

Metabolic syndrome in Iraqi female patients with major β -thalassemia

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ABSTRACT

Patients with β -thalassemia may have an increased risk for diabetes mellitus and cardiovascular diseases due to high level of iron which may lead to insulin resistance and metabolic syndrome. So this study aimed to evaluate the levels of lipids profile in Iraqi female patients with β -thalassemia. Forty two female (age 15-30) years were enrolled in this study. Blood was collected and the sera were separated from (22) female patients with β -thalassemia who were attended the Ibn-Al-Baladi hospital from September 2012 to January 2013 and (20) healthy subject as a control group. Body mass index (BMI), lipid profile, FSG, insulin, insulin resistance, insulin sensitivity, B-cell function, iron, atherogenic index of serum were estimated.

The results showed the presence of a significant increase in serum iron and significant decrease in insulin, B-cell function, LDL, VLDL, and TC in serum of patients with β -thalassemia when compared with control group. BMI also showed a significant decrease in patients when compared with the controls. Serum Insulin resistance, insulin sensitivity, HDL, TG, AIS, and FSG showed no-significant differences in patients with β -thalassemia when compared with control group. We concluded there was no metabolic syndrome in female patients with β -thalassemia.

الخلاصة

يعاني مرضى الثلاسيميا من مخاطر الإصابة بأمراض القلب والسكر بسبب ارتفاع مستوى الحديد الذي قد يؤدي إلى زيادة مقاومة الخلايا للإنسولين ثم الإصابة بالمتلازمة الأيضية لذلك هدف البحث إلى دراسة مكونات المتلازمة الأيضية لدى النساء العراقيات المصابات بالبيتا ثلاسيميا. تضمنت الدراسة 42 امرأة بعمر (15-30) سنة، 22 امرأة مصابة بالبيتا ثلاسيميا و 20 امرأة سليمة كمجموعة ضابطة. تم جمع النماذج من مستشفى ابن البلدي من تشرين الأول 2012 إلى كانون الثاني 2013. تم قياس كل من معامل كتلة الجسم ومستوى الحديد، وصورة الدهون الكلية، والداالة الدهنية، والكلوكوز، والإنسولين، ومقاومة الإنسولين، وحساسية الإنسولين، ونسبة وظيفة خلايا بيتا. أظهرت النتائج وجود زيادة معنوية في نسبة الحديد وانخفاض معنوي في نسبة الإنسولين، ووظيفة خلايا بيتا، والبروتين الشحمي واطى الكثافة، والبروتين الشحمي واطى الكثافة جدا، كوليسترول الكلي في مصول دم المريضات المصابات بداء بيتا ثلاسيميا مقارنة مع مستوياتها في مصول دم السليمات. وكذلك أظهرت كتلة الجسم انخفاض معنوي عند مقارنتها مع النساء السليمات ولم يظهر كل من مقاومة الإنسولين، وحساسية الإنسولين، والبروتين الشحمي عالي الكثافة، والدهون الثلاثية، ومعامل التصلب الشرياني، وكلوكوز، ارتباط معنوي في مصول دم المريضات عند مقارنتها مع مصول دم النساء السليمات. نستنتج من الدراسة عدم وجود تلازم ايضي لدى النساء العراقيات المصابات بالبيتا ثلاسيميا.

INTRODUCTION

Metabolic syndrome is a cluster of metabolic abnormalities including insulin resistance, abdominal obesity, hypertriglyceridaemia, low levels of high-density lipoprotein (HDL) cholesterol, and hyperglycaemia, atherogenic dyslipidemia, systemic hypertension, oxidative stress, proinflammatory, prothrombotic states. It has been found a relationship between these metabolic abnormalities and other diseases such as cardiovascular and diabetes mellitus [1-4]. Reaven suggested the term of metabolic syndrome for combination of cardiovascular factor [5]. Since insulin resistance has been considered as an underlying cause of risk factors and consequently development of diabetes and cardiovascular diseases [5-10], insulin resistance syndrome was used as another term for metabolic syndrome [11].

Thalassemia is a genetically determined defect in hemoglobin synthesis, there is an inability to build sufficient of globin chains [12]. The defect may affect α - β and γ chains or many affect some combinations of α - β and γ -chains in some patients, but never α and β chains together, unmatched globin chains damage red blood cell (RBC) membranes causing their destruction while still in the marrow [13]. There are two genes coding for beta globin chain production, if both genes fail the patients is said to have beta major if only one genes fail than the patients has beta-thalassemia minor [14].

Study showed that β -thalassemia major has been widely associated with lipid abnormalities, and subjected to continuous blood transfusion and show peroxide active tissue injury through secondary iron over load. The alteration of oxidant-antioxidant balance may affect the

susceptibility of LDL to oxidation and this promotes atherogenesis as risk factor for many diseases [15].

The patients with β -thalassemia and metabolic syndrome may have an increased risk of diabetes mellitus and cardiovascular diseases due to insulin resistance. The aim of this study is to investigate the levels of metabolic syndrome lipid profile in Iraqi female patients with β -thalassemia.

SUBJECTS AND METHODS:

Forty two female (age 15-30) years were enrolled in this study. Blood was collected and the sera were separated from (22) female patients with β -thalassemia who were attended the Ibn-Al-Baladi hospital from September 2012 to January 2013 and (20) healthy subject as a control group.

All patients were diagnosed by physicians and other complications were excluded such as, cardiovascular disease, diabetes mellitus renal failure, hypertension and cancer. Serum of subjects was used in determination of the insulin levels were measured by enzyme-linked (ELISA) method. Iron level was determined by using colorimetric method. Total cholesterol (TC), triglyceride (TG), FSG were determined using enzyme-catalyzed colorimetric method. Serum HDL was measured using Burstein separation method using HDL-C kit. The low density lipoprotein (LDL) and VLDL calculated by using the Friedwald equation, $(LDL) = TC - [TG/5 + HDL]$, very low density lipoprotein $(VLDL) = TG/5$. BMI was calculated by $(BMI) = \text{mass (kg)}/\text{height}^2 (\text{m}^2)$. Insulin resistance (IR), Beta cell function (B %), and insulin sensitivity (S %), were calculated by using an updated HOMA model (HOMA2). Atherogenic index of serum was determined using mathematical formula:

$AIS = \log (TG/HDL-C)$ [16].

Statistical Analysis: Data are presented as mean \pm SD using SPSS program version 20. The differences between two groups were analyzed by independent t-test. P-value equal or less than 0.05 considered significant.

RESULTS AND DISCUSSIONS

Mean \pm SD of BMI and lipid profile and AIS for patients with β -thalassemia and control group were shown in table 1. Results revealed that BMI, LDL, VLDL and TC levels in patients with β -thalassemia were significantly lower than control group, while TG and HDL and ASI were in significantly higher than control group.

Table 2 showed that mean of insulin and B% were significantly in patients with β -thalassemia when compared with control group, but FSG insulin resistance levels and insulin sensitivity were in significantly in patients with β -thalassemia when compared with control group. Significant increase was observed in iron levels in the patients compared to control group.

Table 1: Mean \pm SD, P-value of BMI, lipid profile and AIS for studied group.

Parameters	Thalassemia (n=22) Mean \pm SD	CONTROL (n=20) Mean \pm SD	P- Value
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BMI(Kg/m²)	22.4 \pm 31	32.2 \pm 6.4	<0.05
TG(mmol/L)	0.8 \pm 0.12	1.46 \pm 0.5	>0.005
TC(mmol/L)	2.5 \pm 0.5	4.3 \pm 1.32	<0.05
HDL(mmol/L)	1.1 \pm 0.33	1.14 \pm 0.2	>0.05
LDL(mmol/L)	1.4 \pm 0.5	2.61 \pm 1.2	<0.05
VLDL(mmol/L)	0.35 \pm 0.05	0.65 \pm 0.2	<0.05
AI	0.4 \pm 0.2	0.34 \pm 0.12	>0.05

Table 2: Mean \pm SD, P-value of FSG, insulin, insulin resistance, insulin sensitivity, β -cell function% and Iron.

Parameters	Thalassemia (n=22) Mean \pm SD	CONTROL (n=20) Mean \pm SD	P- Value
FSG (mmol/L)	5.15\pm1.07	4.93\pm2.6	>0.05
Insulin (μmol/mL)	9.32\pm6.8	11.9\pm11.9	<0.05
Insulin resistance	1.22\pm0.46	1.53\pm0.7	>0.05
Insulin sensitivity	82.2\pm26.7	65.4\pm20.3	>0.05
B-cell function%	102.1\pm43.5	133.4\pm33.4	<0.05
Iron (μmol/L)	34.09\pm8.7	15.74\pm4.7	<0.05

Thalassemia is a symptom of severe anemia a result of the red blood cells damage. So the patients need blood transfusions on a regular basis. So the level of iron to have high and this increase in the proportion of iron will be deposited the liver, spleen, which lead to effect lipid profile, β -cell function. Throughout this study level of Iron shows significant increase ($p < 0.05$) in female patients with β -thalassemia when compare than the control group. We suggest that patients with thalassemia major accumulate body iron over time as a consequence of continuous RBCs transfusions which cause hepatic, endocrine and cardiac complications. This study agrees with the finding of Dr. Hussein who reported bovine that showed significant increase ($p < 0.05$) in serum iron concentration in thalassemia patients as compared with control group [17]. Also, G.A Werth showed that high levels of iron in the serum of thalassemia children compared with control group [18].

Results in the present study showed that insulin and β -cell function decreased significantly ($p < 0.05$) in serum of β -thalassemia patients when compared with that of the control group, this due to iron excess and its related oxidative stress can mediate apoptosis of pancreatic islet cells resulting in decreased insulin secretory capacity. This result agrees with the result obtained by Ashraf who reported that majority of β -thalassemia did not show significant insulin resistance, and also showed that β -cell function in thalassemia children decrease with age [19]. Insulin deficiency rather than insulin resistance was reported by many authors [20-22]. It was found by the study of Sedigheh that there was no significant difference between the serum insulin level of cases and controls disagreement with result obtained by Sedigheh

who found that there was non-significant difference between the serum insulin level of cases and controls [23].

BMI is one of the most preferred methods to assess underweight associated with developing many health problems. In this study it was observed that BMI significantly decrease in patients group compared with healthy people. It is in agreement with Ali who showed that patients with thalassemia major have low BMI, a common finding in these patients especially when they were older than 10 years of age [24]. Our results are also in agreement with those obtained by Mohammad [25].

Although in the present study LDL, VLDL, TC showed a significant decrease in serum of patients with β -thalassemia when compared with control group, HDL and TG levels showed only insignificant decrease. We suggested that differences in blood lipid profile could be attributed to adherence different life style and dietary habits in patients with β -thalassemia. The results of this study agree with those of Mohammed Hussein who showed that LDL, TC levels in thalassemia patients were lower when compared to control group [25]. Also, this is an agreement with the result obtained by L. Zannous who reported that the levels of lipid profile were significantly lower in patients with β -thalassemia when compared to control group [26].

Most investigators observed lower level of TC, HDL and LDL and higher level of triglycerides in patients with major thalassemia compared with healthy individuals. Several mechanisms were proposed for lipid profiles alterations in patients with β -thalassemia including accelerated erythropoiesis and enhanced cholesterol consumption [25-27]. Low plasma lipoprotein caused by increased cholesterol consumption and abnormal lipoprotein structure were frequently reported in thalassemia major patients [27].

In this study AIS levels showed insignificant measure in patients when compared with control group we suggest that this may be due to the lower levels of lipid profile in patients, this study is in agreement with Adnan who showed significantly increased AIS in β -thalassemia patients not taking DFO treatment compared to DFO group [28].

CONCLUSION

We conclude that there was no metabolic syndrome in Iraqi female patients with β -thalassemia.

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