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Investigation of Fasting Glucose and Glucose Tolerance in Syrian Beta Thalassemia Major Patients

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Abstract

Thalassemia is a genetic blood disease characterized by severe anemia with the accumulation of iron in the body, which results from a failure in the body's functions, including diabetes, which results from the body's resistance to insulin. The aim of this research is to investigate the possibility of diabetes mellitus among β-thalassemia patients and to inform them. We studied Thirty-five major β-thalassemia patients aged between 15 and 30 years, the mean age of 22.5 was included in the meta-analysis, the prevalence of prediabetes was 40 % for IFG and 37 % for IGT. There was no correlation between {BMI, risk factors (hereditary diabetes, smoking, and heart disease), blood transfusion} and development of diabetes. There was a positive weak correlation with taking chelating agent.

Keywords: Diabetes, Beta-thalassemia, correlation, Impaired Fasting glucose (IFG), Impaired glucose tolerance (IGT), Syria.

Introduction

β-Thalassemia (β -thal) is an inherited blood disorder meaning that at least one of the parents must be a carrier of the disorder, it's caused by either a genetic mutation or a deletion of certain key gene fragments **[1]**.

Diabetes mellitus is a major endocrinopathy, which occurs due to transfusional haemosiderosis and is found in 20–30 % of adult patients with β -thalassemia worldwide, accounting for significant morbidity **[2]**. It is multifactorial with iron loading being the dominant cause and its management poses a clinical challenge. Diabetes in thalassemia patients is distinct from type 2 diabetes **[2]**. Iron overload in patients with thalassemia major (TM) affects glucose regulation and is mediated by several mechanisms **[2]**.

Our aim is to investigate the possibility of diabetes mellitus among β-thalassemia patients and to inform them.

Materials and Methods

A cross-sectional study was carried out on 35 thalassemia patients (14 males, 21 females) aged between 15-35 years with a mean age of 22.5 years, during their follow-up visits to the Thalassemia Center in Damascus. Data was obtained by using a form designed to collect the medical information from patients and their records. The present study was approved by the Institutional Ethics Committee of the Al-Sham Private University and Damascus Health Directorate, Informed consent was obtained from all study participants and/or their parents. Inclusion criteria were the patients with beta-thalassemia major, both sexes, fasting 8 hours ago or more, the patient agreed to participate in the study. On the other hand, exclusion criteria were those Diabetics, not fasting, the age was <14 and ≥35 years old, and refusal to participate in the study.

- All patients were subjected to the following:
- Weight measurement using a body scale.
- Height measurement using a ruler.
- Hemoglobin concentration was measured using arterial blood (blood tests).
- Body mass index (BMI) **[3]**
- Measuring the fasting glucose concentration using the Aqua Check Performa device by pricking the finger using stingers.
- Measuring the glucose tolerance concentration two hours after drinking a 75 g glucose solution in half a liter of water and using the same previous device **[4]**, with ensuring hygiene using alcohol and medical cotton.

Criteria to the type of chelation drug. The type of iron chelator was approved by investigating its use by the patient for at least six months.

Statistical analysis.

SPSS version 22 (IBM SPSS, Armonk, NY, USA) was used for data analysis. Mean was used for quantitative variables, while number and percentage were used for qualitative ones. Chi-Square Test, Phi and Cramer's V test. $P < 0.05$ and $P < 0.001$ were considered to indicate significant and highly significant differences respectively.

About the prevalence of diabetes, IFG, and IGT in thalassemia major patients were considered as inclusion criteria. Diabetes was determined according to World Health Organization (WHO) and American Diabetes Association (ADA) [4]. The criterion for the diagnosis of IFG was determined as 100≥FBS<126 mg/dl (FBS; fasting blood sugar) while the criterion for IGT was determined as two-hour glucose levels of 7.8-11.1 mmol/L (140-200 mg/dl), and the United States center for disease control (CDC) the criterion for being prediabetes is from 100 to 125 mg/dl in FBS while intolerance test is from 140 to 199 mg/dl **[4]**.

Results

The mean age of our patients was 22.5 years. They were 14 males (40 %) and 21 females (60 %). The mean weight was 51.9Kg for males and 48.7Kg for females. The mean height was 161.3cm for males and 150.2cm for females. The mean BMI was 19.7Kg/m^2 for males and 21.7Kg/m^2 for females. The mean concentration of hemoglobin was 7.1g/dl for males and 7g/dl for females. The percentage of taking chelators was 80 %, while the percentage of non-users was 20 %. The percentage of patients who suffer from hereditary diabetes is 46 %, and 56 % did not suffer. Normal fasting glucose concentration was 40 % of patients and the same percentage was for prediabetes patients, while diabetic patients were 20 %. Normal glucose tolerance was 57 % of patients and the percentage of prediabetes patients was 37 %, while diabetic patients were 6 %

There was a significant correlation between chelator usage and IGT **(Table 1)**, and the correlation value is 0.438 that indicates the existence of a weak positive correlation.

Table 1. Correlation between IFG, IGT and risk factors, BMI, blood transfusion, and chelator usage of patients. IFG: Impaired Fasting Glucose; IGT: Impaired Glucose Tolerance; BMI: Body Mass Index.

		Approximate Significance	Significance of differences
Risk factors	**IFG**	0.163	Not Significant
	IGT	0.4	Not Significant
BMI	**IFG**	0.072	Not Significant
	IGT	0.1	Not Significant
Blood transfusions	**IFG**	0.079	Not Significant
	IGT	0.251	Not Significant
Chelator usage	**IFG**	0.153	Not Significant
	IGT	0.035	Significant

Discussion

About the body mass index, our study concluded that there is no correlation with IFG and IGT, it may be attributed to the fact that the majority of patients are under normal weight or in the lower limits of normal weight due to lack of nutrition.

About the risk factors, there is no correlation with IFG and IGT, it is maybe by other risk factors related to IFG or IGT and accumulated concentration of iron in the body.

About the variable blood transfusion, our study concluded that there is no correlation with IFG and IGT, it is maybe attributed to several reasons, including the insufficient frequency of blood, and that the transferred iron accumulates in other parts of the body.

About the variable iron chelators our study concluded that there is a correlation with IGT, it is maybe attributed to irregularity in taking chelators by the patients.

In a similar study at Zahedan University in Iran, research on factors affecting diabetes in thalassemia patients was done by Jahantigh et al in 2013 in Ali Asghar Hospital for blood transfusion, the number of patients was 384, ages ranged between 10 and 30 years, with an average of 7.17-9.14 and an IGT ratio 6.3 % and the DM ratio is 15.1 % **[5]**. When studying the relationship with the iron chelator deferoxamine, they found that 11 % of the patients suffer from diabetes, so the study concluded that there was no relationship with the iron chelator deferoxamine, but they noticed that the concentration of sugar tolerance increased when taking the iron chelator deferral. They also noticed that with advancing age, the risk of diabetes developing increases. Also, patients who had serum ferritin of 2000 micrograms per liter and more had an increase in their glucose tolerance concentration.

Conclusion:

We conclude that the most of patients are within the minimum normal weight or below the normal limit. Maybe due to the accumulation of iron in other parts of the body, the variable frequency of blood transfusion is not correlated to IGT. As for the iron chelator variable, there is a weak correlation, maybe due to the patient's lack of commitment to using the chelator.

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Statement of Ethics: The names and personal details of the participants were blinded to ensure privacy.

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