration of anaesthesia and surgery 83.4 ± 82 min and pre/intraoperative insulin dose 0.16 ± 0.2 u/kg. The procedures included endoscopy (n = 22), dental (n = 14), minor ENT (n = 10) and others (n = 32).The fluid types were D5/0.45NS (n = 55), D5NS (n = 15) and saline lock (n = 5).There were 65 patients (84.4%) who underwent intravenous anaesthesia induction and the rest were induced by inhalation. We used multiple regression analysis after an initial univariate analysis of all the variables, with (Post BSL) as the dependent variable and (Pre BSL) together with age, sex , A1C, duration of T1D , daily insulin doses, insulin regimen, pre/intraoperative insulin dose, duration of surgery, types of fluid and mode of anaesthesia induction as the independent variables.

Results: There was no significant change ($p = 0.74$) in the blood sugar levels from pre (10.8 ± 4.5mmol/l) to post (10.7 ± 4.3 mmol/l) procedure. Pre BSL ($p < 0.0001$), duration of T1D ($p = 0.0013$) were positively correlated with postBSL, while insulin regimen (number of insulin injections $p = 0.0441$) was negatively related to the Post BSL. There were no complications noted in any of the patients.

Conclusion: PreBSL was the best predictor of post BSL. Duration of T1D was directly related to Post BSL, whereas number of daily insulin injections was inversely related to PostBSL. Current approaches to the perioperative management of children and youth with T1D undergoing minor surgical procedures are safe and effective. Better control of preoperative BSl using more intensive insulin regimens may allow tighter glycemia to be safely targeted during these procedures.

P/WED/29

The importance of support group for adult and adolescent type 1 diabetes

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The support groups for adult diabetes are available in our country, but these are mainly for type 2 diabetes. The support group for childhood type 1 diabetes is also common but these are not for young adult onset diabetes. So, young adult and adolescent type 1 diabetes patients were tending to isolate in those support groups. To improve this circumstance, we started new support program for young adult and adolescent type 1diabetes patients in 1998 in Osaka area and 30 times of conferences have been held since then. Our program is composed of main lecture and group discussion. We talked about job, marriage, accouchement, labor, diabetic control, diet, sports, unconscious hypoglycemia, and so on. Most of the attendants felt ease and comfort each other. The number of member was 30 people in 1998. It has been expanded to 200 people in 2008. Many members came from other prefectures. They start to establish the same support groups in their own communities. The support groups specific for young adult and adolescent type 1 diabetes patients are also very important in addition to support groups for adult and childhood diabetes.

P/WED/30

Influence of age and BMI increase the first month after diagnosis on the rate of remission in newly onset type 1 diabetes. Results from the Hvidoere Study Group

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Objectives: It has been hypothesised that patients who gain less weight after presenting with type 1 diabetes are more likely to remit during the subsequent weeks. The objective of the current longitudinal investigation was to investigate the association between the proportion of children and adolescents who are in remission 12 months after diagnosis and the BMI increase from diagnosis to one month.

Methods: The study design was multicentre longitudinal investigation in 18 paediatric departments representing 15 countries in Europe and Japan. 275 children and adolescents less than 16 years with newly diagnosed type 1 diabetes were enrolled between August 1999 and December 2000. Height, weight and HbA1c, determined centrally were recorded at 0, 1, 3,6,12 months. Boost-stimulated C-peptide test was carried out 1,6,12 months in 259 children. Partial remission was defined as stimulated C-peptide ≥ 300 pmol/l. A logistic regression was performed with remission status at 12 months as response (stimulated C-peptide) and BMI increase from diagnosis to one month as predictor together with age groups 0-4 years, 5–9 years and +10 years and standard bicarbonate at onset.

Results: By this analysis a negative association between stimulated C-peptide and BMI (-0.36, regression coefficient, $p < 0.046$) and a positive association for standard bicarbonate (0.07, regression coefficient, $p < 0.02$) was shown. There were a reduction in the chance of being in remission of 30% (1–51%) at 12 month with an increase of 1 (kg/m2) during the first 3 month. Disease duration as assessed by polyuria and polydipsia had no influence on BMI increase when standard bicarbonate and HbA1c at onset were accounted for in the mathematical model.
Conclusions: We conclude that significantly more patients enter remission if they only have a slight increase in BMI the first month after diagnosis. If type 1 diabetes reflects beta cell loss accelerated by insulin resistance in very susceptible children, weight gain (increasing insulin resistance) after diagnosis might reasonably shorten the period of remission.

Pumps and Sensors I

P/WED/31

Continuous subcutaneous insulin infusion in a case of glycogen storage disease and type 1 diabetes

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Glycogen Storage Disease (GSD) is a rare genetic disorder. Several types of GSD are now known (Type 0 - IX). GSD IX (~1/200,000 live births) results in marked hepatomegaly and fasting hypoglycaemia due to the inability to convert glycogen stores into glucose.
Objectives: We present an unusual case of a child (Y) with GSD IX who subsequently developed Type 1 diabetes and discuss the difficulties encountered in attaining glycaemic control.
Y presented with hepatomegaly, growth faltering and poor dentition at age 2 years and was diagnosed as having GSD Type IX confirmed by genetic analysis. Dietary therapy consisted of uncooked cornstarch, Maxijul and overnight nasogastric feeds. Management was aimed at maintaining normoglycaemia and minimising secondary complications.
Methods: At age six years, Y developed Type 1 diabetes. He was initially commenced on Mixtard Bd and then switched to a basal bolus regimen. Because Y ate meals slowly, hypoglycaemic episodes occurred and a trial of Actrapid Bd with Levemir at night was commenced. As glycaemic control remained poor, continuous subcutaneous insulin infusion (CSII) was introduced empirically.
Results:
After 12 months of CSII the following was achieved:

- A 30% reduction in Y's total daily insulin dose
- Reduction in HBA1c from 9.5–8.3%
- Improvement in weight (9^{th} to 50^{th} centile)
- Reduction in Liver size
- Reduction in rate of mild hypoglycaemic (BGL 2.6- 4mmol/l) from ˜3xdaily to almost negligible
- Avoidance of severe hypoglycaemia (BGL < 2.6 mmol/l)
- Increase in Y's energy and activity
- Reduction in parental anxiety

Conclusions: This case exemplifies the difficulties in the management of Type 1 diabetes where another (rare) condition affecting plasma glucose homeostasis co-exists. The use of CSII in a child with GSD and Type 1 diabetes is shown to be beneficial in optimising diabetes glucose control, growth potential and quality of life.

P/WED/32

Real-time continuous glucose monitoring in children: a transient effect on diabetes control

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Objectives: Recent studies seem to indicate that patients may benefit both from continuous , and intermittent use of the Real-Time Continuous Glucose Monitoring System (RT-CGMS, MiniMed, Medtronic), which is able to display interstitial glucose levels as soon as they are recorded. The system has not been yet evaluated as to its usefulness in routine pediatric diabetes care. We aimed to assess the effect of 15 dayś real-time monitoring of blood glucose on subsequent diabetes control in sub-optimally controlled children with type 1 diabetes (T1D).
Methods: The study included 19 children with T1D (9 girls, 10 boys, age 15.2 ± 2.2 years, diabetes duration 8.7 ± 4.0 years; mean ± SD) attending a single pediatric diabetes center. Inclusion criteria were age 10–18 years, HbA_{1c} (IFCC) between 6.0% and 9.0%, and treatment with insulin pump (CSII) for at least 6 months. All children were treated with rapid acting analogs. Their mean HbA_{1C} at entry was 7.4 ± 1.0%. The CGMS was applied at four different time points: (1) at entry, it was a blinded CGMS for 10 days as a baseline measurement, (2) then immediately followed by real-time monitoring open to the patient for 15 days, and then after a break of one week, (3, 4) two further blinded CGMS measurements were done. The patients were specifically instructed not to change their dietary regimen, and to measure glycemias at least four times a day. Average daily glycemia, duration of hyper- and hypoglycemic episodes and the respective areas above or under the limits were then analyzed using Wilcoxoń s test. Changes in HbA_{1c} were evaluated using paired t-test.
Results: The application of RT-CGMS led to significant decrease in average glycemias ($p = 0.01$) and in the proportion of time with both hypoglycemia ($p = 0.03$) and hyperglycemia ($p = 0.003$), as compared to the baseline measurement. Consequently, the children were normoglycemic for a significantly longer time ($p = 0.004$). However, this improvement did not persist until the third and fourth CGMS measurements blinded to the patients: their values were very tightly correlated with the baseline measurement. Neither HbA1C nor total insulin dose changed during the study period.
Conclusion: There is a prominent immediate beneficial effect of the RT-CGMS on parameters of glucose control, which however does not persist after weaning off the system.
Support: Grant No. 64203 (Ministry of Health of the Czech Republic).

P/WED/33

Intensive insulin pump therapy for adolescents with type 1 diabetes from diagnosis: QOL, self-efficacy and adjustment at 12 months

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Introduction: Achieving excellent glycaemic control is especially difficult during adolescence. It has been suggested that intensive therapy from diagnosis may facilitate the maintenance of tight

glycaemic control following the honeymoon period but the psychological impact of such therapy has not been evaluated at that time.

Aim: The aim of this study was to assess the impact of intensive management with pump therapy from diagnosis on Quality of Life (QOL), adjustment and self-efficacy in adolescents with Type 1 diabetes compared with routine treatment.

Method: Subjects were randomised at diagnosis to one of two groups: routine therapy (controls) or intensive management. For this study, routine management subjects were 13 (males = 10, mean age = 14.1) and intensive management subjects were 14 (males = 8, mean age = 14). There was no significant difference between the groups at diagnosis on measures of psychosocial functioning. Subjects were asked to complete the following questionnaires: Diabetes Quality of Life for Youth (DQOLY) which contains the Worry, Impact and Satisfaction scales, ATT19, Self-Efficacy for Diabetes scale (SED) at 12 months after starting the study. Nonparametric tests were used to analyse the data.

Results: The average scores for both the treatment and control groups were within normal ranges across all the psychological measures.

The results indicated that at 12 months there was a significant difference between the groups on the QoL Satisfaction scale ($p = 0.048$) with the treatment group reporting higher satisfaction than the control group.

Conclusion: These results indicate that intensive management with insulin pump therapy, does not appear to have a negative effect on QOL and adjustment and may even have a positive effect on patients' perceived satisfaction for managing their diabetes.

P/WED/34

Using insulin pump therapy in the management of insulin-dependent diabetes in childhood: the Leeds, UK experience

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Aims: Continuous subcutaneous insulin infusion (CSII) has been endorsed by the National Institute for Clinical Excellence (NICE) in the UK as a treatment strategy in certain individuals with Type 1 diabetes. The aim of the study was to evaluate the impact on glycaemic control and hospital admission rates of CSII therapy treated children diagnosed with Type 1 diabetes compared to their previous treatment strategy using standard insulin injections. Findings would be used to inform clinical practice across the Leeds Diabetes Service.

Methods: Patients with Type 1 diabetes treated using CSII therapy since 2002 who attended paediatric diabetes clinics in Leeds, UK were eligible. Data was abstracted onto a bespoke data collection form and entered onto an insulin pump clinical database. Baseline information on glycaemic control (HbA1c) and frequency/type of hospital admission was collected during the 12 month period before CSII was initiated and compared prospectively after the transition to pump therapy using multilevel linear regression.

Results: Data was included on 83 individuals ranging in age from 0 to 18 years, 54% of whom were female. Median age (range) when CSII therapy was initiated was 12 (0.3–17.6) years and total follow-up on CSII exceeded 160 patient years. The proportion of subjects treated using CSII therapy increased from 5% in 2002/3 to 24% in 2007. Mean (SD) HbA1c levels improved from a baseline of 9.4 ± 1.7% to 8.9 ± 1.5%, with multilevel regression indicating a significant reduction of 0.49% (95% CI: 0.30 to 0.78%). The improvement in HbA1c levels was sustained for up to 5 years after CSII therapy commenced. Regression modelling showed that age, sex and duration of diabetes were not significantly associated with change in HbA1c levels. Hospital admission rates fell for severe hypoglycaemia from 8.9 to 2.4 per 100 patient years although hyperglycaemia admissions remained largely the same (7.6 vs. 7.3 on CSII per 100 patient years).

Conclusions: Patients treated using CSII appear to exhibit both improved glycaemic control, which is sustained over the short/medium-term, and lower hospital admission rates for hypoglycaemia, representing a significant clinical benefit to patients and cost saving to the NHS. Further analyses are planned investigating other clinical outcomes and frequency of complications.

P/WED/35

CSII versus MDI cohort study in Slovenian children and adolescents with T1D

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Objective: To compare the long-term effects of CSII vs. MDI therapy in young Slovenian patients with T1DM. Metabolic control was evaluated in both cohorts and in subgroups of preschool children and patients with eating disorders.

Patients and methods: Data from the 613 young patients with T1DM were prospectively collected for HbA1c, BMI SDS and insulin requirement. Data from CSII and MDI cohort 2 years before and 5 years after CSII initiation were analyzed.

Results: HbA_{1c} significantly decreased in the CSII group 6 months after the beginning of CSII therapy (7.73% ± 1.09 vs. 8.31% ± 1.58; $p = 0.001$) and stabilized at 7.84 ± 1.09% after 5 years. HbA1c was significantly lower in the CSII group as compared to MDI group in the first 3 years after CSII treatment. Insulin requirements and BMI SDS increased slowly in both groups, but after 5 years remained significantly lower in the CSII group ($p = 0.02$). Insulin requirements were also lower in the CSII group ($p = 0.01$). In preschool children HbA_{1c} dropped significantly for –0.65%, $p = 0.04$. Even in patients with eating disorders glycemic control significantly improved after 6 months of CSII therapy (HbA1c –0.64%, $p = 0.001$) and stabilized in the 5 year period, without a significant increase in insulin requirements or weight gain.

Conclusions: The results demonstrated significant immediate and long-term benefits of CSII on glycemic control in young Slovenian patients with T1DM. Long-term improvement was significant for all age groups, including the group of preschool children, and the group of patients with eating disorders.

P/WED/36

Case study - continuous subcutaneous insulin infusion (CSII) in a three year old child with resolution of neuritic pain

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Objectives: To describe the clinical outcomes of CSII using the SPIN Method (Newcastle, Australia) in a three year old child with brittle diabetes leading to behavioural problems, ketosis, significant blood glucose fluctuations, and neuritic foot pain.

Methods: We present a detailed analysis of blood glucose profiles and their variability pre and post initiation of CSII, and other

relevant clinical data such as insulin dose, regimen, weight, height, HbA1c, BMI, episodes of grade three hypoglycaemia.
Results: Blood glucose levels pre CSII were analysed with a mean BGL 13.3 mmol/l standard deviation 5.75. Average HbA1c 8.9.
One hospital admission for grade three hypoglycaemia.
Blood glucose Levels post CSII were analysed with a mean BGL 9.2 mmol/l standard deviation 4.03. Average HbA1c 6.5.
One episode of grade three hypoglycaemia managed by family post CSII initiation.
Conclusions: This case clearly demonstrates the difficulties associated with treating ''Toddler Diabetes''. Increased sensitivity to insulin, variable appetite and activity levels and varying degrees of cooperation all contribute to the complexity of treating this condition. In this case multiple combinations of insulin's and regimens were trialled with poor outcomes. Initiation of CSII using the SPIN Method had a significant impact on improving blood glucose levels and reducing variability of blood glucose, with excellent metabolic control of diabetes maintained over the 11 months post CSII initiation, resulting in resolution of neuritic foot pain and behavioural problems.

P/WED/37

Improvement of HbA1c level in children and adolescents of Moscow Region with T1D after CSII therapy

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Objectives: All the affords in modern children diabetology are being made to achieve and maintain target levels of HbA1C and to reduce the invasiveness of therapy. Nowadays, pump therapy helps us to improve the state of the patient. Even if there was poor control of disease before it.
Methods: Eighty-five were included in the research (65%- girls). Middle age- 11.8 ± 0.7 years. Continence of T1D before the research -4.5 ± 1.24. There were 11 children of pre-school age (2–6 years), 31 children of primary school age (7–11), 43 adolescents (12–18). All these children had poor control of disease, not adhered to the diet and insulin therapy regimen, avoided to follow doctor's recommendations. HbA1C level and ratio of insulin needs to patient's weight were registered in each age group before CSII therapy and after 1.3 ± 0.25 years of it.

Results are given in the table.

	Before the start of CSII therapy		Afer the start of CSII therapy	
Age groups	HbA1c %	Insulin/ weight	HbA1c %	Insulin/ weight
Pre-school n = 11	9.3 ± 1.4	0.8 ± 0.1	7.8 ± 0.4	0.6 ± 0.2
Primary school children n = 31	10.7 ± 0.5	0.9 ± 0.3	7.6 ± 0.6	0.7 ± 0.2
Adolescents n = 43	9.65 ± 0.6	1.1 ± 0.6	8.1 ± 0.4	0.8 ± 0.2
All children	9.8 ± 0.8	0.9 ± 0.3	7.8 ± 0.5	0.7 ± 0.2

$P < 0.05$.

Conclusion: Pump therapy, used for long time in children with prior poor control, helps to improve carbohydrate metabolism significantly and to reduce the insulin dosage per weight ratio.

Diabetes Epidemiology

P/WED/38

Current status of A1C global standardization examined by the JDS calibrators

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Objectives: Current feasibility of mutual interpretations between IFCC, NGSP and JDS numbers is examined by the JDS Calibrators.
Methods: The JDS Calibrators have had both JDS and IFCC numbers for A1C certified by the IFCC reference method (RM) and the JDS RM. The ex-JDS Calibrator, Lot2, and current Calibrator, JCCLS CRM-oo4a (Lot3) has each 5 different levels of A1C specimens made of deep-frozen whole fresh blood. The equations between IFCC, NGSP and JDS numbers according to Clin Chem 2004 were as follows; IFCC mmol/mol = 10.78JDS% + 18.66 by Lot 2 and IFCC mmol/mol = 0.93NGSP% –23.5 by NGSP RM, and the equation between IFCC and JDS numbers was reported by JCCLS 2007; IFCC mmol/mol = 10.39JDS% –16.8. Lot 2 and Lot 3 were measured in 2001 and 2007, respectively, by field methods certified by either JDS or NGSP. Statistical significance of accuracy in each field method was evaluated by CV and the differences from certified numbers were shown by absolute relative difference (ARD). Furthermore Lot2 were repeatedly measured every 4 months for 6 years.
Results: Each field method satisfied CV < 1% in between assays. Equation of A1C % between NGSP-certified field HPLC method and JDS-certified field HPLC method showed; NGSP% = 1.001JDS% +0.1 and NGSP% = 1.11JDS% – 0.086, in 2001 and 2007, respectively. If the same JDS% was observed by Lot2 and Lot3 calibrations, ARD in IFCC number revealed < 2.3% at largest. Where certified IFCC numbers of Lot3 were 30.3, 37.9, 55.8, 78.5 and 103.7 mmol/mol, at levels 1 to 5, respectively, JDS-certified field HPLC method showed 30.0,37.1, 55.2,78.7 and 102.2 resulting in ARD from certified number < 1.4% at largest; NGSP- certified filed HPLC method showed 31.2,38.8,59.3, 86.7 and 115.6, thus resulting in ARD 2.4–11.5%. CV in between-assay of Lot 2 level 1–5 was < 1.9% at largest for 6 years.
Differences in A1C by HPLC and immuno-assay were not significant as field methods.
Conclusions: Currently mutual interpretation between NGSP and JDS numbers remains yet to be satisfied in field methods, although significant linear co-relation may be obtained for the traceability in each designated comparison method (DCM). Master equations should not be used between NGSP and JDS numbers until IFCC-derived NGSP and JDS numbers are induced into each manufacturer's field method. Calibrators with IFCC and each DCM number may be useful for A1C global harmonization.

P/WED/39

Associations between allelic variants of the vitamin D receptor gene and type 1 diabetes mellitus onset vary by ambient winter ultraviolet radiation levels: a meta-regression

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Vitamin D receptor (*VDR*) gene polymorphisms have been reported to be associated with the risk of developing type 1 diabetes mellitus but reports have been conflicting. Here, we re-examine population-based case control studies reporting on selected *VDR* polymorphisms and T1DM to investigate whether variation of reported associations could be partly explained by differences in ambient winter ultraviolet radiation (UVR) levels.
A meta-analysis was conducted on 16 studies across 19 regions (mid-winter UVR range from 1.0 to 133.8 mW/m^2). The association between winter UVR and the log odds ratio was examined by meta-regression. For *Fok*I and *Bsm*I, the magnitude of the log odds ratio for the association between F and B alleles respectively and T1DM increased ($p = 0.039$, $p = 0.036$ respectively) as regional winter UVR increased. The association between *Taq*I T allele and T1D reduced with increasing winter UVR ($p = 0.040$). In addition, low winter regional UVR was associated with a higher proportion of controls carrying *Bsm*I and *Apa*I upper case alleles and a lower proportion of controls carrying *Taq*I upper case alleles. The findings from this report strengthen the case that *VDR* variants are involved in the aetiology of T1DM. These findings suggest that environmental UVR conditions may influence the association between *VDR* genotype and type 1 diabetes risk. Further work on the role of *VDR* polymorphisms in type 1 diabetes mellitus should occur in the context of a concomitant examination of the role of past UVR exposure and vitamin D status.

P/WED/40

Childhood type 1 diabetes in Croatia: incidence and trends from 1995 to 2003

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Aims/hypothesis: The aim of this study was to examine incidence and trends of Type 1 diabetes in children aged 0–14 years in Croatia from 1995 to 2003.
Methods: Two sources were used to obtain the incidence data. Patient group was aged 0 to 14 years, and subgroups 0 to 4, 5 to 9, and 10 to 14 years. Calculation of the incidence was done as the number of newly diagnosed Type 1 diabetes patients per 100 000 person-years for the above mentioned patient group and subgroups. Standardized incidence was calculated using the method of direct standardization to the world standard population for the age group 0–14 years. Capture-recapture method was used to estimate the ascertainment. Poisson regression model was used to analyze the trends in the incidence of Type 1 diabetes for period from 1995 to 2003 in Croatia.
Results: The standardized incidence of Type 1 diabetes for the whole age group was 8.87 per 100 000 person-years (95% CI: 5.07–12.68), for girls 8.47 (95% CI: 7.54–9.41) and for boys 9.26 (95% CI: 8.30–10.21). During the studied period, the trend in incidence raised significantly for the whole age group ($\chi^2 = 32.6$, $p < 0.001$). The average annual increase in incidence was 9% (95% CI: 5.8–12.2).
Conclusions/interpretation: Results obtained from this study place Croatia among countries with moderate risk for development of Type 1 diabetes. The average annual increase in incidence of 9% is markedly higher than in most European countries, and probably reflects lifestyle changes upon economic recovery of the country.

P/WED/41

Features of Egyptian type 1 diabetic toddlers

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Background: The incidence of type 1 diabetes mellitus is increasing worldwide especially in toddlers and preschool children in whom the disease appears to run a more accelerated course than the elder age group.
Aim: To determine the epidemiological and clinico-pathological features of type 1 diabetes in Egyptian toddlers and preschool children.
Methods: 120 diabetic patients were included divided into two groups: according to age at presentation: group I ($n = 60$), aged ≤ 5 years at presentation (32 males and 28 females) diagnosed in the period from January 1st 2006 till December 31st 2006; group II ($n = 60$), aged > 5 years at presentation (30 males and 30 females). They were diagnosed in the period from January 1st 2000 to December 31st 2005. Patients were subjected to thorough history, and examination. Laboratory investigations included; random blood sugar, HbA1c every 3 months as well as C-peptide assessed initially and after 6 months. Structured questionnaire was filled by parents for assessment of risk factors.
Results: There was a steady increase in the percentage of diabetic toddlers and preschool children in relation to total number of diabetic patients diagnosed in the 6 years period, increasing from 16% in the year 2000 to 23.3% in year 2005. The median duration of exclusive breast feeding was 2 months in patients with early onset versus 4 months in patients with late onset of diabetes. The median duration of total breast feeding was 9.5 months versus 11.2 months in early onset and late onset respectively. Median age of introduction of cows milk was 2.5 months in early onset diabetics (range 1–5.3) compared to 4 months in late onset diabetics (range 2–7). History of preceding clinical infection (febrile illnesses) occurred in 73.3% and 33.3% in diabetic toddlers and older age group respectively ($p < 0.0001$). 50% of young diabetics were diagnosed in winter and autumn versus 25% of older group (< 0.05). More aggressive disease presentation in the toddlers group as 75% had DKA as a presenting symptom compared to 38.3% of the older diabetics ($p < 0.0001$). Higher initial random blood sugar in diabetic toddlers compared to older age group ($p < 0.0001$). Higher incidence of major hypoglycemia in young diabetics compared to older age group ($p < 0.0001$). Higher mean insulin dose and mean random blood sugar follow up values were found in young diabetics ($p < 0.01$). Young diabetics had significantly lower initial C-peptide values ($p < 0.0001$) as well as significantly lower 6 months follow up values ($p < 0.0001$), compared to older age. Initial C-peptide values were negatively correlated with initial RBS ($r = -0.335$; $p < 0.05$) and mean insulin dose ($r = -0.609$; $p < 0.0001$) while its positively correlated with age at presentation ($r = 0.538$; $p < 0.0001$).

Conclusion: The role of environmental factors in triggering type 1 DM was highlighted especially in toddlers with more aggressive presentation and disease course which was related to lower β-cell reserve.

P/WED/42

Change of incidence rate of type 1 diabetes mellitus in children from central Poland during the last 25 years

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Objective: In the 1980s Poland was among the countries with low incidences rate of type 1 diabetes mellitus in children. However in the last decades type 1 diabetes mellitus has been recognized more often in Poland.

Aim: The aim of this study was to establish the change in incidence rate of type 1 diabetes mellitus in children in Central Poland during the last 25 years (1983–2007) and to estimate its relation to sex and age.

Materials and methods: The population of 4,75,000 children (0 to 14 year.) since 1983-01-01 to 2007-12-31 was observed. The date of first insulin injection was recognized as the onset of type 1 diabetes mellitus. Data were collected from diabetic out-patients clinics, pediatric hospitals and local diabetic association. The ascertainment was estimated to be over 95%. Incidence rate was expressed as the annual number of newly diagnosed diabetic cases per 100 000 age-adjusted population. Mid-period incidence rate for three-year periods were compared since the annual differences were observed.

Results: A total number of 1215 newly diagnosed type 1 diabetic patients (639 boys, 576 girls) were registered during the period of 25 years. In Central Poland the mean incidence rate for the years 1983–2007 in was estimated at 9.59/100 000/year (95% CI; 9.08–10.10). Incidence rate increased from 4.81 (95% CI: 2.28–7.34) in the years 1983–85 to 20.09/100 000/year (95% CI: 17.54–22.64) in 2005–2007. The total incidence rate for 0–4 year-old group was 6.19/100 000/year (95% CI: 5.47–6.19), for 5–9 year-old group - 18.72/100 000/year (95% CI: 17.05–20.41) and for 10–14 year-old group - 11.49/100 000/year (95% CI: 10.55–12.42). In all age groups an increase in incidence rate of type 1diabetes mellitus was observed: 0-4 year-old group –2.56 vs. 14.40, 5–9 year-old group – 3.51 vs. 25.55 and 10–14 year-old group –6.43 vs. 19.94. No significant difference was observed in the incidence rate between diabetic boys and girls 9.88/100 000/year (95% CI: 9.16–10.61) vs. 9.29/100 000/year (95% CI: 8.57–10.00).

Conclusion: During the last 25 years Central Poland became a region with rapidly increasing incidence of childhood type 1 diabetes mellitus. The highest incidence rate was observed in the age group of 5–10 years old.

P/WED/43

Efficiency of insulin analog application with patients suffering from type 1 DM in the Russian population

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Objectives: To compare incidence of vascular diseases and other complicating diseases among two groups of patients suffering with DM of type 1 (T1DM): i) patients that take analogs of insulin in past 5 years and ii) patients who take human insulin permanently since the outset of their disease.

Methods: From May, 2002, to November, 2007, a random sample of patients suffering with T1DM (n = 5894: 100% are > 20 years old) with disease duration of 10 years was examined in the territory of Russia (in Central, Volga, Ural, Siberian, North-Westernm, Southern Federal districts). For all patients examination of eye ground was performed (examinations were carried out in doctor's consulting rooms) and diabetic foot, albumen and level of HbA1c (%) were determined. Anamnesis data of patients: (weight, length, age of disease outset, type of insulin) were derived from patient register cards, according to data provided by regional diabetes care centers. Statistical processing of data was carried out by method of variance analysis ANOVA and student non-parametric criterion, value p, Me ± SD.

Results: The mean age at the moment of examination in group 1 (n = 2173; 36.9%) comprised 22.76 ± 0 years, in the second group (n = 3721; 63.13%) it comprised 23.52 ± 0.99 years SD. The average age of debut was 13.89 ± 0.74 (1) and 14.18 ± 0.65 (2). Ratio of males to women inside groups (1) and (2) was 1.5 to 1. The mean level of HBA1c among patients of group 1 was certainly lower than among patients of group 2. (Me is 8.5 ± 0.2% and 9.7 ± 0.4% SD, respectively), p > 0.01. Average daily dose of insulin in group (1) was > 1.0 per a kilogram of a patient's weight, in the group (2) it was ? 1.0 per a kilogram of a patient's weight. Incidence of vascular diseases and other complicating diseases that accompany diabetes was really lower among patients of group (1), p < 0.05 (see table).

Complications	Patients (1) n = 2173	Patients (2) n = 3721	p-value
Cataracta	21.1%	33.4%	0.01
Retinopathy	33.5%	52.9%	0.03
Nephropathy	36.4%	44.6%	0.006
Neuropathy	32.1%	54.3%	0.04
Diabetic foot ulcers	2.3%	4.7%	0.003
Physical development delay	0.8%	1.6%	0.00007
Chairopathic	14.3%	17.6%	0.001

Conclusions: The highest correlation between analogs of insulin and decrease of complications development risk in group (1) are identified for nephropathy, diabetes foot syndrome and physical development retardation.

P/WED/44

Age-specific incidence of type 1 diabetes mellitus in children's population in Russian Federation during 2001–2006

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Objectives: The incidence of type 1 diabetes mellitus (DM1) annually increases in children's population in Russian Federation (RF). The territory of RF is large and subdivided into seven Federal districts (FD), located in various geographically-defined areas: Northwest, Central, Volga, Southern, Urals, Siberia, Far East.

Aims: To estimate the age-specific incidence rates (IR) of DM1 among the children's population of RF during 2001–2006 years.

Methods: The information was received from national Register of DM and annual statistical reports from endocrinologists. The degree of ascertainment was calculated in accordance to capture/recapture method. The incidence was calculated on 100 000 the children's population. The confidential interval was 95%.The age standardized incidence was obtained using the direct method with a

standard population consisting of equal members of children in each of three subgroups (0–4, 5–9, 10–14 years of age).
Results: During 2001–2006 years an average incidence of DM 1 among children in RF was 10.2/100000 (95% CI: 8.7-11.0), age standardized incidence was 9.2/100000 (95% CI: 8.4-11.3). The age-specific IR has been increased with age and was higher in the 10- to 14- year- old age group (13.6/100000), than in on 0- to 4- year- old age group (6.4/100000) and in the 5- to 9– year- old age group (11.2/100000). The average annual IR gain was 8.2% in on 0- to 4- year- old age group, 10.3% in on 5- to 9- year- old age group and 4.7% in on 10- to 14- year- old age group. The age-specific IR were different among FD of RF. The highest IR was constantly registered in Northwest district. IR were considerably below in Siberia and Southern district. An incidence was similar to an average level in RF in Central, Volga and Urals districts. It was observed significant IR rise in Far East district during 2005–2006 years.
Conclusion: In 2001–2006 years the age-specific Incidence of DM1 in children's population in RF were similar to most European countries and was the highest in the 10- to 14- year- old age group. The maximum IR gain was registered in the 5- to 9- year- old age group. The decrease of IR was observed in a direction from northwest on a southeast of RF.

P/WED/45

Ketoacidosis at presentation of type 1 diabetes in children in Kuwait: frequency and clinical characteristics

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Objective: To describe the incidence and severity of diabetic Ketoacidosis (DKA) at initial diagnosis of type 1 diabetes (T1DM) in children in Kuwait.
Methods: Five hospitals, all of which have pediatric diabetes clinics participated in the study. Hospital records of 674 patients below the age of 12 years who were diagnosed with type 1 diabetes from January 1st 2000 to December 31st 2006 were retrospectively reviewed. Clinical and laboratory data were analyzed. DKA was defined as blood glucose > 11 mmol/l, pH < 7.3 or bicarbonate < 15 mmol/l and ketonuria.
Results: At diagnosis, 47.8% of all patients presented with diabetic ketoacidosis at the onset of their illness. The mean age of these patients was 5.3 years. The frequency of DKA was higher in girls than in boys (44.4 vs. 39.1%; $p < 0.001$). Most of the ketoacidosis were mild to moderate (81.1%), and only 18.9% had severe form. Thirteen (81.2%) of patients younger than 2 years had severe DKA, compared to 42% in the 2–4 years old, 3% in 4–6 years old and 1.6% in those older than six ($p > 0.0001$). The incidence of DKA at initial disgnosis was constant in the period of 2000–2003 (50–59%), but decreased significantly in the following years reaching 29% in 2006; ($p < 0.001$). One child (0.14%) died, 24.3% had altered level of consiouness, and 27 (4%) needed ICU care; all were younger than 4 years. None had neorological sequale on discharge.
Conclusion: The frequency of DKA at onset of type 1 diabetes in children in Kuwait is high, although has significantly decreased in the last 2 years. However, children aged less than 2 years still remain at high risk. Increasing the general awareness of disease symptoms in public as well as pediatricians dealing with sick children can raise the index of suspicion for this treatable condition, leading to early diagnosis before the development of acidosis.

P/WED/46

Some epidemiological characteristics of T1D, T2D and obesity in children of Moscow population

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Objectives: Nowadays, a lot of researches are devoted to the role of insulin resistance and preceding obesity in T1D pathogenesis. The new form between T1D and T2D - double diabetes - is defined. In order to study this problem, dynamics of T1D and obesity incidence were researched in the population of children 0–14 years in Moscow in the period between 1996 and 2005 years.
Methods: Incidence and prevalence of T1D, T2D and obesity was estimated by the amount of registered and newly onset cases in Moscow population with regard to sex of the patient. All the characteristics were evaluated per 100 000 of children between 0 and 14 years of age.
Results: Overall mean incidence of T1D was 12.9 cases per 100 000 children, with significant increase in every three-year period. In the first period (1996–1998) it was 11.2 ± 0.36 ($p < 0.05$ everywhere) cases per 100 000; in the second (1999–2001) - 12.6 ± 0.73, in the third (2002–2005) - 14.4 ± 0.62. There were no significant differences in T1D incidence due to sex. Maximum mean incidence was noted in the group of children of 10–14 years old, it was 16.4 ± 2.19. Overall mean prevalence of T1D in children was 79.1 and has no significant changes during the period of study. Overall mean incidence of obesity in this 10-year period was 262 cases per 100 000 children per year. Maximum of the incidence was fixed in the period between 2002 and 2005 years, it was 312 ± 16.3. Overall mean prevalence of obesity increased significantly during the period of study (1996–393 patients per 100 000 children, 2005–691). Correlation coefficient is 0.93 ($p < 0.01$). High obesity incidence causes high T1D incidence in the next 3 years ($R^2 = 0.58$, $p < 0.01$). Overall mean T2D incidence was 0.1 and didn't change during the period of study, despite increase of obesity prevalence. Overall mean prevalence of T2D - 0.38 and also didn't change in the period of study.
Conclusion: Incidence of T1D and obesity were both increasing continuously through the period of study, mainly in the period between 2002 and 2005 and in the group of children of 10–14 years old. These data shows the importance of insulin resistance forming up in T1D pathogenesis, and confirm the hypothesis of double diabetes as medium form between T1D and T2D. This theme needs to be investigated more, in order to work out new measures against obesity prevalence increase, which is a risk factor of T1D.

P/WED/47

Incidence of type 1 diabetes mellitus in children's population in the Udmurt Republic during 1988–2006

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Introduction: The incidence of type 1 diabetes mellitus (T1DM) increases annually in children's population in the Udmurt Republic (UR). Udmurtia is a multi-national republic. Udmurt nationality is 26% of population in the republic. Udmurt nationality is a kind of Finno-Ugric nationality.

Aims: To estimate the incidence of DM1 among the children's population of the UR during 1988–2006 years.
Methods: The information was received from Register of T1DM and annual statistical reports from hospitals and clinics of the UR. The incidence was calculated on 100000 of children's population. The confidential interval was 95%. Age standardized incidence was obtained using the direct method with a standard population consisting of equal members of children in each of three subgroups (0–4, 5–9, 10–14 years of age).
Results: There were 369 new cases of T1DM in the UR during 1988–2006. The medium annual incidence of T1DM increased from 2.9/100000 [95% CI: 2.1-3.7] in 1988–1992 to 5.5/100000 [95% CI: 4.7-6.3] in 1993–1999 and 8.5/100000 [95% CI: 7.1-9.9] in 2000–2006. The incidence rate increased on average of 8.6% per annum. Significant distinctions of the incidence were marked between geographical provinces. Higher incidence rate was registered in the central province of UR. The medium annual incidence of T1DM was 6.9/100000 [95% CI: 6.1-7.8] in urban areas, 4.3/100 000 [95% CI: 3.4-5.2] in rural areas. The incidence was higher significantly in urban compared with rural ($p < 0.001$). Age standardized incidence rate for the age-groups 0–4, 5–9 and 10–14 were 5.3/100 000, 8.4/100 000, and 9.1/100 000 respectively. The T1DM manifested itself more often in the cool months (November–December) compared with the warm months (June–July). Udmurt children had a medium annual incidence rate 4.6/100 000 [95% CI: 2.7-6.5] from 2000 to 2006. It is lower than the incidence rate of Russian children – 6.0/100 000 [95% CI: 4.6-7.4].
Conclusion: The incidence of T1DM is increasing in the UR. During 1988–2006 years the incidence rate has increased from 2.0 to 8.9 on 100 000 children's population. The highest indices of the incidence are observed in pubertal age children in cities and central regions of the republic. The incidence of Udmurt children has a low level.

P/WED/48

Associations between physical activity, sedentary behaviour and glycemic control in a large cohort of adolescents with type 1 diabetes: the Hvidoere Study Group on Childhood Diabetes

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Background: The Hvidoere study group on childhood diabetes has demonstrated persistent differences in metabolic outcomes between paediatric diabetes centres. These differences cannot be accounted for by differences in demographic, medical or treatment variables. Therefore, we sought to explore whether differences in physical activity or sedentary behaviour could explain the variation in metabolic outcomes between centres.
Method: An observational cross-sectional international study in 21 centers, with demographic and clinical data obtained by questionnaire from participants. HbA1c levels were assayed in one central laboratory. All individuals with diabetes aged 11–18 years (49.4% female), with duration of diabetes of at least 1 year, were invited to participate. Individuals completed a self-reported measure of quality of life (DQOL-SF), with well-being and leisure time activity assessed using measures developed by health behaviour in school children WHO project.
Results: Older participants and females reported less physical activity. Physical activity was associated with psychological well-being, but not with glycemic control, BMI, frequency of hypoglycaemia or DKA. The more time spent watching television ($r = .06$) and less time spent doing school homework ($r = -.09$), was associated with higher HbA1c. The relationship to school homework remained significant after controlling for age, gender, parental co-habitation and insulin regimen. Between centres there were significant differences in reported physical activity, but these differences did not account for centre differences in metabolic control.
Conclusion: Physical activity is strongly associated with psychological well-being but has weak associations with metabolic control. Leisure time activity is associated with individual differences in HbA1c but not inter-centre differences.

Diabetes and Obesity

P/WED/49

Effect of weight loss on insulin sensitivity, liver enzymes and liver steatosis in obese Danish children

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Objective: Obesity is an increasing problem in Danish children, and obesity is associated with reduced insulin sensitivity and liver steatosis, which may progress to type 2 diabetes and non-alcoholic steatohepatitis (NASH). The aim of the study was to examine if weight loss, obtained through diet and exercise, could increase insulin sensitivity and reduce markers of liver steatosis in obese Danish children.
Methods: One hundred and sixteen (51 males) Caucasian obese children with mean (SD) age 12.2 (1.4) years, and body mass index (BMI) for age more than 3 SD, were examined before and after a 10 weeks intervention in a Weight Loss Camp. Examinations included anthropometry with calculation of BMI, a glucose tolerance test, blood samples for liver parameters, and ultrasonographic examinations of the liver (US). The insulin sensitivity index was determined as ISI - HOMA. Median (range) ISI-HOMA in a population of normal weight children has been found to 2.1 (1.6–2.4).
Results: Median (range) BMI changed during the 10 weeks intervention from 27.5(22.3-43.9) kg/m^2 to 24.5(19.9–39.7) kg/m^2, $p < 001$. No children had type 2 diabetes, but three children had impaired glucose tolerance. Median (range) fasting insulin decreased from 7 (1.4–33.8) mU/l to 4.9 (1.4–15) mU/l, $p < 0{,}001$, and median (range) ISI-HOMA increased from 0.7 (0.2–3.7) to 1.0 (0.3–3.1), $p < 0.001$. Median insulin (range) response measured 2 hours after glucose administration (1.75 mg/kg) decreased from 32 (3.3–190) mU/l to 22 (1.9–107.3) mU/l, $p < 0.001$. At inclusion 20 children had elevated alanine aminotransferase (ALAT) levels, and liver steatosis by UT was found in 30 children. Overall, ALAT and liver steatosis by UT decreased significantly, $p < 0.05$ and $p < 0.001$, respectively.
Conclusion: Although overt type 2 diabetes and glucose intolerance are rare in obese Caucasian children, reduced insulin sensitivity and markers for liver steatosis are very frequent. Weight loss significantly increased insulin sensitivity and reduced markers for liver steatosis, which may decrease the later risk of type 2 diabetes and NASH.

P/WED/50

Community-based Participatory Research (CBPR) and the African American Church: an innovative approach to prevent obesity and diabetes in African American children

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Background: Nine million children in the U.S. are overweight. The rate of overweight among U.S. children aged six to 11has quadrupled in the last four decades. African American (AA) children suffer disproportionately from overweight, with nearly 40% suffering from this disease. Likewise, the incidence of type 2 diabetes among AA children has significantly increased. Racial disparities in childhood obesity and type 2 diabetes argue for innovative approaches and community-level interventions that promote healthy dietary and physical activity (PA) practices in AA youth. Working with the AA church is one promising approach since over 80% of U.S. AAs believe in God, and the potential for reaching AAs through churches is high. The church plays a pivotal role for many AA families in the southern U.S., and can serve as a powerful environment to promote healthy dietary/PA behaviors essential in preventing obesity and type 2 diabetes in young AA children.

Objective: The purpose of this pilot study was to:

i) understand the AA church educational environment;
ii) determine the role of spirituality and the AA church in obesity and diabetes-related health promotion; and
iii) employ a CBPR process to create a faith-based 12-week diet and PA curriculum to promote dietary/PA knowledge and behaviors in AA children aged six to 11.

Methods: Focus groups (n = 6) were conducted with 24 AA children aged six to 11 [n = 3], 17 parents [n = 2], and nine church leadership [n = 1] from three AA churches in NC. Data was transcribed and analyzed using NVivo 7.0.

Results: Data suggest that spirituality and health were intimately connected among participants. Parents and children reported the importance of an interactive curriculum with parent involvement, and contextually-relevant faith-based health messages. Church leadership reported:

(i) the church being an important setting in preventing diabetes and obesity in children; and
ii) the need for a curriculum that was faith and health focused as well as integrated into the existing church educational structure to increase sustainability.

Results were used to create a 12-week faith-based diet/PA curriculum, which will be pilot tested.

Conclusions: A Community Advisory Board partnered with researchers to employ a CBPR approach to develop a culturally sensitive health curriculum. Partnering with AA churches to develop such a curriculum was innovative, and may prove effective in the fight against obesity and type 2 diabetes in at-risk AA children.

P/WED/51

Primary prevention of overweight and type 2 diabetes should already start in preschoolers

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Background: The rising incidence of obesity has changed the prevalence of type 2 diabetes in children and adolescents worldwide. We investigated the prevalence of overweight and obesity in children in pre-school age and analyzed the correlation of overweight on their quality of life (QoL) and physical skills.

Methods: Within a biennial cross-sectional intervention study, we screened children from 33 kindergartens in Lower Saxony, Germany. The screening included the measurement of weight and height, waist, hip and abdomen circumferences, questionnaires regarding the health related QoL (Ravens-Sieberer & Bullinger, 1998; max. score of 100) as well as a test of physical skills (MOT 4-6®, second edition, Zimmer & Volkamer, 1987; max 34 points). Overweight was defined as BMI SDS > 90th, obesity > 97th percentile.

Results: A total of 772 children with a mean age of 4.6 ± 0.4 years (mean ± SD) and mean BMI SDS of 0.08 ± 1.02 at baseline were enrolled into the study. All children were born in Germany, while in 112 cases (14.5%) their parents were not born in Germany. Fifty seven children (7.4%) were overweight and 30 (3.9%) obese. Girls (n = 374) had significantly higher BMI SDS (0.16 ± 1.01) than boys (0.01 ± 1.03, n = 397). However, mean waist, hip and abdomen circumferences were similar between genders. The mean QoL sum score from the children's view (n = 733, 95.1%) was 75.3 ± 9.0. Girls (n = 357) showed a marginal higher quality of life (75.9 ± 8.5) compared to boys (n = 376; 74.6 ± 9.5; $p < 0.05$). There were no differences between German (n = 633) and non German children (75.2 ± 9.0 vs. 75.8 ± 9.1; $p > 0.05$). No systematic relations between QoL scores and different weight groups (normal weight, overweight, obesity) were found.681 children (88.3%) participated at the MOT 4-6® including 18 physical exercises. They exhibited a sum score of 16.1 ± 4.8 without differences between girls (n = 329) and boys (n = 352). Obese children had a significantly lower performance (n = 27, 12.7 ± 3.9) than normal weight (n = 540, 16.15 ± 4.8) and overweight children (n = 49; 16.16 ± 4.8, $p < 0.001$).

Conclusion: According to our study, overweight and obesity are already present in preschoolers in Germany. While quality of life is not affected in this age group, physical skills are reduced with increasing BMI. Methods to prevent an excessive weight gain should already start in the first years of life and also focus on the physical activity.

P/WED/52

Adiposity gain during childhood, ACE I/D polymorphisms and metabolic outcomes

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Objectives: We aimed to

(i) determine the relative importance of childhood gain in upper body adiposity for insulin resistance (IR) and triglyceridaemia (TG);
(ii) examine whether the associations between adiposity and metabolic indices were more evident in those with the ACE DD genotype.

Methods: We examined a birth cohort study of 292 children with measures in the neonatal period (day 4) including subscapular and triceps skinfolds; repeat skinfoldmeasures at age eight, cardiorespiratory fitness, insulin resistance by the HOMA equation(HOMA-IR) and serum triglyceride (TG) concentrations and measures of ACE I/D genevariants. A multiple linear

regression analysis incorporating a life course approach was undertaken.
Results: Childhood gain in upper body adiposity was positively associated with HOMA-IR and TG independently of neonatal skinfolds ($p < 0.02$). The magnitude of these associations was higher among those of the ACE DD genotype. For example, subscapular skinfold gain was not strongly associated with HOMA-IR or TG among those with II or ID genotype ($b = 0.03$, $p = 0.05$; $b = 0.02$, $p = 0.18$ respectively) but was positively associated among those with the DD genotype ($b = 0.11$, $p = 0.001$; $b = 0.08$, $p = 0.003$); difference in effect $p = 0.05$; $p = 0.01$ respectively.
Conclusion: Upper body fat accumulation during childhood was positively associated with HOMA-IR and TG independently of neonatal skinfolds. Further, the stronger associations for those with the ACE DD genotype is consistent with RCT findings that ACE inhibition is associated with a reduced risk of developing type 2 diabetes. Further work is required to confirm and extend these findings.

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Metabolic syndrome and non-alcoholic fatty liver disease in obese pre-pubertal children: a comparison of two different definitions

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Introduction: Insulin resistance (IR) is a common feature of childhood obesity and a key component of the Metabolic Syndrome (MS). As in obese children IR is also strongly associated with non-alcoholic fatty liver disease (NAFLD), the latter could be considered the hepatic manifestation of the MS.
Objective: The aim of this study was to evaluate the prevalence of MS among obese pre-pubertal children, by using two different definitions.
Methods: We recruited 64 obese pre-pubertal children (29 boys; age median [range] 8.1 [6–9] years). All children underwent anthropometric measurements, an oral glucose tolerance test, a hepatic ultrasound scan, assessment of blood pressure, plasma lipids and alanine aminotransferase (ALT). Homeostasis model assessment of IR was calculated. MS was diagnosed according to a classical definition (Weiss's criteria): presence of ? 3 of the following criteria: BMI > 2 SDS; triglycerides > 95th percentile (p), HDL-cholesterol < 5th p; blood pressure > 95th p; impaired fasting glucose (IGT). Then, the presence of steatosis associated with elevated ALT (> 40 U/l) was included as an additional criterium to this definition.
Results: Metabolic Syndrome was found in 10 children (15.6%) according to Weiss's criteria and in 15 children (23.4%) when NAFLD was also considered. The prevalence of MS was equally distributed between the two sexes, but increased across tertiles of HOMA-IR (p: 0.01). In this group of obese children, the prevalence of the single components of the MS was as follows: hypertriglyceridaemia 32.8%, low HDL-cholesterol 3.1%, hypertension 29.7%, IGT 6.3%, high ALT 28.1%; steatosis 56%.
Conclusions: In conclusion, this study showed that a high prevalence of the MS is already present among prepubertal obese children, particularly when NAFLD is included among the diagnostic criteria. Therefore, screening for the MS should be performed already in the prepubertal age-group and, given the association between NAFLD, IR and IGT already in children, NAFLD should be considered as an additional criterium in the diagnosis of the MS.

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Effectiveness of a family-centered, healthy lifestyle program after school on measures of adiposity

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Objective: To determine the effect of an after school, family centered, lifestyle intervention on measures of adiposity.
Methods: The pilot took place over the 2006–2007 school year at eight matched elementary schools in low-income school districts in Los Angeles, San Jose, and Vacaville California. Families at the intervention schools attended 6 weekly 3-hour classes consisting of didactic and interactive nutrition education, exercise, parental support and behavior change motivation. Control schools families were tracked throughout the year for comparison. School based personnel were trained by Registered Dietitians to teach the Kids N Fitness Program. Primary outcome measure was BMI z-score with Body Fat %, nutrition knowledge, eating and physical activity behavior also measured.
Results: Three hundred and twenty-five students and 247 parents enrolled with complete data collected on 232 children: 123 controls (101 parents), and 109 interventions (79 parents). 84.6% were Hispanic. Intervention and control subjects did not significantly differ on any baseline characteristics. Paired t-tests showed the intervention group decreasing BMI z-score by -0.0632 (SD 0.1743, $p = 0.0002$) with the control group increasing by 0.0364 (SD 0.1664, $p = 0.0167$) over 6 weeks. Similar results were appreciated among those students with enrollment BMIs ≥ 85th and 95th percentiles. Subjects with a BMI% ≥ 85 ($n = 118$) showed a mean decrease in BMI z-score of -0.0445(SD 0.113, $p = 0.0034$) and subjects with a BMI% ≥ 95 ($n = 76$) had a mean decrease in BMI z-score of -.03567(SD 0.0865, $p = 0.0168$) as compared to controls ($p = 0.0096$ for BMIs ≥ 85th%and $p = 0.0158$ ≥ 95th percentiles). Repeat measurements taken 9 months (+/- 1.7 months) later showed a significant decrease in mean BMI% ($p = 0.0237$) and body fat % for the intervention group as compared to the control group ($p = 0.0075$). Neither the effect of intervention on decrease in BMI z-score nor the downward trend for body fat percentage was affected by adjustment for age, gender, or school location.
Conclusions: The study results suggest that the Kid N Fitness intervention had a positive effect on BMI z-score in all children, including those with baseline BMI ≥ 85th and 95th percentiles. It appears that these significant changes were driven by a change in eating behavior, nutrition knowledge and physical activity. These encouraging results suggest that non-health professionals can effectively implement healthy lifestyle programs in a school setting with positive outcomes.

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Cause and effect in the relationship between body fat and physical activity in children: a longitudinal study

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Objectives: Several cross-sectional studies have concluded, based on weak inverse associations, that less activity leads to more body fat. However, such study designs cannot determine direction of

causality, and the observed association may equally reflect the reverse - that more body fat leads to less activity. The aim of this study is to investigate the direction of causality between physical activity and body fat in children, applying the rule of temporality to longitudinal data.

Methods: Physical activity (PA) was measured objectively by 7-day accelerometry (MTI Actigraphs) at four annual time-points - 6y, 7y, 8y and 9y. Percent body fat (%BF) was measured by DEXA at 7y and 8y. Time-lagged correlations between %BF and PA 1 year before ($PA_{[t-1]}$) and 1 year after ($PA_{[t+1]}$) the measurement of $\%BF_{[t]}$ were performed at two time-points (t = 7y and t = 8y). Analysis was performed on 185 children (104 boys, 81 girls) from the EarlyBird Diabetes Study.

Results: The correlation of $\%BF_{[t]}$ with $PA_{[t+1]}$ was stronger than $\%BF_{[t]}$ with $PA_{[t-1]}$ when t = 7y ($\%BF_7$-v-PA_8, r = -0.21, $p < 0.01$, $\%BF_7$-v-PA_6, r = -0.06, p = 0.40) and again when t = 8y ($\%BF_8$-v-PA_9, r = -0.20, $p < 0.01$, $\%BF_8$-v-PA_7, r = -0.13, p = 0.08). On average the correlations were: $\%BF_{[t]}$-v-$PA_{[t+1]}$ r = -0.20 and $\%BF_{[t]}$-v-$PA_{[t-1]}$ r = -0.10 with the magnitude of the difference remaining even after controlling for $PA_{[t]}$.

Conclusions: Body fat is associated more strongly with PA measured 1 year later than with PA measured one year earlier, implying that fatness may influence activity more than activity influences fatness. The weakness of the association and its direction of causality could together be reasons why attempts to tackle childhood obesity by promoting physical activity have been largely unsuccessful. If confirmed, the findings may shift the focus of prevention to calorie intake.

P/WED/56

Impaired glucose tolerance in obese children and adolescents

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The epidemic of childhood obesity during the last few decades is associated with increase of impaired glucose tolerance (IGT) and type 2 diabetes (DM2).

Objective: To assess the incidence of IGT in obese children and to establish criteria for screening.

Methods: A total of 158 obese children, 70 girls and 88 boys, at an age 6–18 years were analysed. Obesity was assessed according to CDC criteria. Risk factors in the family such as DM2, hypertension, hyperlipidemia, PCOS and/or obesity were recorded for the first degree relatives. Standard OGTT accompanied by four points of insulinemia was performed. HOMA index was calculated according to the standard formula.

Results: Thirty eight children (24% of the total cohort), 16 girls and 22 boys at an age 12.3 ± 3.2 years average (range 6–18 years), had glucose intolerance. BMI was 31.3 ± 3.6 kg/m^2 (range 26.7–43.3 kg/m^2). All children with IGT (100%) had at least one risk factor in the immediate family member compared to the total group of obese children with a risk of 52% ($p < 0.001$). Peak glycaemia was 9.2 ± 1.2 mmol/l (range 7.9–11.1 mmol/l). HOMA index was 4.76 ± 3.53, and peak insulinemia was 117.4 ± 28.2 μIU/dl average (range 10.7–300.0 μIU/dl)). There was no correlation between the fasting glycaemia and peak insulinemia with the peak glycaemia on OGTT. Body mass index correlated well with insulinemia ($p < 0.001$), but not with the peak glycaemia (p = 2.4). The correlation of the peak glycaemia with the HOMA index was of borderline significance (p = 0.04). Three children developed overt DM2.

Conclusion: We conclude that all children with obesity should be screened for glucose intolerance, especially if risk factors are present in their families.

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Problems of the metabolic syndrome in children

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The aim of the study was to ascertain the frequency of the metabolic syndrome in children and adolescent in our country and to analyse complex examinations in these children. In the study included were 370 children with the diagnosis metabolic syndrome from seven Centers in Poland, 156 boys, 184 girls, aged 5 to 19 years. Analysed was in the family: diabetes type 2, metabolic syndrome, hypertension, dyslipidemia, obesity in parents. The examinations in the children included: gender, age at diagnosis of the metabolic syndrome, BMI, blood pressure, glycemia, insulinemia, insulin resistance, cholesterol, lipids.

Results: Mean BMI was in all groups increased. Systolic and diastolic blood pressure was in the two elder groups increased. Increased were the mean values of basal insulin. The mean level of HbA1c was in all three groups increased. The mean value of total cholesterol was in all groups increased. The mean values of glycemia, HDL, TGL and LDL were in normal range. Insulinresistance positive in group II and III. In the families observed was obesity, type 2 diabetes, hypertension, dyslipidemia and the metabolic syndrome.

Conclusion:

i) The pathophysiological mechanism related to the metabolic syndrome in adults is also important in children.
ii) The biomarkers of the cardiovascular risk are present already in young obese children and adolescents.
iii) Because of the serious consequences it should be very important to ascertain as soon as possible the frequency and the eventually increasing tendency in our country.
iv) Very important is also to diagnose the metabolic syndrome so early as possible and to introduce an adequate therapy.
v) Uniform criteria for the diagnosis of the metabolic syndrome and a screening for children and adolescents are very urgent.
vi) Important should be a follow-up of the children to ascertain the tendency and incidence of complications, the frequency of diabetes type 2.
vii) Urgent is a register of the frequency of chronic complications in obese children and adolescents in Poland and a close monitoring of the dynamic of the disturbances.