Anthrop. Közl. *32;* 215–218. (1989/90)

GROWTH AND NUTRITIONAL CONDITIONS OF DIABETIC CHILDREN

M. Collell, C. Pavia, M. R. Caballin and *M. C. Sanz*

Unit of Anthropology, Department of Animal Biology, Vegetal Biology and Ecology, Faculty of Sciences, University Autonoma of Barcelona, Bellaterra, Barcelona, Spain; Section of Endocrinology, Hospital Infantil Sant Joan de Déu de Barcelona, Carretera d'Esplugues s/n. Barcelona, Spain

Abstract: *We have studied a sample of 185 diabetic children type I aged 3 3/12 and 18 year old, in order to evaluate their growth and nutritional condition considering the metabolic control degree, puncture zone and period of the diabetes evolution. We have measured 7 auxological variables and calculated 3 derived indices. The sample has been distributed according to their prepubertal maturing and pubertal one, comparing, these subgroups: one another, with the healthy population, according to sexes, HbA1C levels and with the evolution period. It seems that the period of disease evolution and the zone of puncture do not affect the considered anthropometric variables. The subjects have a good nutritional condition. Sexual dimorphism is shown much more intensively in adiposity. If HbA1C level is maintained under 10.0% we are sure that the development will be produced in a way closer to normality.*

Key words: *Growth, Nutrition, Skinfold, Diabetes mellitus type I.*

Introduction

It has been accepted that chronical illness have negative effects on the children growth and development (Kappy 1987).

Insulin-dependent diabetes mellitus (IDDM) is probably one of the most profound metabolic disturbance of childhood and adolescence (Joslin 1985). One of the goal of treatment is to intend attain the best possible metabolic control of the disease, in order to reach a development closer to normality (Clarson, Daneman and Ehrlich 1985).

The fact that the study of the anthropometric traits have a fundamental interest in the pediatric endocrinological clinics and, also the discrepancy existing in what concerns their dependence from the diabetes metabolic control (Beal 1948, Larsson and Sterky 1962, Birbeck 1972, Drayer 1974, Brink 1987, Salardi, Tonioli, Tassoni, Tellarini, Mazzanti and Cacciari 1987, Wilson 1987), have decided by us to develop the present cross-sectional study based on a sample of IDDM children.

Subjects and Methods

We have studied a sample of 185 diabetic children (Table 1), grouped taking in consideration their pubertal situation (using criteria described by Tanner 1962) and the period of the disease evolution (≤ 5 years and ≥ 5 years). All the patients were submitted to a treatment combining long and short acting insulin and, also to an adequate diet to their chronological age and have been taught suitably on the selfcontrol techniques.

Seven anthropometrical measures: supine length, sitting height, leg length (supine length – sitting height), retrotricipital, subscapular and suprailiac skinfolds, upper arm circumference and weight have been recorded following the International Biology Programme (Weiner and Lourie 1969). All these measurements, have been obtained using a Holtain stadiometer, a weighing machine (showing 100 grs differences), a

Holtain skinfold caliper and a steel tape. We have calculated the Quetelet's index (Weight/Height^2) x 10, cormic index as per Giuffrida-Ruggeri's formula (sitting height x 100/supine length) and segment ratio (sitting height/leg length). The obtained data have been compared with the standards reported by sempé (1979).

Glycosylated hemoglobin levels (HbA1C) have been measured using mini-column chromatography (BIORAD test). Intra- and interassay coefficients of variation were 2.7% and 2.8%, respectively, that have allowed us to define three groups depending on the metabolic control degree: fair control (HbA1C ≤ 0.0%), intermediate control (8.1% – 10.0%) and poor control (HbA1C ≥ 10.1%).

The data have been analyzed in the VAX/VMS computer from the "Centre de Càlcul" in the "Universitat Autonoma de Barcelona". The statistical analysis was made with the package SPSSx, using U Mann-Whitney test and Spearman correlation coefficient. It has been considered valid a probability P ≤ 0.05.

Table 1. **Sample of IDDM children**
(N = 185 IDDM children Chronological Age from 3 years 3 months to 18 years)

	Boys		Girls	
Maturing situation	N = 104 C. A. 3 3/12 – 18 years		N = 81 C. A. 3 3/12 – 18 years	
	Period of disease evolution		Period of disease evolution	
Prepubertal	≤ 5 years	> 5 years	≤ 5 years	> 5 years
66 boys	N = 48	N = 18	N = 27	N = 5
32 girls	C. A. 3 years 8/12 – 12 years		C. A. 3 years 3/12 – 11 years	
Pubertal	N = 18	N = 20	N = 27	N = 22
38 boys 49 girls	C. A. 12 years 1/12 – 18 years		C. A. 11 years 1/12 – 18 years	

Results

In all groups, HbA1C level do not surpass 9.0% (Table 2). Supine length and weight show higher significant values than reference population. Prepubertal boys show lower mean values of segment ratio (P ≤ 0.001) than reference values but they have also higher values of leg length and no significant difference in their sitting height. Quetelet's index mean values are higher than reference population in all subgroups (P ≤ 0.05). Sexual dimorphism, and evolution of the skinfolds are normal, but these patients show higher significant values in prepuberty. Arm circumference values are higher (P ≤ 0.001) in all subgroups except in pubertal boys in which muscularity is very important.

Comparing the sex subgroups (Table 3), we found that sexual dimorphism is evidenced in skinfolds, leg length, cormic and Quetelet-s indexes and segment ratio.

Table 2. **Comparison with the healthy population, means (Sempé, 1979)**

Variable	Prepubertal boys	Pubertal boys	Prepubertal girls	Pubertal girls
Chronological age (months)	108.0	175.2	94.9	169.4
Supine length (cm)	134.0**	161.3	128.8**	156.3
Weight (kg)	30.7***	49.6	28.2***	49.5
Sitting height (cm)	71.2	83.4*	69.7***	82.4*
Leg length (cm)	62.8**	77.8*	59.2*	73.8*
Skinfolds (cm):				
Retrotricipital	11.4***	9.7	13.6***	17.3***
Subscapular	6.0***	6.6	7.3***	12.0***
Suprailiac	5.5***	7.2*	7.2***	11.2***
Arm circumference (cm)	20.2***	23.6	20.5***	24.9***
Quetelet's index	169.2*	187.8*	166.2*	200.2*
Cormix index	53.2	51.7	54.3	52.8
Segment ratio	1.142***	1.073	1.195	1.120
HA1C (%)	8.1	8.3	8.2	8.9
Period of disease (mts)	40.8	67.8	32.2	62.0

* $P \leq 0.05$ ** $P \leq 0.01$ *** $P \leq 0.001$

Table 3. **Comparison in order to sex subgroups**

	Prepub/ prepub	Pub/ Pub
Supine length	NS	NS
Weight	NS	NS
Sitting height	NS	NS
Leg length	NS	$P < 0.05$
Retrotricipital skinfold	NS	$P < 0.001$
Subscapular skinfold	NS	$P < 0.001$
Suprailiac skinfold	$P < 0.05$	$P < 0.001$
Arm circumference	NS	NS
Qetelet's index	NS	$P < 0.05$
Cormic index	$P < 0.05$	$p < 0.05$
Segment ratio	$p < 0.05$	$p < 0.001$

Table 4. **Spearman correlation coefficients**

Spearman correlation coefficient between the puncture zone and the body implicated areas

Variable	Prepuber	Puber	Prepuber	Puber
Triceps	0.0861	-0.1215	-0.0140	0.2531
Subscapula	0.2162	-0.1013	0.0140	0.0896
Suprailiac	0.1387	-0.0624	-0.2029	0.0844
Arm circumference	0.3072	-0.0471	-0.3429	0.1318

Spearman correlation coefficient between the period of disease evolution and the body implicated areas

Variable	Prepuber	Puber	Prepuber	Puber
Triceps	0.2293	0.1139	0.4373	0.0925
Subscapula	0.2846	0.3710	0.1793	0.1281
Suprailiac	0.2677	0.1563	0.3165	0.1214
Arm circumference	0.2131	0.2675	0.6813	0.2631

It has not been observed any significant correlation between the zone of puncture and the implicated body areas and neither between the period of disease evolution and the implicated body areas (Table 4).

It has not been found any difference in none auxological variable considered between HbA1C levels subgroups.

Discussion

The period of disease evolution and the zone of puncture it seems that do not affect the considered anthropometric variables. On the other hand, the subjects have a good nutritional condition, so, this fact suggests that the teaching programme we use secures a good control of diabetes.

The progression of the different auxological considered variables do not differ from the healthy population, in disagreement with previous studies (Wilson 1987).

Sexual dimorphism is shown much more intensively in nutritional conditions. Diabetic girls show more adiposity than girls from the reference population.

If HbA1C level is maintained under 10.0% we are sure that the development will be produced in a way closesr to normality.

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Paper presented at the 6th Congress of the European Anthropological Association, Budapest, September 1988. – *Devided first price "for the best poster".* – Received September, 1988; revision received 21 May, 1990.

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Mailing address: Dr Montserrat Collell
Unitat d'Antropologia
Facultad Ciencies
Universidad Autonoma Barcelona
08193 Bellaterra Barcelona
Spain