

RESEARCH PAPER

Nutritional Status of Children and Adolescents with Type1 Diabetes Mellitus in Basrah

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Abstract

Growth problems represent an important complication in children and adolescent with Type1 diabetes mellitus and poor metabolic control seems to impact their growth velocity. **Aim:** to assess the nutritional status in children with type 1 diabetes mellitus, in relation to selected patients' variables.

Methods: a case-control study has been carried out to assess the nutritional status of sixty-one patients with type 1 diabetes mellitus; and eighty-two age and sex matched healthy children as control group; their ages ranged from 3-14 year, from the 1st of October 2016 till 15th of March 2017.

Results: The mean age of diabetic patients was (10.3±3.02) years; (60.66%) belong to large family size with low education. Diabetic patients significantly belong to families with poor financial support and income in (45.9%) compared to the control group (26.8%) (p value 0.02), as well as those undernourished diabetic children significantly belongs to families with poor income than those with normal nutritional status (75%, 38%) respectively. Body mass index was significantly below 5th percentile in diabetic patients than the controls (19.68 %, 2.4 %) respectively; P value 0.001. History of inadequate dietary intake was recorded in 66.67% of patients; significantly related to undernutrition in diabetics patients than controls (P value 0.002). Undernutrition in diabetic children significantly associated with poor glycemic control with significantly high level of HbA1c (13.9±9.57) than those without undernutrition (10.6±5.28) respectively.

Conclusion: Frequent evaluation of diabetic children is required to overcome the problem of undernutrition in patients with type 1 diabetes mellitus.

Keywords: Type1diabetes; Nutritional status; Children.

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Introduction

Diabetes mellitus is a syndrome of disordered metabolism due to an absolute or relative deficiency of insulin which resulted into inappropriate hyperglycemia. ⁽¹⁾ Several studies

have suggested growth retardation in children with type 1 diabetes with suboptimal diabetes control and normal growth in children with good metabolic control. ⁽²⁾

Like other chronic diseases, growth delay may result from combination of pathophysiologic processes such as calorie wasting from hyperglycemia or malabsorption secondary to celiac sprue, chronic acidosis, increased glucocorticoid creation, hypothyroidism and

delay puberty, the severity is mainly related to glycemic control and to the insulin regimes.⁽³⁾ The traditional goals of treatment in children and adolescents with diabetes were to balance insulin, diet, and exercise to promote optimal growth and development while minimizing episodes of hypoglycemia and hyperglycemia.⁽⁴⁾ Nevertheless, the association among glycemic control and skeletal growth is unreliable and many kids with seemingly marginal control appear to grow well. Such patients are able to reach normal intracellular nutrition despite apparent hypo-insulinemia. However, that advancement in improving glycemic control in diabetes will improve growth in these children.⁽⁵⁾ Factors affecting growth include: gender, genetic, age at diagnosis, diabetes duration, puberty, metabolic control, and status of growth hormone (GH), insulin-like growth factors (IGFs), and IGF binding proteins (IGFBPs) and psychosocial factors.⁽⁶⁾

Methods

A case control study has been carried out to assess the nutritional status of children and adolescent with type1 diabetes mellitus who were registered and followed at Al-Faiha Specialized Diabetes Endocrine and Metabolism Center (FDEMC); Sixty-one patients were enrolled in the study, their ages ranged from 3-14 year; 36 were females and 25 were males. Eighty-two apparently healthy children, were age and sex matched as a control group.

Patients with type 2 diabetes, children with positive serology for celiac disease and hypothyroidism were excluded from the study. A special Questionnaire was designed for the purpose of the study. An informed consent was

obtained from the parents for recruitment in the study. All patients underwent general, systemic examination. Anthropometric measurements were assessed and applied to appropriate charts.⁽⁷⁾

Body mass index (BMI) less than 5th percentile has been proposed as a cutoff to define thinness in children. The term “overweight” generally defined as a BMI at or above the 95th percentile of sex-specific BMI-for-age values from the 2000 CDC growth charts.⁽⁸⁾

Conventional insulin therapy: define as a twice daily insulin regimens of short and longer acting insulin requirement.

Intensive insulin therapy: which enable insulin dose to be matched to carbohydrate intake in four divided doses.^(9,10)

Family size is described according to the number of children; those families with ≥ 3 children regards as large families, and those families with less than 3 children regard as small families.⁽¹¹⁾

On the other hand family income divided in to:⁽¹²⁾

Low income: below 100,000 ID per capita,

Medium: range from 100,000- 250,000 ID per capita,

High: above 250,000 ID per capita

Assessment of dietary requirement:

Recommended daily allowance and actual intake was calculated according to caloric intake and physical activity of patients by 24- hours recalls for food intake.⁽¹³⁾

The following equation was used:

$RDA = \text{Basal metabolic rate} \times \text{Physical activity} + \text{Thermal effect.}$

$BMR = \text{Ideal body weight} \times 1 \text{ Kcal.} \times 24 \text{ hr. (in male and 0.95 Kcal. in female).}$

Hemoglobin A1c (HB A1c) determined by high performance liquid chromatography (HPLC), normal range 4.0-6.0 %

The Data analyzed using SPSS software version 23 and were expressed by mean± Standard Deviation (SD). Comparison was performed by using Chi-Square test and T test. Logistic regression analysis (Binary Logistic) was also done for the analysis of different marker, by using Odd Ratio (OR) and Confidence Interval (CI). For all test p value was considered as statistically significant if below 0.05.

Statistical analysis

All data were analyzed by SPSS (Statistical Package for Social Science – version 15). P value <0.05 was considered to be significant.

Results

The mean age of diabetic patients and control group was 10.3±3.02, 9.3±2.96 as well as the frequency of diabetic females and males was 59.02% ,40.98% respectively .

The growth parameter as weight for age (WFA), height for age (HFA), and body mass index (BMI) were significantly below 5th percentile in diabetic children than control group, BMI which is considered as indicator of undernutrition show statistically significant results with P value (0.001). Table (1)

Diabetic children belong to families with low and medium income were significantly undernourished (P value 0.05), on the other hand, history of inadequate dietary intake was recorded in 66.67% of patients; was significantly related to undernutrition in diabetics patients than controls (P value 0.002). Other variables as parents' education and family size show no significant

relation to the nutritional status as shown in Table (2)

Percent ile	WFA	Control No. (%)	HFA	Control No. (%)	BMI	Control No. (%)
	Cases No. (%)		Cases No. (%)		Cases No. (%)	
<5 th	17(27.87)	8(9.76)	15(24.59)	3(3.65)	12(19.68)	2(2.44)
5 th -50 th	24(39.35)	34(41.46)	32(52.46)	52(63.42)	30(49.18)	43(52.44)
50 th -95	18(29.51)	35(42.68)	12(19.68)	24(29.28)	17(27.87)	31(37.81)
>95 th	2(3.27)	5(6.1)	2(3.27)	3(3.65)	2(3.27)	6(7.31)
Total	61(100)	82(100)	61(100)	82(100)	61(100)	82(100)
P value	0.017		0.001		0.001	

Variables	Diabetic patient with under nutrition (No. 12)		Diabetic children without under nutrition (No. 49)		P value	
	No.	%	No.	%		
Mothers' education	Illiterate	1	8.3	5	10.2	0.55
	Primary	5	41.7	25	51.1	
	Secondary	5	41.7	14	28.5	
	Academic	1	8.3	5	10.2	
Fathers' education	Illiterate	2	16.7	3	6.1	0.56
	Primary	3	25	18	36.7	
	Secondary	6	50	18	36.7	
	Academic	1	8.3	10	20.5	
Family size	Small	4	33.3	20	41	0.43
	Large	8	66.7	29	59	
Family income	Low	9	75	19	38.7	0.05
	Medium	2	16.7	27	55.2	
	High	1	8.3	3	6.1	
Dietary intake	Adequate	4	33.33	45	91.8	0.002
	Inadequate	8	66.67	4	8.17	

Table (3) shows the duration of treatment in diabetic patients less than one year was significantly related to undernutrition (P value 0.003), while the age of diagnosis or modality of treatment had no relation to nutritional status of studied patients.

Significantly high level of HbA1c with poor glycemic control in diabetic children with undernutrition aged (10-14 years) (P value 0.041). Table (4)

Table (3) Nutritional status of patients and diabetes related variables

Variables		Diabetic patients with under nutrition		Diabetic patients without under nutrition		P value
		No.	%	No.	%	
Age of onset (years)	3-5	2	12.5	14	87.5	0.17
	>5-10	8	21.05	30	78.95	
	>10-14	2	28.57	5	71.43	
Duration of treatment (years)	<1	8	47.05	9	52.95	0.003
	1-5	3	7.5	37	92.5	
	>5	1	25	3	75	
Modality of treatment	Convention al	7	20	28	80	0.92
	Intensive insulin therapy	5	19.23	21	80.77	
Total 61		12(100)		49(100)		

Tables (4) Mean HbA1c level in relation to nutritional status and age group

		HbA1c level in diabetics with under nutrition	HbA1c level in diabetics without under nutrition	P value
Age group (years)	3-5 (3)	6.9±1.2	6.8±1.1	0.481
	>5-10 (25)	10.7±2.8	10.3±2.07	0.7
	>10-14(33)	13.9±9.57	10.6±5.28	0.041

logistic regression analysis of selected variables was studied in Table (5); it reveals that undernutrition in diabetic children are significantly related to their age, duration of treatment, poor dietary intake and low family income.

Table (6) Predictors of Undernutrition in T1DM patients

Variables	Odd ratio	Confidence interval		P value
		Lower	Upper	
Age	0.169	0.029	0.99	0.049
Dietary intake	0.01	0.0012	1.1	0.002
Modality of treatment	6	1.2	28.6	0.92
Duration of treatment	2.6	0.22	31.06	0.003
Family income	1.7	0.26	12.02	0.05

Discussion

Growth is a complex process influenced by many genetic and environmental factors and abnormal growth secondary to chronic metabolic status like diabetes mellitus.

The growth parameters (WFA, HFA, BMI) of diabetic children were significantly lower than that of control group, undernutrition in diabetic children was 19.7%; which is in consistent to Vaman et al study in India⁽¹⁴⁾ and Stipančić G et al in Croatia.⁽¹⁵⁾

In contrast to Economos et al⁽¹⁶⁾ who reported that approximately one-third of children in the USA are either overweight or obese possible because malnutrition particularly undernutrition has remained a major health challenge in children in low-income developing countries and more in those with chronic diseases.

The American Diabetes Association released a position statement emphasizing the importance of psychosocial care for people with diabetes.⁽¹⁸⁾ Socioeconomic status of studied patients reveals that poor financial support and poor living conditions particularly with regard to access to food and health care is an important factor determine their nutritional status; that's against Manal et al study who reported that 60% of diabetic patients belong to high income families.⁽¹⁷⁾

Higher frequency of inadequate dietary intake was reported in diabetic children compared with control group, this is mainly due to improper food intake and dietary restriction, similar result reported from Mona et al study who showed the effect of nutritional intake on health status.⁽¹⁹⁾

The etiology of disorders of eating behavior in diabetes seems to be multifactorial. Behaviors

and attitudes that are important components of diabetes management, such as dietary restraint and counting carbohydrates, may place an unhealthy emphasis on food intake that results in dysregulated eating pattern.⁽²⁰⁾ Undernutrition in diabetic patients are more common in first year of diagnosis which indicate that nutritional status deterioration may begin at early stage of diagnosis and improve with beginning of treatment and improvement of glycemic control. Some studies have shown that the first year after T1D diagnosis is essential to the acceptance and adaptation of the patients and their relatives to the disease. These studies also have described that those patients who adapt more quickly have a better prognosis.⁽²¹⁾

In this study the modality of treatment whether conventional or intensive insulin therapy didn't significantly influence the nutritional status of diabetic children, in contrast to Vaman et al⁽¹⁴⁾, who concluded that undernutrition is less frequent in diabetic patients receiving intensive insulin therapy than those who receive conventional therapy.

HbA1c which is a reliable index of long-term glycemic control in diabetic patients and high values of HbA1c are indicative of persistent hyperglycemia, which is a common cause for undernutrition in diabetic patients was more noticeable in the age group (>10-14 years).

Similar studies have documented that poor metabolic control was associated with growth impairment in diabetic children.⁽²²⁾ In fact, similarly to what documented in healthy adolescents, also in subjects with T1D puberty is associated with a reduction in insulin sensitivity, which might negatively influence growth and height gain.⁽²³⁾

There are conflicting literatures on anthropometric parameters in children with diabetes, while it is generally agreed that there is impairment of anthropometric parameters in diabetic children, some studies report that these are related to metabolic control while others have reported that differences in growth parameters cannot be attributed to metabolic control alone. This finding suggest other possible mechanisms for growth failure in children with diabetes mellitus and further investigations are needed to understanding growth impairment in diabetic children.⁽²⁴⁾

Conclusion

undernutrition is a considerable problem in children with type1 diabetes mellitus, and growth evaluation need to be considered as one of the main tasks in the regular follow up of these populations.

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الخلاصة