Biochemical Study of Some Parameters in Patients with B- Thalassemia in Karbala City

Ruqaih K Al-kenany[1], Ghusoon G Al- Janabi [2], Sajaa R Al-Saedi[3]

[1]Assistant Professor, Clinical Laboratories Department, Applied, Medical Sciences College, Karbala University, Iraq, [2]Research Scholar, Clinical Laboratories Department, Applied Medical Sciences college, Karbala University, Iraq, [3]Research Scholar, Physiology and Pharmacology Department, Veterinary Medicine College, Karbala University, Iraq

Abstract

This study is intended to estimate some biochemical parameters in the adult men with ß- thalassemia major and compared with control group. Twenty Iraqi beta- thalassemia major (TM) patients are employed from thalassemia center in Karbala city at age of 15-25 years . The body mass index (BMI) of patients was calculated by measuring weight and high of patients , and the concentration of platelets ,Total cholesterol (TC),Triglyceride(TG),Low density lipoprotein (LDL) ,high density lipoprotein(HDL), Alanine amino transferase (ALT), Aspartate transferase (AST), Antidiuretic hormone (ADH),Growth hormone (GH), Triiodothyronine (T3) ,Thyroxin (T4), Thyroid stimulating hormone (TSH),Testosterone hormone, Urea and Creatinine were measured in thalassemic patients and compared with healthy control group. The results display that significant decrease ($p<0.05$) in serum levels platelets, HDL, ADH, GH, TSH, T3, T4, Testosterone hormones and creatinine in patients with ß- thalassemia and showed significant rise ($p<0.05$) in serum Tc, TG, LDL, ALT, AST and Urea levels in thalassemic group compared with healthy group .and the results demonstration that significant lower in BMI in group of patients compared with control group. we can be concluded from the present study ,that iron overload state influence on some endocrine glands secretions, liver and kidney functions.

Key Words: *Thalassemia , Iron overload, platelets, ADH, GH.*

Introduction

Thalassemia is an inherited blood disorder that affects the body's ability to produce hemoglobin and red blood cells , mutations of globin genes lead to weak a globin synthesis [(1)].the main type of thalassemia are alpha and beta thalassemia , ß- thalassemia is results by decrease in ß- globin synthesis [(2)] . The ß- thalassemia major is an autosomal recessive disorder ,characterized by reduction of normal ß-globin synthesis , and beta-thalassemia is commonly associated with shortened red cells life span and excessive destruction of red blood cells [(3)].

The ß- thalassemia is a severe genetic disturbance which leads to a significant excess in mortality and morbidity [(4)]. In Iraq ,thalassemia is a major health problem with prevalence of carrier range from (4.4-6.6)% [(5)]. Symptoms in infants with ß- thalassemia include jaundice ,splenomegaly ,fatigue ,siderosis and cardiomegaly [(6)]. In some studies have shown that , in patients with thalassemia there is excess of reactive oxygen production , such as hydrogen peroxide (H_2O_2) and superoxide anion (O_2^-) and that causing oxidative stress and lead to oxidative damage to erythrocyte [(7)] . In patients with ß- thalassemia long – term regular blood transfusions causes iron overload that results in cardiac damage , liver fibrosis , growth retardation and gonadal dysfunction [(8)]. Iron chelation therapy is essential for lowering of iron deposition on endocrine glands [(9)].

Corresponding Author
Ruqaih K Al-kenany Assistant Professor, Clinical Laboratories Department, Applied
Medical Sciences college, Karbala University, Iraq,
E-mail : Ruqaya.kareem@uokerbala.edu.iq

The major causes of death in thalassemia patients are congestive heart failure and fatal cardiac tachyarrhythmia to be the cause of abrupt cardiac death [10]. The principal mechanism of iron toxicity is the free radical – mediated pathway [11] . Therefore ,the current study is designed to calculate some biochemical parameters in adult men patients with beta – thalassemia major and compared with healthy group.

Materials and Methods

In this study 20 patients (male) were completed all biochemical analysis tests . the range of their ages between 15-25 years .the patients registered as thalassemic patients in (thalassemia center) in Karbala city – Iraq, from February to March 2019.the patients had ß- thalassemia major as recorded in their files , 20 apparently healthy male were selected as the control group . the range of their ages were equal to that of patients . blood were obtained from individuals in the morning and collected in plain tube for serum in order to rating some hematological and biochemical parameters : Platelets ,ALT, AST, TC, TG, LDL-c, HDL-c, ADH, GH, T3,T4, TSH, Testosterone hormones , Urea and Creatinine . serum platelets count were measured by,serum (ALT and AST) levels were gauged by , serum(TC) levels were measured by using (cholesterol kit BIOLABO company , France),serum (TG) level were amounted by using (Triglyceride kit BIOLABO company , France), serum (HDL-c) level were gauged by using (Rondo.United kingdom laboratories Ltd , co.Antrim) kit . Serum (LDL-c) level were measured by using : LDL= TC- (HDL+TG/5) Serum ADH,GH,T3,T4, TSH and Testosterone hormones were measured by enzyme – Linked immunosorbent assay (ELISA) technique. BMI was determined by calculating weight (in kilograms) divided by the square of height (in meters) ; BMI = weight (kg)/square height (m^2). The mean ±Std. Division(SD) of parameters measured from groups healthy and patients were determined with serum platelets ,ALA,AST and other biochemical parameters measured.

Results

Table 1 shows the results gained for BMI in patients groups with control group , decrease significantly ($p<0.05$) in BMI of ß- thalassemia patients in comparison to control group**.**

Table 1. : Comparison of BMI in Patients men groups with control group.

parameter	Control group Mean ±SD.	Patients group Mean ±SD
BMI kg/m2	33.66 ± 4.09 A	19.08 ±3.17 B

The latter's indicate to Significant at ($p< 0.05$)

Table 2 shows the results acquired for serum platelets levels in patients groups with control group, reduction significantly ($p<0.05$) in Platelets of ß- thalassemia patients in comparison to healthy control .

Table 2. : Comparison of serum platelets levels in Patients men groups with control group

parameter	Control group Mean ±SD	Patients group Mean ±SD
Platelets (103/mL)	247.70 ± 29.84 A	176.45 ± 26.30 B

The latter's indicate to Significant at ($p< 0.05$) .

Table3 shows the results obtained for serum ALT and AST levels in patients groups with control group , increase significantly ($p<0.05$) in ALT and AST concentration of ß- thalassemia patients in comparison to healthy control . The same table shows the results gained for Urea and Creatinine in patients groups with control group , rise significantly ($p<0.05$) in Urea concentration ,and low significantly ($p<0.05$) in creatinine concentration of ß- thalassemia patients in comparison to control group.

Table 3. : Comparison of serum ALT and AST levels in Patients men groups with control group

parameter	Control group Mean ±SD	Patients group Mean ±SD
ALT (U/ml)	21.97 ± 2.29 A	50.07 ± 4.97 B
AST (U/ml)	28.34± 4.27 A	49.54± 1.75 B
Urea(mmol/l)	5.51 ± 0.54 A	9.42 ± 0.82 B
Creatinine (mmol/l)	94.65 ± 10.43 A	54.68 ± 5.23 B

The latter's indicate to Significant at ($p< 0.05$) .

Table 4 shows the results gained for serum TC,TG,LDL-c and HDL-c levels in patients groups with control group , rise significantly ($p<0.05$) in TC,TG and LDL-c concentration, and reduction significantly ($p<0.05$) in HDL-c concentration of ß- thalassemia patients in comparison to control group ..

Table 5 shows the results obtained for serum ADH,GH,T3,T4,TSH and testosterone levels in patients groups with control group , low significantly ($p<0.05$) in ADH,GH,T3,T4,TSH and Testosterone levels of ß- thalassemia patients in comparison to control group .

Table 4. : Comparison of serum TC,TG,LDL-c and HDL-c levels in Patients men groups with control group .

parameter	Control group Mean ±SD	Patients group Mean ±SD
TC (mg/dl)	178.99 ± 8.34 A	226.45 ± 11.58 B
TG (mg/dl)	130.05 ± 7.36 A	167.90 ± 18.09 B
LDL-c (mg/dl)	149.35 ± 22.70 A	229.53 ± 33.22 B
HDL-c (mg/dl)	45.65 ± 3.76 A	31.43 ± 5.50 B

The letters indicate to Significant at ($p< 0.05$) .

Table 5. : Comparison of serum ADH, GH, T3, T4 ,TSH and testosterone levels in Patients men groups with control group .

parameter	Control group Mea ±SD	Patients group Mea ±SD
ADH (pg/ml)	5.10 ± 0.55 A	2.98 ± 0.59 B
GH (ng/ml)	11.07 ± 0.93 A	6.68 ± 1.33 B
T3 (ng/dl)	85.56 ± 5.43 A	59.27 ± 6.53 B
T4(ng/dl)	1.90 ± 0.40 A	0.67 ± 0.22 B
TSH (mlU/ml)	4.66 ± 0.45 A	2.24 ± 0.47 B
Testosterone(ng/ml)	5.46 ± 0.81 A	2.16 ± 0.51 B

The letters indicate to Significant at ($p< 0.05$) .

Discussion

In this study we found decrease significantly ($p<0.05$) in BMI of ß- thalassemia patients in comparison to healthy control and that result by insufficient production of hemoglobin and disorders in beta chains of globin production , the red blood cells cannot carry sufficient oxygen [12] , inability to transfer O_2 to tissues and exchange with CO_2 which lead to (Hypoxia) to induce (Anorexia) and under- weight of patients with thalassemia [13] , and may be due to toxic effect of Deferrioxamine , causes over plus deposition of iron in tissue and diminish in iron dependent enzyme which modify collagen which cause growth flaw [14]. The results appearance that significant reduced ($p<0.05$) in platelets numbers in serum of ß-thalassemia group comparison with healthy control, Hypersplensim state [15] ,and excess production of reactive oxygen intermediate such us superoxide (O_2^-) , hydrogen peroxide (H_2O_2) that lead to oxidative stress which responding to direct effect on platelets production in bones and that due to decrease in numbers of platelets in serum of ß- thalassemia patients [16], and reduction in platelets in serum was induced by immunity system dysfunction which due to increase in platelets damage and decrease it numbers in blood [17]. Iron over load in liver cells lead to (lipid homeostasis) dysfunction and that lead to change in (Hydroxyle -3-methylglutary- co enzyme A(HMG-Co A) reductase activity and dysfunction of cholesterol esters and decrease in lipoprotein lipase activity and all that lead to rise in free fatty acids in blood [18], Iron over load in liver response to excess tumar necrosis factors (TNF-α) and interleukin (IL-IB) which lead to raise levels of cholesterogenic enzyme such as HMG-Co A reductase and diminution levels of α- cholesterol – 17 hydroxylase that in charge of cholesterol catabolism in liver [19] , and by oxidative stress that results form Iron over load may because of stress of endoplasmic reticulum and rise in gene expression of strole on endoplasmic reticulum membrane and that due to height levels of TC and TG [20] . and the results display high levels of LDL – c in serum of patients with ß- thalassemia compared with healthy group and this results may be induce by (hypersensitivity) of LDL-receptors in blood vessels to collection of lipoproteins in serum and result high rate of LDL-c in serum [21]. HDL-c levels in serum correlated oppositely with LDL-c levels in serum , and HDL-c have role in carry cholesterol from tissues to liver and rise levels of LDL cause lower HDL-c levels in serum [22] .

The results in table 4 indicated escalation ($p<0.05$) in ALT and AST concentrations in thalassemic patients as compared with control group. The reason for this result is oxidative stress that induced by iron over load in liver due to lipid peroxidation in lipid proteins of cell membrane of liver cells and changes in permeability of cell liver membrane and that results to destroyed of cells liver with rise ALT and AST levels in blood [23].

The results in table 5 showed that significant dwindling in serum levels ADH,GH,TSH,T3,T4 and testosterone hormones in patients group compared with healthy group , reduce levels ADH,GH and TSH hormones may be result to Iron level rise in thalassemia patients (long-term transfusion) ,some iron will not connect to transferrin and restricted with other blood composition leading to formulation of plasma non-transferrin bound iron (NTBI) which is toxic and participate to obstetrics of reactive oxygen species (ROS), therefore leading to tissue deterioration and pituitary dysfunction . Excess iron head for deposit in pituitary glands causing end glands dysfunction by ROS-mediated lipid peroxidation and that leading to lower in levels of ADH,GH and TSH hormones [24]. And the results manifest significant lower in levels of T3 and T4 hormones and that may be by iron over load , high iron level deposited in endocrine gland such as thyroid gland responsible for formation of free radicles and output of reactive oxygen spices (ROS) that can lead to inhibit peroxidase (TPO) activity ,reduce 5- deiodnase production , decrease in activity of T3-receptors [25], and damage of proteins which responsible for transported of thyroid hormones (thyroxin binding globin) TBG and that lead to hypothyrodsim (lower in T3 and T4 levels in blood [26]. The results demonstrated ,testosterone levels was significantly lower in ß- thalassemia group compared to healthy group , the primary reason for this result may be by increased deposition of iron in pituitary glands has a cytotoxic effect, that leading to hyper-gonadotrophic hypogonadism due to pituitary hypo-responsiveness to GnRH, and that causes reduction in testosterone production by the testis and lower levels of testosterone hormone in blood [27].the results show in table (3) escalation significant ($p<0.05$) in urea concentration , and decrease significant ($p<0.05$) in creatinine level in ß- thalassemic patients in comparison to healthy group , high iron levels deposit in kidneylead to disorder in functions of kidney and this result to glomerular filtration dysfunction and this cause rise in Urea levels and reduction in ceratinine concentration in blood [28].

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