

## P-61

### Therapeutic education cycles for young diabetics

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**Background:** Education groups for young diabetics have been organized for several years, in the Center for Education of Sick Children, to give them age-adapted knowledge and help them face diabetes-related problems, using group dynamics.

**Methods:** Each group of age (5-6yr, 8-9 yr, 12-13 yr old) includes 6-8 children from those who are regularly followed in the Unit of Pediatric Diabetology. Each cycle includes 4-6 sessions, each distant by 1-2 months, and lasting one morning for the 5-6 and 8-9 yr old, a full day for the 12-13 yr old patients. Parents participate in these educative cycles, in separate groups, working on the same themes on the same day. The educational program includes theoretical, practical, dietetic and psychological objectives, adapted to each age group, so that every child/parent can follow 2-3 therapeutic education cycles without redundancy. The meetings preparation is long and meticulous, all the team meeting regularly for the detailed design of "pedagogic sequences" and pedagogic materials. The evaluation session, 6 months later, is made of knowledge workshops for the children and satisfaction questionnaires for parents and children.

**Results:** Results for 3 groups of 8-9 yr old and 12-13 yr old children (38 parents and 35 children) are presented. The sessions were found interesting by 78% of the 8-9 yr old, but only 41% of the 12-13yr old children; 70% of them thought that they had learned something by meeting other children. Few of them (11%) said they liked learning alone with a health educator; 57% of them felt more confident in explaining their illness. The main motivation to come to the sessions was to learn about diabetes for the 8-9 yr olds (89%), while it was to meet friends (53%) and to be nice to their parents (47%) for the 12-13 yr olds. The satisfaction scores were elevated for the parents concerning organisation (92%), "group effect" (93%), improvement of knowledge (85%) and impact of the cycles on diabetes care (71%); 89% of them thought that group education completed individual outpatient clinics.

**Conclusion:** These results have influenced our strategy towards a continuous group education focused on the 6 to 12 yr old period.

## P-62

### **Paediatric staff education programme for management of children with diabetes and their families**

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**Background:** A national study organised by the association Aide aux Jeunes Diabétiques (AJD) revealed the educational needs of paediatric staff. An education commission including medical staff from all over the country was established with the aim to evaluate methods, content of programmes and modalities of evaluation on the model of a preliminary action developed since 1998 in the Nord - Pas de Calais district

**Methods:** The commission works on a multimodal staff education program with different levels: knowledge about the disease, insulin therapy, diet, psychology, pedagogy, organisation. Guidelines for teachers and documentation for the participants are created, inspired by the textbooks of the Education Commission of the AJD and by the recommendations of the Diabetes Education Study Group. The course lasts for several days. Participants meet six months later in order to assess knowledge progression and to exchange ideas about new projects according to propositions of each participant. Courses are performed by a two-member team: a paediatric endocrinologist-diabetologist and another person (paediatrician, diabetologist for adults, psychiatrist, nurse educator or member of parents' association). The participants perform daily evaluation of the course. Criteria based on the participants' knowledge and their application allowed us to assess the evolution of the programme.

**Results and Conclusion:** Evaluations of these formations are very encouraging. Since 1998, many courses have already been performed in France and projects are under way for an enlargement of this education programme in response to local needs. An improvement of the educational level of the medical staff is necessary for the education of children with diabetes mellitus and their families. It is necessary to repeat these courses for new nurse staff, new physicians or to update the knowledge of others. Another aim of the programme was the creation of a common education file as a reference for the education of patients, parents and staff.

**Training course for school personnel:****«Integrating and Assisting Children with Diabetes in School»**

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**Background:** In cooperation with the Ministry of Education we developed a systematic educational program for school personnel in order to facilitate coping with complex physiological and psychosocial needs of children with diabetes. The aim of the study is to evaluate the outcome of courses for teachers of children with diabetes in terms of changes of diabetes-related knowledge and attitudes towards children with diabetes.

**Methods:** We organised three courses with a total of 124 participants. The courses consisted of lectures about basic knowledge regarding diabetes, active learning about the psychological implications of diabetes in children, practicing skills related to diabetes management and discussion with nurses, pediatrician and psychologist. Two comparable versions of questionnaires were completed before and after the course. One evaluated knowledge about diabetes and the other attitudes toward children with diabetes. The participants' perception of the importance and applicability and their satisfaction with the course were also evaluated.

**Results:** Diabetes-related knowledge of participants increased significantly after the course ( $t=3.01$ ,  $p<0.05$ ). The questionnaire score related to the attitudes toward children with diabetes increased significantly ( $t=2.95$ ,  $p<0.05$ , higher score reflects more positive attitudes toward abilities and potential of children with diabetes). All participants perceived the course as applicable, interesting and well organized.

**Conclusions:** The training course for school personnel is useful in improving diabetes-related knowledge and positive attitudes toward children with diabetes. The course helped participants understand the implications of having diabetes, gave them basic knowledge and skills to manage children with this illness and helped them to feel at ease in accepting these children in the school setting.

**Quality of life assessment in adolescents  
with type 1 diabetes and factors influencing it**

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**Background:** Quality of life (QoL) questionnaire is a widely recognised tool to evaluate the impact of diabetes on the well-being of patients. This study aimed at estimating the factors influencing QoL in young patients with type 1 diabetes.

**Methods:** The study involved 54 adolescents with type 1 diabetes on routine clinic attendance, M/F 19/35, mean age  $18.1 \pm 0.19$  yrs (range 15-20), mean diabetes duration  $6.7 \pm 0.65$  yrs, BMI  $21.8 \pm 0.49$  kg/m<sup>2</sup>, insulin dose  $0.9 \pm 0.04$  U/kg/day. There was no statistical difference between males and females. All adolescents received 4 or more injections per day. QoL was assessed by a modified Diabetes QoL questionnaire measuring impact of diabetes, worries and satisfaction with life (51 questions). Metabolic control was estimated by fructosamine (FA). The controls were 24 healthy adolescents (M/F 11/13, mean age  $17.8 \pm 0.2$  yrs) who completed 15 non-diabetes related questionnaires.

**Results:** Mean FA was  $396 \pm 82$  mmol/l (range 299-594); it was not significantly different in females or males (391 vs 405, respectively). We did not find any correlation between metabolic control (FA) and QoL. The mean QoL score, impact of diabetes and satisfaction scores were similar in diabetic boys and girls. Girls with diabetes had significantly higher score for worries ( $p < 0.05$ ) that reflected higher incidence of depression in adolescent girls. QoL was not related to BMI and duration of diabetes. Adolescents with diabetes from single parent families had significantly higher FA than those from two-parents families (422 vs 386,  $p < 0.05$ ) and reported less satisfaction ( $p < 0.05$ ). Adolescents with diabetes showed greater satisfaction with life than their age-matched controls ( $p < 0.01$ ) despite having a chronic disease.

**Conclusions:** In our study QoL assessment in young patients with type 1 diabetes demonstrated that specific attention should be given to management of high risk groups, especially adolescents with diabetes from single parent families and teenage girls.

## P-65

### **Does social status influence metabolic control and weight gain in children and adolescents with diabetes mellitus type 1?**

#### **Results of a multi-center study in South-West Germany**

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**Background:** Ethnicity has been shown to influence metabolic control in children and adolescents with type 1 diabetes mellitus. The effect of social status has yet to be proven. In Germany there are two types of health insurance. Privately insured patients usually belong to the upper social class, while workers and employees are covered by public health insurance.

**Aim:** To examine the effect of social status on metabolic control and weight gain in a multi-center survey in 5 pediatric diabetes centers in SW Germany.

**Methods:** The data of all patients with type 1 diabetes and manifestation-age of <18 years were collected with the DPV System. This computer program is installed in all of the 5 participating centers. Data were collected locally and sent to Ulm for centralized statistical analysis with the SAS program.

**Results:** 150 of all 1,033 patients were privately insured. The age of these patients did not differ from that of the other 883 patients (13.2 vs. 13.8 yrs). Gender: 56.7% vs. 53.1% male patients. Age at manifestation: 7.8 vs. 8 yrs. There was no statistical difference for duration of diabetes (5.4 vs. 5.9 yrs). The DCCT-corrected HbA1c was 8.7 vs. 9.1% (n.s.). Except for the 1<sup>st</sup> year, HbA1c was consistently lower over the whole course of 10 years; after 5 years the difference was significant (7.3 vs. 7.8%,  $p<0.01$ ). However the rate of hypoglycemic events per 100 patient years was not different (5.3 vs. 8.6). Height was slightly below mean, but there were no differences between the groups. Concerning weight as expressed in SDS the privately insured patients were lighter; after 5 years it was statistically significant (0.08 vs. 0.32,  $p<0.04$ ). Correspondingly, BMI-SDS was lower (+0.16 vs. +0.47,  $p<0.005$ ).

**Conclusions:** Even if the social status is partially reflected by the kind of social insurance, in our multi-center study there was significantly better metabolic control in privately insured patients. We also found a reduced tendency towards obesity. Thus education on nutrition should be targeted according to the social background of the patients.

**The effect of anxiety on life satisfaction in parents of diabetic children using different treatment methods**

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**Background:** Chronic disease affects a patient's life in many aspects: psychological, social and professional, and also the quality of life of the family. A higher anxiety level is measured in parents of diabetic children. The aim of this study was to examine the anxiety level in parents of diabetic children using different treatment methods (MDI versus CSII) and determine whether it has any effect on their feeling of life satisfaction.

**Methods:** Data were collected in 2002. There were 119 parents of 58 children treated with CSII and 61 children with MDI; children's age was 1.7 to 18.0 yr old, mean 10.6 yr). Subjects filled in the State-Trait Anxiety Inventory (STAI) and the 5-point quality of life questionnaire (58 questions) during the routine control. HbA1c and other variables (child's age, diabetes duration) were also recorded.

**Results:** There was no significant difference between anxiety level measured as a state and a trait (mean = 43.6 state vs. 43.3 trait). There was a correlation between anxiety level and life satisfaction, both as a state ( $R=0.42$ ,  $p<0.001$ ) and a trait ( $R=0.60$ ,  $p<0.001$ ). Life satisfaction was related to anxiety level, as state ( $F=24.5$ ,  $df=2$ ,  $p<0.001$ ) and as trait ( $F=62.2$ ,  $df=2$ ,  $p<0.001$ ). The higher the anxiety level, the lower life satisfaction, depending on state (Life satisfaction =  $92.99 + 1.16 \times \text{State}$ ,  $p<0.001$ ) and trait (Life satisfaction =  $65.59 + 1.798 \times \text{Trait}$ ,  $p<0.001$ ). There was no effect of treatment method, hemoglobin level, age of the child and diabetes duration on anxiety level (both as a state and a trait) or satisfaction with life (mean = 139.45 CSII and 147.44 MDI) in parents of diabetic children using different treatment methods.

**Conclusions:** Anxiety level is not modified in parents of diabetic children. The treatment method does not have any effect either on anxiety level or life satisfaction, as expected. Parents experiencing more anxiety feel less satisfied with life. Our results have implications for further treatment, especially psychological care.

**Adjustment to diabetes in South African teenagers**

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**Background:** Teenagers go through a time of turmoil, and adjustment to their new developmental tasks are difficult. Diabetic patients have the additional burden of adjusting to their disease as well. The objective of this study was to determine how well the teenagers in our clinic adjusted to their disease.

**Methods:** An anonymous self-administered questionnaire was supplied to the teenagers in the clinic. It consisted of 68 questions, marked on a 5 point Likert scale. The questions covered their attitude towards diabetes, dependence-independence conflicts, peer adjustments, family relationships, school adjustment, and body functioning and image. A mean adjustment score (MAS) (maximum 100) was calculated for each variable.

**Results:** Twenty-one of the forty subjects were male. They were aged between 12.1 and 19.3 years, with a mean of 14.9 years. Their duration of diabetes ranged from 1 month to 16 years, with a mean of 6.8 years. In terms of family relationships, adjustment seemed relatively poor, with scores of 49 for parents' expectations of the diabetic teenager, 41 for the teenagers feeling their parents act like they love their child, and scores of 36 and 52 respectively for getting angry at their mothers and fathers. Peer relationships fared a little better; for talking to friends about diabetes the score was 56, and for playing with younger children rather than their own peer groups, 54. Some independence issues were well handled. The score for giving one's own insulin was (as expected) 94, but taking part in meal planning scored 54 and own sick day management 58. The feeling was that diabetics get too many responsibilities (36), and that their mothers (31) and fathers (59) are too protective.

**Conclusions:** Teenagers do take responsibility for some aspects of their disease. They, however, feel that their social support is not always adequate. They get angry at both parents, but more with their mothers, and feel that their mothers are overprotective. They consider the burden of the disease to be too heavy.

**Behavioral problems in children and adolescents  
with type 1 diabetes in the Beijing district**

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**Objective:** To investigate the prevalence of behavioral problems in children and adolescents with type 1 diabetes in the Beijing district, compared with those of healthy children and adolescents, and to study the risk factors associated with behavioral problems in type 1 diabetes.

**Methods:** A total of 619 healthy children and adolescents and 205 children and adolescents with type 1 diabetes mellitus were evaluated by the Chinese version of Achenbach's Child Behavior Checklist and a self-made questionnaire of influencing factors. The two groups were matched for gender, age and main socioeconomic status. SPSS soft package was used for data analysis.

**Results:** The prevalence of behavioral problems was significantly higher in the diabetic group than in the control group (20.0% vs 8.2%,  $p=0.0001$ ). There was no gender effect on the incidence of behavioral problems (girls 20.2%, boys 19.8%). In the type 1 diabetes group, the four preceding subscales were social withdrawal (4.9%), depression (3.9%), separation anxiety (3.4%) and social problems (2.9%). The prevalence of these four subscales was significantly different between patients and controls ( $p=0.0001, 0.004, 0.04, 0.018$ , respectively). Logistic analysis of risk factors showed that residence, maternal cultural level, marital relationship, level of expression, rearing style, degree of comprehension, children's character and HbA1c were risk factors for behavioral problems.

**Conclusions:** In Beijing district, young type 1 diabetic patients are at risk of behavioral problems. The prevalence rates of social withdrawal, social problems, depression and separation anxiety are higher than in the healthy population. Multiple psychological and biological factors are associated with the behavioral problems in diabetic patients.

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### Decreased prevalence of alcohol, tobacco, marihuana and other drugs use in school age teenagers with diabetes mellitus type 1 (DM1)

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**Background:** The burden of diabetes care may alter the behaviour of adolescents regarding legal and illegal drug use. Alcohol and illegal drug use may lead to acute complications and tobacco is involved in the appearance of long term macrovascular complications.

**Methods:** The Chilean government performed a national study of prevalence of drug use in 8<sup>th</sup>-12<sup>th</sup> graders (n = 58,871) (Nation) using a 92 item internationally validated self answering questionnaire for assessment of drug use ([www.conace.cl](http://www.conace.cl)). One hundred and fourteen 8-12<sup>th</sup> graders (DM) attending a diabetes camp answered the questionnaire anonymously and voluntarily. The results were analysed according to whether the patient had ever tried (prevalence-life), tried during the last year (prevalence-year) or month (prevalence-month) tobacco, alcohol, marihuana, or illicit drugs (marihuana, cocaine, heroin). We compared the prevalence rates by using the chi-squared test, and the effect of HbA1c over drug use using binary logistic regression.

**Results:** The DM group had a mean age of 14.7 ± 1.6 yrs, and had DM1 of 5.7 ± 4.2 yrs of duration. The Nation group had a similar age. Prevalence rates are shown in the table. The use of tobacco, alcohol, or illicit drugs had no significant effect on HbA1c.

	Tobacco		Alcohol		Marihuana		All illicit	
	Nation	DM	Nation	DM	Nation	DM	Nation	DM
Prevalence-life (%)	76.1	66.7*	75.9	60.9***	23.0	9.3**	23.8	10.2**
Prevalence-year (%)	55.7	29.8***	61.7	51*	14.8	7.6	15.5	8.6
Prevalence-month (%)	41.8	26.9**	39.2	27.9*	7.9	6.7	8.5	6.7

\*p<0.05 \*\*p<0.01 \*\*\*: p<0.001

**Conclusions:** In Chile school age children with DM1 use less tobacco and alcohol and have tried fewer illicit drugs than the general population, suggesting that they are aware that these drugs may complicate the management of their diabetes.

### Ovarian function during puberty in girls with type 1 diabetes mellitus (DM1)

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**Background:** Increased prevalence of ovarian hyperandrogenism has been reported in women with DM1. We investigated whether some of these hormonal alterations might begin during puberty.

**Methods:** We studied 33 adolescent girls with DM1 (12.2±0.2yr) and 41 normal girls (C, 11.8±0.2 yr) matched by age and pubertal development, up to 2 yr postmenarche. Anthropometry, hirsutism, acanthosis, acne and waist-hip ratio were evaluated. A leuprolide test (500 µg sc) was performed and testosterone (T), SHBG, estradiol (E2), FSH, LH, 17-OH-progesterone (17OHP) were determined 0, 3 and 24 hr after the injection. Free androgen index (FAI) was calculated. Differences between DM1 and controls for each Tanner stage were assessed using non-parametric tests. The interactive effect of diabetes and pubertal development was examined by ANCOVA.

**Results:** The hormonal results are shown in the Table. Progression according to Tanner stage in basal T, SHBG, FAI, and E2, stimulated 17OHP, LH and T were different between DM vs C. We identified four patients with DM1 who had clinical or laboratory evidence of hyperandrogenism.

	Tanner 2		Tanner 3		Tanner 4		Tanner 5	
	DM (N:8)	C (N:11)	DM (N:9)	C (N:9)	DM (N:8)	C (N:12)	DM (N:8)	C (N:9)
Age (yrs)	11.2 ± 0.4	10.4 ± 0.3	11.7 ± 0.3	11.5 ± 0.4	12.5 ± 0.5	12.3 ± 0.3	13.2 ± 0.5	13.0 ± 0.3
T 0 †	10.0 ± 1.9	13.7 ± 3.0	28.1 ± 6.1	22.4 ± 5.3	26.4 ± 5.4	39.6 ± 5.2	43.4 ± 9.8	36.1 ± 6.7
T24 †	43.1 ± 15.8	34.7 ± 11.0	55.4 ± 12.4	44.3 ± 8.4	47.0 ± 6.3	65.8 ± 5.4	96.1 ± 33.2	72.7 ± 10.2
SHBG (nM)	54.8 ± 4.5	44.5 ± 3.2	50.5 ± 3.3	30.8 ± 3.7*	37.7 ± 4.7	34.1 ± 3.3	33.6 ± 5.4	33.7 ± 3.5
FAI	0.6 ± 0.1	1.1 ± 0.3	2.1 ± 0.6	2.8 ± 0.7	2.8 ± 0.7	4.5 ± 0.8	5.3 ± 1.4	4.2 ± 1.0
E2 (pg/ml)	47.4 ± 5.7	40.6 ± 6.3	54.0 ± 5.3	37.0 ± 4.8	51.0 ± 5.4	67.4 ± 7.5	52.4 ± 4.0	44.7 ± 2.8
LH3 ††	8.8 ± 2.7	10.3 ± 2.9	28.1 ± 8.3	24.5 ± 8.5	35.8 ± 7.4	42.9 ± 10.8	90.3 ± 22.5	45.8 ± 8.1
17OHP24†	1.64 ± 0.32	2.62 ± 0.4	1.76 ± 0.27	2.58 ± 0.4	2.23 ± 0.3	4.18 ± 0.5*	4.16 ± 0.88	3.04 ± 0.42

\*p<0.05 by Mann-Whitney; †: ng/ml; ††: µU/ml.

**Conclusions:** We observed an incremental trend in basal T, FAI, E2, SHBG and stimulated T, 17OHP and LH during puberty in DM1 girls compared to controls, which suggests that ovarian hyperandrogenism may start during late puberty in some of these patients.

**Adrenocorticotrophy due to type 1 diabetes in children**

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**Background:** Imbalanced therapy in type 1 diabetes leads to changes in adrenal steroid metabolism, even in regular disease course. We evaluated hypothalamo-pituitary-adrenal axis and steroid metabolism in diabetic children.

**Methods:** Diabetic girls (n=22) and boys (n=22) aged 8-17 yr and control girls (n=21) and boys (n=17) underwent an ACTH iv stimulation test (1 µg/30 min + 50 µg/90 min) with blood sampling for cortisol every 30 min up to 150 min, and 7 h-urine collection for cortisol (F), cortisone (E) and TH-derivatives (µg). Diabetic patients had 2 tests: A- with delayed morning insulin dose and B- with iv added insulin + glucose. Matched patients groups (n=20) underwent hCRH (1 µg/kg) iv test for ACTH and F (from -15' to +90' at 15' intervals). Blood F (ng/ml) and ACTH (pg/ml) were estimated with commercial RIA kits; urine steroids were measured with HPLC (HP1100). Repeated measures ANOVA and Pearson correlations were used for statistics.

**Results:** Blood F response to ACTH in diabetic vs control pts as total AUC was (min\_ng/ml): 50477±12118 vs 40403±7955 (p<0.001), 0-30': 7281±2296 vs 6133±1492 (p<0.01), 30-150': 43196±2296 vs 34270±6724 (p<0.001). F in urine was greater in diabetic girls: 187±142 vs 105±114 (p<0.05) after A-test, in all diabetic pts after B-test: 164±138 vs 113±101 (p<0.001), higher after B-test than A-test (p<0.015). E excretion was higher in all diabetic vs control pts: 89±52 vs 53±28 (p<0.0001) without A- vs B-test differences. Significant correlations of serum/urine steroids to disease duration, HbA1c, glycemia and insulinemia indicate diabetes as causative factor of differences. Urine F/E ratio was higher after A-test in diabetic girls vs boys (p<0.01) and after B- vs A-test for diabetic boys and all pts (p<0.01). E correlated to urine volume (possible changes in renal 11\_OHSD2 activity). Urine F+E/THFs+THEs (liver metab) was unchanged. ACTH response to CRH was higher in controls (AUC min\_pg/ml): 2449±394 vs 1213±117 (p<0.001), while F (min\_ng/ml) was higher in diabetic 22936±856 vs controls 16486±785 (p<0.03).

**Conclusion:** Diabetic adrenocorticotrophy involves enhanced adrenal steroidogenic response to ACTH and renal steroid excretion, when suppression of pituitary response to CRH is the secondary consequence.

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### Towards optimal screening intervals for retinopathy in type 1 diabetes during childhood and adolescence

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**Background:** Current ISPAD Guidelines recommend annual screening for retinopathy 2 yrs after onset (for pubertal onset T1D), and after 5 yrs (or age 11, whichever is earlier) for prepubertal onset. Our aim was to explore optimal retinal screening intervals for children and adolescents (<20 years) screened according to these guidelines.

**Methods:** Retinopathy status (defined as at least one microaneurysm or haemorrhage) was assessed through dilated pupils using stereoscopic fundus photography of seven fields. The first analysis examined outcome 1-2 yrs after initial assessment. The second analysis used Generalised Estimating Equations to assess the odds of developing retinopathy compared to baseline.

**Results:** Patients were divided into two age groups at baseline: <11 yrs old (n=50, median HbA1c 8.5% [8.0-9.2]) and ≥11 yrs old (n=618, HbA1c 8.7% [8.0-9.5]). The prevalence of retinopathy at baseline was 16% (<11 yr gp) and 22% (≥11 yr gp). One to 2 yrs later, in the <11 yr group, retinopathy regressed in 80% but progressed in none. In ≥11 yr group, retinopathy regressed in 36% and progressed in 13%. The odds of having retinopathy increased significantly after 2 yrs in the older group (p=0.003) but not until 6 years in the younger group (p=0.01). These effects were independent of HbA1c.

Interval	N	Odds Ratio	95% C.I.	P value
0-1 yrs	92	1.12:1	0.71-1.77	0.622
1-2 yrs	450	1.39:1	1.15-1.72	0.003
2-4 yrs	431	1.81:1	1.44-2.26	<0.0005
4-6 yrs	167	2.24:1	1.62-3.10	<0.0005
>6 yrs	44	3.81:1	2.28-6.35	<0.0005

**Conclusion:** These results suggest that in the ≥11 yr old child with T1D (in reasonable metabolic control), the next screening interval could be extended until 2 years rather than the currently recommended 1 year. In the younger group the next screening interval could be >2 yrs later.

**Diabetic retinopathy in type 1 diabetes patients is strongly associated with mean HbA1c during 18 years follow-up**

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**Background:** Diabetic retinopathy (DR) is a major complication of diabetes mellitus. We assessed the association between mean HbA1c during 18 years and DR in type 1 patients diagnosed when young and having used intensified insulin treatment with multiple injections or insulin pumps for 14-18 years.

**Methods:** DR was evaluated by fundus photography. Microaneurysms (Ma), haemorrhages (He), soft exudates (SE) and hard exudates (HE) were assessed by an ophthalmologist who had no knowledge of the patients' glycaemic status.

**Results:** In 39 patients followed during 18 years mean age was 43 (35-58) yr, mean duration of diabetes was 30 (23-39) yr and mean age at onset 12 (5-21) yr. Mean HbA1c was 8.2% (6.6-11.3). Mean number of Ma/He for each eye was 11.2 (0-76). Mean number of Ma/He was significantly associated to mean HbA1c during 18 years ( $r=0.471$ ,  $p=0.002$ ). Having SE was also significantly associated to mean HbA1c ( $r=0.35$ ,  $p=0.028$ ). HE, age, duration of disease, microalbuminuria, BMI, smoking and total cholesterol were not significantly associated to Ma/He. When comparing means below and above the third tertile of HbA1c, patients over 8.4% had a mean of 5.6 Ma/He and patients below 8.4% had a mean of 20 Ma/He ( $p=0.003$ ). SE were seen in none of the patients in the lower HbA1c group and in 20% of the higher group ( $p=0.022$ ). For hard exudates we found 21 vs. 40% in the two groups.

**Conclusions:** At 18 years follow-up these patients on intensive insulin treatment had mostly minor retinal changes, most of which could be characterized as mild non-proliferative diabetic retinopathy. However, the number of microaneurysms and retinal haemorrhages were significantly associated to mean HbA1c during 18 years.

**Longitudinal study of diabetic eye disease in children**

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**Background:** Diabetic retinopathy is a complication of diabetes and remains one of the commonest causes of blindness in young and older adults. Ten percent of patients who exhibit background retinopathy will progress to sight-threatening retinopathy. Current ISPAD Consensus Guidelines recommend screening for diabetic eye disease at 5 years from diagnosis if the child is prepubertal or at 11 years of age. In pubertal children, the recommendation is for screening at 2 years from diagnosis and annually thereafter. However, there are currently limited data published on the long-term follow up and progression of diabetic eye disease in children.

**Aims:** (1) To determine the prevalence and progression of diabetic eye disease in our paediatric population. (2) To evaluate the risk factors associated with presence of diabetic eye disease in children.

**Methods:** This is a longitudinal prospective study. All children with type 1 diabetes between 5 and 16 years who attended the Diabetes Clinic at Royal Liverpool Children's Hospital were invited for formal retinopathy screening in 1998 and 2002 using fundal photography. Risk factors assessed were duration of diabetes, age at screening, pubertal stage, HbA1c, body mass index and mean blood pressure.

**Results:** In 1998, 197 children were screened. Prevalence of diabetic eye disease was 4%. Seven had background retinopathy and one had significant maculopathy. Seventy children were re-screened in 2002 from a total of 154 children screened in 2002. The prevalence of diabetic eye disease in 2002 was 4.5%. Six patients screened in 1998 who had no previous diabetic eye disease have now developed diabetic eye changes. In 2002, four had background retinopathy, two significant maculopathy and one preproliferative retinopathy. Significant risk factors identified were duration of diabetes > 5 yr ( $p=0.003$ ), age  $\geq 12$  yr at screening ( $p<0.05$ ) and puberty ( $p<0.05$ ).

**Conclusion:** Prevalence of diabetic eye disease in our paediatric population is 4-4.5%. Routine annual diabetic eye screening should be offered to children from puberty, at 12 years of age or if duration of diabetes exceeds 5 years. There is evidence that rapid progression of diabetic eye disease can occur in children with type 1 diabetes.

**Diabetic nephropathy in young people**

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**Background:** The incidence of diabetic nephropathy (DN) might be higher among diabetics with poor metabolic control and elevated rate of consanguinity which represents a frequent situation in Morocco. This study was carried out to evaluate the incidence of diabetic nephropathy in childhood-onset diabetes, in relationship to diabetes duration and rate of consanguinity.

**Methods:** The study included 600 young patients (318 girls and 282 boys) aged 9 months to 33 years (mean 14.4 years) with type 1 diabetes diagnosed before 15 years of age, monitored in the Department of Diabetology of the Rabat Children's Hospital. Systematic screening for microalbuminuria (MA) was achieved by nephelometry in 215 diabetic patients with more than 5 years of diabetes duration.

**Results:** DN was diagnosed in 26 young patients: 17 have MA (30 to 300 mg/l), 5 proteinuria (300 mg/l to 3 g/l) and 4 nephrotic syndrome with renal failure. 17/26 had hypertension (mean BP=102-119 mmHg). 189 patients were normoalbuminuric. The patients with DN were more often females (20F vs 6M) and had a mean age of 26 years (18-33 years), a mean diabetes duration of 11.2 years (4-17 years), a mean BMI (22.7) similar to the age-matched normoalbuminurics, a rate of parental consanguinity (27%) similar to other diabetic patients (30%), poor metabolic control with a mean HbA1c of 9.3% (8.2-11.5%) versus 8.2% in all the diabetics monitored at the clinic and 8.3% in the normoalbuminuric group, a mean duration of monitoring at a specialized clinic of 5 years (0-13 years). DN was associated with diabetic retinopathy in 73% patients.

**Conclusion:** It appears that DN has a very early onset in poorly controlled, not monitored diabetic people and that consanguinity has no influence. Considering the prognosis and care cost, prevention is required as well as appropriate care of diabetic children from the beginning of their disease.

## P-76

### Albumin/creatinine ratios within the normal range in diabetic children

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**Background:** Although AER is easily performed, determination of the albumin/creatinine ratio (ACR) is appreciated since measurement of urine volume is unnecessary. Schultz *et al.* (2000) have shown that ACR increases, within the reference range, more rapidly in those children with diabetes who subsequently develop pathological albuminuria.

**Methods:** Timed overnight urine samples (n=452) from 115 males and 106 females (aged 5-20 years) were obtained during 1996-2002. Collections less than 5 hours were discarded. ACR was determined in those excreting less than 20 µg/min.

**Results:** ACR was significantly higher in young females <11 years and higher than in males. Males showed no age dependent changes.

Age, y		5-7,9	8-10,9	11-13,9	14-16,9	17-19,9
Male	Mean	0,68	0,69	0,80	0,73	0,67
			p<0,005			
Female	Mean	1,11	1,18	0,85	0,63	0,65
				p<0,005		

In females the age dependent increase in AER (median 2.4 → 3.9 µg per min; age 5-7.9 → 17-19.9 yr) was less pronounced than in males (median 1.5 → 5.3 µg/min; age 5-7.9 → 17-19.9 yr) which may explain the differences found for ACR in males and females.

**Conclusions:** In a large unselected diabetic population, ACR within the reference range showed no increase with age. On the contrary, ACR was lower at pubertal age than at younger age in females. This study supports that any significant increase, even within the reference range, may indicate glomerular damage.

**Necrobiosis lipoidica diabeticorum:  
Diagnostic difficulties in early skin lesions**

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**Background:** Necrobiosis lipoidica has been reported in type 1 and type 2 diabetic patients. An early diagnosis is important to avoid traumatism that are known to worsen the lesions with possible endothelial cell degeneration and proliferative endoarteritis.

**Patient report:** We report the case of a 9.9 year-old girl who presented a large asymptomatic yellowish plaque on both shins 34 months after onset of type 1 diabetes mellitus. Different dermatologists described the lesions as unspecific pretibial dermatitis without a clear diagnosis. We recommended to avoid any trauma including skin biopsy. Seventeen months later, in absence of overt trauma, we noticed the progression of the lesion into clear features of NL with symmetric reddish, sharply demarcated plaques with waxy central clearing without ulceration. The HbA1c passed from 7.9% at first presentation to 9.4% at worsening. In the last three years, despite continuous poor glycaemic control (HbA1c 8.5%), the cutaneous lesions remained stable. Several reports proposed multiple therapeutic options for NL, including topical steroids, pentoxifylline, topical tretinoin, oral chloroquine, hyperbaric oxygen and pulsed dye laser. However, as no specific therapy has been reported to be consistently effective, we did not prescribe any treatment except avoiding trauma. A greater risk of retinopathy and nephropathy has been suggested in diabetic patients with necrobiosis lipoidica, but has not been confirmed in our patient yet.

**Conclusion:** This case demonstrates that necrobiosis lipoidica in children may start with skin signs far different from typical adult lesions. The diagnosis is challenging by its rarity and resemblance to several cutaneous conditions (erythema nodosum, morphea, granuloma annulare, sarcoidosis and necrobiotic xanthogranuloma) and even possible misdiagnosis of other diabetic-related skin lesions. Although the association of necrobiosis lipoidica with poor glycaemic control is controversial, evolution of the cutaneous lesions may be related to worsening of the metabolic control.

**Determinants of high plantar pressure in adolescents  
with type 1 diabetes mellitus (T1DM)**

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**Background:** Limited joint mobility (LJM) in the foot and/or plantar callus may increase plantar pressure leading to ulceration in people with diabetes. Functional changes resulting from LJM in the feet and plantar callus in adolescents with T1DM have not been investigated. The aim of this study was to examine associations between reduced subtalar (ST) and 1<sup>st</sup> metatarsophangeal (MTP) joint motion, high peak pressure (PP), high pressure time integrals (P/TI) and plantar callus in adolescents with T1DM.

**Methods:** Two hundred and sixteen adolescents with diabetes (101 M, 115 F) with a median age of 15.3 yrs and a median diabetes duration of 6.0 yrs were examined. Fifty-seven controls (27 M, 30 F) with a median age of 15.6 yrs were also examined for LJM, high PP, high P/TI and plantar callus. Plantar pressure was examined using the Pedar in-shoe pressure measuring device. Subtalar and 1<sup>st</sup> MTP joint motion was examined using goniometry. Abnormality was defined as 2 SD above the control mean for pressure readings and 2 SD below the control mean for joint measurements.

**Results:** Joint motion (ROM) was reduced in diabetic patients compared to controls at the ST (28° cw 30°, p=0.0005) and 1<sup>st</sup> MTP joint (67° cw 72°, p=0.0001) confirming the findings of Duffin *et al.*, 1999. High PP was associated with greater BMI (25.9 cw 22.3, p<0.001), but not age, HbA1c or duration. The 22 diabetic patients with high PP had reduced ROM at the 1<sup>st</sup> MTP joint compared to those without (65° cw 70°, p=0.05). First MTP joint motion was significantly lower in diabetic patients with the highest PP under the hallux compared to those with the highest PP under the metatarsal heads (60.9° cw 70.5°, p=0.03). The 41 diabetic adolescents with plantar callus had higher PP (43 vs 39 N/cm<sup>2</sup>, p<0.001), higher P/TI (51.8 vs 62.8 N/cm<sup>2</sup>/s, p<0.001) and were older (16.4 vs 15.0 yr, p<0.001) than those without callus.

**Conclusions:** Reduced joint motion, plantar callus and higher BMI are associated with higher PP in adolescents with T1DM. Reduced 1<sup>st</sup> MTP joint motion is associated with higher PP under the hallux, suggesting that LJM alters foot function leading to higher PP. Plantar callus is already present in 19% of diabetic adolescents and is associated with high PP and high P/TI.

## P-79

### **Oxidative stress and adhesive molecules in children with IDDM:**

#### **A possible link**

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**Background:** There is evidence that oxidative stress is involved in the pathogenesis of early endothelium dysfunction in IDDM. We investigated a possible correlation between markers of oxidative stress and plasma levels of soluble adhesive molecules P-selectin and tetranectin (TN) as markers of endothelium dysfunction in children and adolescents with IDDM.

**Methods:** 45 IDDM children and adolescents (age:  $12.8 \pm 3.4$  yrs, disease duration  $5.8 \pm 4.1$  yrs) and 20 matched healthy controls were included in the study. The plasma levels of NO stable metabolites ( $\text{NO}_x$ :  $\text{NO}_2^-/\text{NO}_3^-$ ) as well as the activity of glutathione peroxidase ( $\text{GP}_x$ ) were determined. The plasma levels of P-selectin and TN and  $\text{HbA}_{1c}$  were also measured.

**Results:** The levels of  $\text{NO}_x$  were found significantly higher in IDDM children compared to controls: 60 mmol/ml (52.6-69.1) [median, interquartile range] vs 52 mmol/ml (43.7-53.8), respectively,  $p < 0.01$ . The activity of  $\text{GP}_x$  was lower in IDDM children: 36.9 mmol/ml (29.03-45.2) vs 47.2 mmol/ml (36.6-48) respectively,  $p < 0.03$ . Plasma TN and P-selectin were found elevated in IDDM children vs controls: 19.9 mg/L (16-21.7) and 10055 ng/ml (828-1289) vs 15.6 mg/L (11-19.5) and 350 ng/ml (245-480),  $p < 0.008$  and  $p < 0.001$ , respectively. Statistical analysis showed that in IDDM children with poor control ( $\text{HbA}_{1c} > 7\%$ ) levels of TN and P-selectin were positively correlated with levels of  $\text{NO}_x$  (TN:  $r_s = 0.50$ ,  $p < 0.04$ ; P-selectin:  $r_s = 0.18$ ,  $p < 0.05$ ) and negatively with levels of  $\text{GP}_x$ . (TN:  $r_s = -0.48$ ,  $p < 0.05$ ; P-selectin:  $r_s = -0.58$ ,  $p < 0.04$ , respectively).

**Conclusion:** Oxidative stress seems to be related to upregulation of endothelium adhesive molecules in IDDM. This fact suggests that oxidative stress may contribute to the early development of vascular complications of the disease.

### Reactive oxygen metabolites, vitamin A, vitamin E and coenzyme Q10 in type 1 diabetic children

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**Background:** Studies regarding oxidant/antioxidant balance in children and adolescents have given conflicting results. We determined hydroperoxide levels (reactive oxygen metabolites = ROMs) as oxidative marker and vitamins A, E and coenzyme Q10 values as membrane antioxidants in a group of children, adolescents and young diabetic adults.

**Methods:** We studied 75 unselected children and young type 1 diabetic patients (mean age of  $15.4 \pm 7.4$  yr). 16 patients were examined at clinical onset and 59 after a mean of  $10.5 \pm 6.7$  years of disease. Fifty-six patients had no complications, 11 had retinopathy and 8 micro- or macroalbuminuria. ROMs were assayed using the kit d-ROMs test (Diacron, Italy), vitamins A and E by HPLC and coQ10 by HPLC by the method of Grossi *et al.*

**Results:** Compared to age-matched controls the whole group of diabetic patients did not have different ROMs values, but higher vitamin E levels. Higher CoQ10 and vitamin E levels were present in patients with HbA1c  $>8\%$  than in those with values  $<8\%$  and higher vitamin E concentrations in patients with complications than in those without. We found the following:

correlations between:	<i>Whole group</i>	<i>At onset</i>
Vit. E and coQ10	$r=0.497, p<0.0001$	$r=0.655, p=0.011$
Vit. E and HbA1c	$r=0.360, p=0.003$	$r=0.242, N.S.$
CoQ10 and HbA1c	$r=0.402, p=0.0001$	$r=0.510, p=0.05$
ROMs and Vit. E or coQ10	N.S.	N.S.
ROMs and HbA1c	N.S.	N.S.

**Conclusions:** In this study, oxidative stress has been demonstrated indirectly through the rise of membrane antioxidant defences, which increase as the control worsens. This adaptive response seems to be sufficient for the moment to neutralize the increased production of reactive oxygen species. CoQ10 seems to have an important role from the onset of the disease.