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Original Research Article

Assessment of Cumulative Glycated Hemoglobin in Children and Adolescents with Type 1 Diabetes in Alzawia Diabetic Patients

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Abstract: As a result of the pancreas not secreting the hormone insulin or secreting it in a low concentration, as the hormone is important in enhancing the ability of glucose to enter cells and produce energy, and the cumulative glucose analysis is HbA1c, also known as glycated hemoglobin, which is a product of glucose adhesion in the body with red blood cells (RBC). The pellets are effective from two to three months, and for this reason, 3 cumulative glucose readings are taken for the same period. This study was conducted at Al-Zawiya Central Hospital, Children's Department, for 100 children with type 1 diabetes, of whom 46 were males and 54 were females, the purpose of this study is to evaluate the cumulative sugar levels for children and adolescents with diabetes, as the study showed a weakness in the cumulative rate, which was high at a rate of 10.6%, and a lack of care for diabetes with a lack of regular exercise.

Keywords: hormone insulin, glycated hemoglobin, diabetes.

INTRODUCTION

Glycated hemoglobin (hemoglobin A1c, HbA1c, A1c, or Hb1c; sometimes also HbA1c or HGBA1c) is a form of hemoglobin that is measured primarily to identify the average plasma glucose concentration over prolonged periods [1]. It is formed in a non-enzymatic glycation pathway by hemoglobin's exposure to plasma glucose. HbA1c is a measure of the beta-N-1-deoxy fructosyl component of hemoglobin. Normal levels of glucose produce a normal amount of glycated hemoglobin. As the average amount of plasma glucose increases, the fraction of glycated hemoglobin increases in a predictable way. This serves as a marker for average blood glucose levels over the previous 3 months before the measurement as this is the lifespan of red blood cells [2-3].

Historically, HbA1c was first isolated by Huisman *et al*., [4] in 1958 and characterized by Bookchin and Gallop [5] in 1968, as a glycoprotein. The elevated levels of HbA1c in diabetic patients were reported by Rahbar *et al*., [6] in 1969. Bunn *et al*., [7] identified the pathway leading to the formation of HbA1c in 1975. Using the HbA1c as a biomarker for monitoring the levels of glucose among diabetic patients was first proposed by Koenig *et al*., [8] in 1976.

The HbA1c assay was introduced in 1989 as a replacement for the total glycohemoglobin test. The HbAlc assay is the measurement of glycated hemoglobin and is regarded as the gold standard method for assessing long-term glycemic control [9].

Diabetes is a disorder of the endocrine glands and metabolism in the body and is more common in the category of children and adolescents. When the disease is diagnosed for this group, daily life requires a continuous injection under the skin, where sugar must be monitored several times a day while preserving the meals and activities that the infected person does, as management affects Diabetes affects the life of a child or adolescent with the involvement of family, school and friends [10] and it has an effect on the physical way. And that the incidence of type 1 diabetes is increasing all over the world, and the major complications are due to the severe long-term metabolic imbalance such as kidney disease, neurological effect, retinopathy, and cardiovascular disease [11]. Despite the presence of several factors that predispose children and adolescents to chronic complications of diabetes [12], the important adjustable indicators are controlling the level of cumulative sugar in the blood, as it delays the emergence of chronic complications of the disease [13].

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The HbA1c analysis is one of the most important indicators that measure the level of sugar in the blood during the past 3 months and gives clear indications of controlling metabolism in the body and provides clear information to the treating specialist [14]. Research published by the American Diabetes Association (2005) for children and adolescents with type 1 diabetes is keen on the importance High medical care and how to manage the disease and educate adolescents about the importance of measuring cumulative glucose HbA1C and the risks that can occur in the long term. Good control of blood sugar levels for children with type 1 diabetes is considered to improve the diet and lifestyle and reduce the occurrence of severe complications during the stages of life [15].

As result of the increase in the incidence of type 1 diabetes among children and adolescents, the importance of improving quality and the relationship between it and safety and the use of these measures to determine and improve the quality of service providers has increased [16].

Studies have shown that most adolescents with diabetes suffer from poor control of adjusted modified proportions of HbA1c [10]. Also high-income countries showed lower levels of HbA compared to poor countries, who cost their families to buy treatment and blood sugar test strips. A study in Ethiopia documented that more than half of 52.3% of children. And adolescents with diabetes suffer from poor control of blood sugar levels, and it was shown that HbA1c is greater than 10, as it was higher than the recommended normal levels [17].

Aims: To know Prevalence of glyaemic control in Alzawia pediatric diabetic patients.

METHODS

Between May 2021 and July 2022, Children and adolescents with type 1 diabetes were followed up in the Zawia Teaching Hospital, whose ages ranged between 5-15 years, and who frequent outpatient clinics on a regular basis. Regular sports by those in charge of this study, where cumulative sugar rates were reviewed and recorded, a sample of venous blood was taken, and HbA1c was measured in the hospital laboratory as well as some private clinics.

Statistical Analysis

Statistical analysis was performed on a personal computer with the statistical package for social sciences (spss). Test used to compare severe hypoglycemia by HbA1c level. The factors over which patient had no control.

RESULT

There were (100) patient included in the study all children and adolescents with type 1 diabetes had been diagnosed for at least one year. Other patient characteristics are shown in Table (1). The analysis shows that the number blood glucose tests per day, number of HbA1c tests were associated with HbA1c level ($p < 0.01$) show Table (2). In this study, the means HbA1c was (10.6%) standard deviation (3.5%) show Table (3). In Table (4) show t- test for two independent means between care and non-care samples in HBA1c.And Table (5) show one-way analysis of variance f- test between sample members based on exercise participation in HBA1c.

t- test = It is am measure between average

f- test = It is rate of change

Table 1: Demographic of characteristics of all patients included in the study attending pediatric diabetes follow up in al zawia hospital, (n= 100)

Patients	Patient with diabetes
Total	**100**
Males	46
Females	54
Minimum age	5
Maximum age	15

Table 2: Correlation between blood sugar and HbA1c

	N	Mean	SD±	Minimum	Maximum	Person correlation	P- value
Blood sugar(mg/dl)	100	228.32	109.60	53.00	640.00	0.483**	<0.01
HbA1c %		10.70	3.51	5.00	18.00		

(p<0.01)

Table 3: Control HbA1c in children and adolescent's patients

	N	Minimum	Maximum	Mean	Std. Deviation
HbA1c	100	5.00	18.00	10.6580	3.50760
Valid N (List wise)	100				

Table 4: t- test for two independent means between care and non care samples in HBA1c

Variable	Sample	N	Mean	Std.	t	Sig
HBA1c	care	37	8.178	1.23	**12.199	.000
	Non care	63	11.679	1.46		

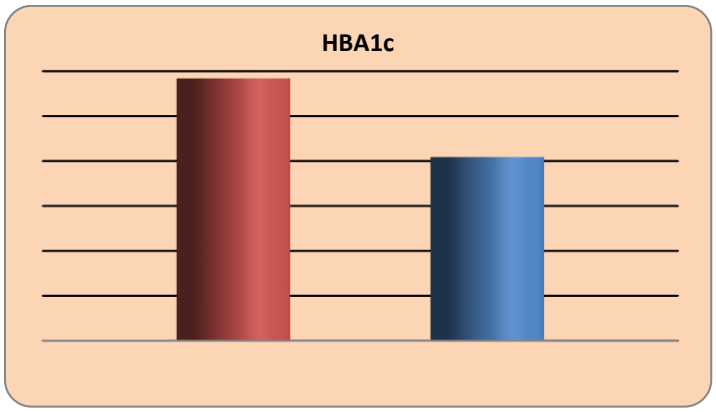

Fig 1: Independent means between care and non-care

Table 5: One-Way analysis of variance f- test between sample members Based on exercise participation in HBA1c

Sample	N	Mean	Std	f	sig
regular	27	8.092	1.01	**72.24600	.0000
Irregular	29	9.869	1.61		
No. Exercise	44	12.129	1.45		

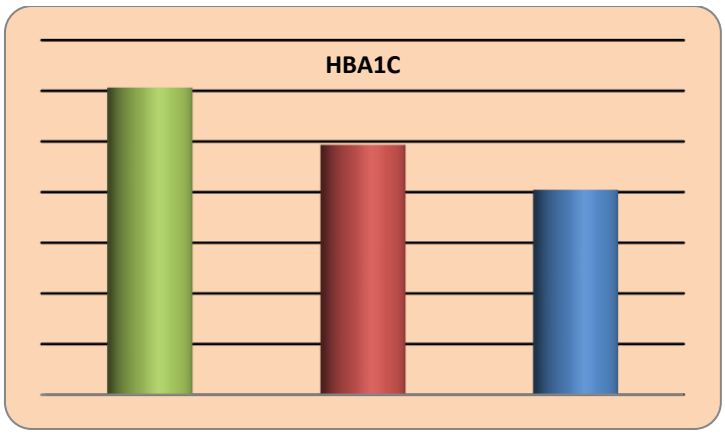

Fig 2: Means of exercise in HBA1c

DISCUSSION

HbA1c is considered the gold standard for glycemic control in diabetic patients and is one of the predictors of disease complications. In this study, our aim was to measure the mean HbA1c levels in diabetic pediatric patients.

We found that the mean HbA1c in our study population was 10.70%, which appears to be moderate high level compared to the values of HbA1c recommended for 10.6% in the result of (Alsaheel *et al*., 2020) at Saudi Arabia previous study [18]. It is also to be to higher compared than values reported in previous studies; the mean HbA1c was 7.8% in Germany and Austria, 7.6% (± SD 1.5) for Polish children and adolescents with long-term type 1 diabetes, and >9.3% in more than half (53%) of the patients in a study conducted in Sweden [19-21]. An HbA1c of 6.5% is recommended as the cut point for diagnosing diabete [22].

Stander deviation in our study about 3.507, which regards higher than previous study in Arabia Saudi about 1.075 and Austria 1.5.

The general nature of this trend might be explained by factors such as hormonal changes during age of puberty, since the growth hormone can decrease insulin sensitivity and increase its clearance [23].

Aside from this, we observed a significant correlation between HbA1c and disease duration. The levels of HbA1c rose as the disease duration increased a result that has also been reported.

Conclusion: Glycemic control of diabetic children in Alzawia teaching hospital was poor.

RECOMMENDATIONS

Good control of blood sugar to avoid high level of HbA1c, this could be achieved through:

a. Controlled diet
b. Regular daily exercise
c. Self-monitoring of blood sugar.
d. Good monitoring of HbA1c every 3 month

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