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Some Circumferential Measurements of the Body and Limbs in Children with Type 1 Diabetes Mellitus

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The aim of the present study was to determine some circumferential measurements as indirect indices for deposition and distribution of fat tissue in children with type 1 diabetes mellitus. The examined patients were children with type 1 diabetes mellitus divided into the following age groups: 45 boys aged 4-12 years, 50 boys aged 12.01-18 years, 46 girls aged 4-12 years, 53 girls aged 12.01-18 years. Healthy children (250) were divided into same groups. The following six measurements were taken from each child: circumference of the arm, forearm, waist, hip, thigh and leg. In the boys aged 4-12 years the circumference of the leg was smaller in the diabetic than in the healthy boys. In the boys aged above 12 years the circumferences of the arm and waist were statistically smaller in the diabetic than in the healthy boys. Girls aged 4-12 years showed no statistically significant difference between patients and controls. In the girls aged above 12 years the waist, hip and thigh circumference were significantly greater in the diabetic patients. In between-gender comparison the diabetic girls above the age of 12 showed greater waist and thigh circumference than the same age diabetic boys. No difference was found in the other measurements. In the age group 4-12 years the waist/hip ratio was greater in the diabetic than in the control children. In the 12-18-year-old girls the patients had greater ratio than the controls, while in the boys of the same age group the ratio was greater in the controls than in the patients.

Key words: type 1 diabetes mellitus, circumference measurements, body, limb, anthropometry.

Introduction

Metric examinations of the body and limb circumferences are essential for evaluation of the risk and development of type 1 diabetes mellitus [5].The great prognostic role of the waist, hip and thigh circumference measurements and the ratio between them are especially mentioned [1, 2, 4].

Aim

The aim of the present study was to determine some circumferential measurements as indirect indices for deposition and distribution of fat tissue in children with type 1 diabetes mellitus.

Material and Methods

Children (boys and girls) with type 1 diabetes mellitus treated with insulin by individual schemes were included in the study.

The boys were divided into two groups: group 1 aged from 4 to 12 years (45 children of mean age 9 years and 7 months) and group 2 aged from 12.01 to 18 years (50 children of mean age 15 years and 8 months). The girls were also divided into two groups: group 1 from 4 to 12 years (45 children of mean age 8 years and 9 months) and group 2 from 12.01 to 18 years (53 children of mean age 15 years and 2 months).

Six circumferential measurements were taken: arm, forearm, waist, hip, thigh and leg. Waist/hip ratio was determined. Analogous measurements were done in 250 healthy children divided into the same age groups. They were used as a control group.

The results obtained were analyzed with statistical programmes SPSS 11.0 and INSTAT. The level of significance was determined as low ($p>0.05$), moderate ($p=0.04$-0.001) and high ($p<0.001$).

Results and Discussion

Boys aged from 4 to 12 years

In this age group moderate statistical difference was found only in the circumferential measurements of the leg between the studied and control group ($p=0.04$-0.001).

Boys aged from 12.01-18 years

This age group presents with between-group difference of moderate statistical significance in the waist circumference ($p=0.04$-0.001) and between-group difference of low statistical significance ($p>0.05$) in the arm circumference.

Girls aged from 4 to 12 years

In this age group no statistically significant between-group difference was found in any of the circumferential measurements.

T a b l e 1. Circumferential measurements in diabetic and healthy boys aged 4-12 years

Variables	Diabetic patients			Healthy subjects		
	N	Mean	SD	N	Mean	SD
Arm	45	19.44	2.79	65	19.88	2.62
Forearm	45	19.71	2,21	65	19.76	1.92
Waist	45	60.85	7.76	65	58.91	5.98
Hip	45	71.87	9.47	65	71.10	6.41
Thigh	45	39.51	6.53	65	40.83	5.10
Leg	45	27.13	4.05	65	28.46	3.26

T a b l e 2. Circumferential measurements in diabetic and healthy boys aged 12-18 years

Variables	Diabetic patients			Healthy subjects		
	N	Mean	SD	N	Mean	SD
Arm	50	24.02	2.94	61	25.26	3.56
Forearm	50	24.19	2.41	61	24.45	2.69
Waist	50	68.68	13.21	61	71.93	7.09
Hip	50	87.78	8.91	61	89.08	7.26
Thigh	50	48.07	5.72	61	48.65	5.53
Leg	50	33.40	3.58	61	34.40	3.83

T a b l e 3. Circumferential measurements in diabetic and healthy girls aged 4-12 years

Variables	Diabetic patients			Healthy subjects		
	N	Mean	SD	N	Mean	SD
Arm	46	19.78	2.93	70	20.03	2.79
Forearm	46	19.72	1.74	70	19.50	2.19
Waist	46	58.64	6.32	70	57.81	6.34
Hip	46	70.67	8.52	70	73.16	7.39
Thigh	46	40.78	5.32	70	41.86	5.41
Leg	46	27.59	3.80	70	28.53	3.41

T a b l e 4. Circumferential measurements in diabetic and healthy girls aged 12-18 years

Variables	Diabetic patients			Healthy subjects		
	N	Mean	SD	N	Mean	SD
Arm	53	24.29	2.81	65	23.72	2.80
Forearm	53	23.32	1.91	65	22.66	2.29
Waist	53	69.55	7.63	65	66.02	6.76
Hip	53	91.99	7.09	65	89.70	7.13
Thigh	53	52.34	5.16	65	49.95	5.26
Leg	53	33.95	3.13	65	34,11	3.47

T a b l e 5. Waist/hip ratio in diabetic and healthy children

Groups	Boys aged 4-12 years	Boys aged 12-18 years	Girls aged 4-12 years	Girls aged 12-18 years
Diabetic patients	84.67	79.24	83.00	75.60
Healthy subjects	82.86	80.75	79.00	73.60

Girls aged from 12.01-18 years

Moderate statistically significant difference in the hip and thigh circumferences was found between the diabetic patients and control subjects (p=0.04-0.001). Statistically significant difference was found in the waist circumference (p<0.001). This relationship was mentioned by other authors, too [1].

Between-gender comparison of the circumferential measurements

Besides the above-mentioned comparisons we compared the circumferential measurements between boys and girs divided into two groups: below 12 years and above 12 years of age. Children above the age of 12 showed moderate statistical difference in the hip circumference (p=0.04-0.001) which was significantly greater in girls. In the same age group moderate statistical significance was found in the thigh circumference (p=0.04-0.001), which was significantly greater in girls. No statistically significant differences were found in the remaining measurements. These findings accord with those reported by other authors [1, 2, 3, 6].

Conclusions

1. In the girls with type 1 diabetes mellitus aged from 4 to 12 years the circumferential measurements of the leg are statistically smaller than those in the healthy girls.
2. In the boys with type 1 diabetes mellitus above the age of 12 the circumferential measurements of the arm and waist are statistically smaller than those in the healthy girls.

3. In the girls of 4-12 years of age the difference in none of the circumferential measurements shows statistically significant difference between patients and healthy subjects.
4. In the girls above the age of 12 the waist, hip and thigh circumferences are significantly greater in diabetic than in the healthy children.
5. In between-gender comparison of the circumferential measurements in the diabetic patients the waist and thigh circumferences are significantly greater in the girls than in the boys above the age of 12. No statistically significant differences are found in the other measurements.
6. Waist/hip ratio is greater in diabetic than in the healthy boys and girls aged from 4 to 12 years. In the 12-18-year-old girls the index is also greater in the patients than in the healthy controls, while in the 12-18-year-old boy the healthy children show greater index than the patients.

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