**Comparative Study Of Lipid Profile & Lipid Associated Fucose In Sera Of Control, Minor And Major Thalassemic Patients**

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**ARTICLE INFO**

**A B S T R A C T**

The aim of the present study is to evaluate the lipid profile and lipid associated fucose in sera of minor, major thalassemic and compared that with the levels of normal control. Cholesterol (Ch), Triglyceride (TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL) and Lipid Associated Fucose (LAF) were determined in sera of 40 control, 40 T minor and 45 T major.

A significant elevation in cholesterol, TG, HDL and VLDL in sera of T major was found compared to the same parameters in sera of T minor and control, also a significant increase in cholesterol, TG, HDL and VLDL in sera of T major compared to T minor, also the same lipids showed a significant increase in sera of T minor compared to control. On the other hand LDL in sera of T major showed a significant reduction compared to T minor and control, also a significant decrease in LDL for T minor compared to control was found, while lipid associated fucose showed a significant increase in sera of T major over that for T minor and control, also a significant high level of LAF in sera of T minor compared to control was found.

**Keywords:** Lipid Profile, Lipid Associated Fucose, and Thalassemic Patients

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**1. Introduction**

Beta-thalassemia is considered to be the most frequent hereditary blood disorder worldwide. Lipid abnormalities have been detected in different types of beta-thalassemia (1-2), and also in various hematological disorders (3). The amphipathic nature of phospholipids and sphingolipids makes them ideally suitable as the main lipid components of cell membranes.

α-L-Fucose is a six carbon deoxy–hexose (6-deoxy-L-galactose) with a general formula of C6H12O5, and is important component of glycoproyein and glycolipid produced by mammalian cells (4-6).

Fucose usually is present at the non-reducing end of the oligosaccharide, fucose may alternatively or additionally by attached in a sub-terminal position on the epitope (7).

Actions that alter expression of receptors for fucoligands should enhance or reduce the binding of fucoligands to the target cells (8).

**Experimental**

Selection of subjects and blood sampling

Ten ml of venous blood sample was obtained from 45 subjects of both sexes, with β-thalassemia major, 40 with β-thalassemia minor and 40 healthy individuals as control group.

All patients major and minor were admitted to thalassemia center in Erbil and Ibn Al-Balady hospital in Baghdad for blood transfusion for
β-thalassemia major and routen test for patients with β-thalassemia minor.

The blood samples which collected from all subjects were transferred into plain tube for serum separation which was at room temperature for 15 minutes, centrifuged at 2500 rpm for ten minutes.

Determination of total cholesterol (Ch)The cholesterol is determined according to Richmond method (9).

Determination of triglyceride (TG)
The triglyceride is determined by enzymatically hydrolyzed glycerol and fatty acid according to (10-11).

Determination of high density lipoprotein–cholesterol (HDL-Ch)
Low density lipoprotein (LDL), very low density lipoprotein (VLDL) and chylomicron fraction are precipitated quantitatively by the addition of phosphotungstic acid which contain magnesium chloride at pH 6.2, after centrifugation the supernatant contains the cholesterol concentration in the HDL (High density lipoprotein). Fraction which is determined by using cholesterol kit (12).

Determination of low density lipoprotein–cholesterol (LDL-Ch)
LDL-Ch can be calculated mathematically the total cholesterol, the triglycerides and the HDL-Ch concentration using Friedwald’s formula (13).

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\text{LDL-Ch (mmole/L) = Total cholesterol – TG/2.2 – HDL-Ch.}
\]

Determination of very low density lipoprotein (VLDL)
VLDL concentration is calculated as one – fifth of the serum TG.

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\text{VLDL mmol./L=TG/2.2 (14).}
\]

Determination of lipid associated fucose (LAF)
A mixture of chloroform and methanol (2:1) extracts lipid completely, were proteins and carbohydrates will be in the polar alcoholic solvent. The protein will be precipitated by phosphotungstic acid leaving the carbohydrate in the solution (15).

Statistical analysis Data presented were the means and standard deviations. Student Z-test was used to compare the significance of the difference in the mean values of any two groups. (P≤0.05) was considered statistically significant.

The overall predictive values for the results in all studied groups were performed according to biostatistics by Daniel in 1987(16).

Results and discussion

Table (1) showed the results of cholesterol and triglyceride levels in sera of three studied groups.

Cholesterol levels were found to be (4.75±0.21), (5.00±0.33) and (5.62±2.85) for control, T minor and T major groups respectively.

The increase in cholesterol for minor thalassemic and major compared to control was noticed, still the value is within the normal range (4-6 mmole/dL).

The results of triglyceride levels for control, T minor and T major were (2.39±0.33), (2.56±0.28) and (4.68±0.52) respectively.

A significant increase of triglyceride in sera of minor thalassemic compared to control and a significant increase in triglyceride for major thalassemic compared to minor thalassemic and control was found The present findings are in agreement with those found by other studies as there is significant increase in plasma TG level (3), which is the same as detected by (17). However other researchers did not find such differences. Ricchi et al study, reported that triglyceride were elevated in association with
diseases such as thalassemia, probably due to extra-hepatic lipolytic activity (18).

Triglycerides lipase activities (both hepatic and extrahepatic) were significantly lower in thalassemic patients. Christina speculated that the decreased levels of these enzymatic activities could play a role in determining the decrease of HDL-C observed in thalassaemic patients (19).

Data analysis revealed that only 2% of major thalassemic patients had total serum cholesterol > 200 mg/dl and 15% of the patients had triglyceride level > 150 mg/dl (19).

During the past years many scientific researches reported a normal lipid levels i.e total cholesterol and triglycerides in patients with β – thalassemia, they also reported abnormal distribution is not more 3% of the total number of patients of the 192 patients (20).

Table (2) showed lipoprotein (HDL, LDL and VLDL) mean ±S.D in sera of control, minor and major thalassemic. The values of HDL in sera of control, T minor and T major were (1.6±0.3), (1.81±0.11) and (2.73±0.28) respectively.

As for LDL in control, T minor and T major were (2.07±0.78), (2.03±0.11) and (0.77±0.13) respectively.

The levels of VLDL for control, minor and major thalassemic were (1.08±0.17), (1.16±0.11) and (2.12±0.33) respectively.

A significant increase in HDL for minor thalassemic compared to control and increase levels of major thalassemic compared to minor and control was found. This result disagrees with results of a study revealed a lower serum HDL-Ch level in beta thalassemic patients compared to control (21).

A significant decrease in LDL levels in sera of major thalassemic compared to minor and control was found, also a significant decrease in LDL levels of T major compared to T minor was found. This is in agreement with reported data that it appears because of that many factors such as iron overload, liver injury, and hormonal disturbances affects lipids pattern among patients with beta-thalassemia. Other explanation could be, accelerated erythropoiesis (3).

In a study (22) evaluation of several blood lipid and lipoprotein with β-thalassemia major showed that the majority of the patients had low LDL – Ch levels and only few population had LDL – Ch levels greater than 130mg/dL and a considerable proportion of the patients had very low HDL – Ch levels.

LDL – Ch refer to a class and range of lipoprotein particles varying in their size and content, which carry cholesterol in the blood and around the body, for use by the cells. It is the final stage of VLDL which is produced by the liver. LDL is formed as VLDL lipoproteins, which lose triglyceride through the action of lipoprotein lipase (LPL) and become smaller and denser containing a higher proportion of cholesterol. Low concentration of large LDL particles is the healthy pattern. Conversely, high concentrations of small LDL particles, despite the same total cholesterol content correlates with much faster growth of atheroma and progression of atherosclerosis (23).

Table (3) showed the results of lipid associated fucose in sera of control, minor and major thalassemic. The levels of LAF were (3.88±0.39), (5.03±1.91) and (8.22±1.63) for control, T minor and T major respectively.

A significant increase in LAF for T minor compared to control and a significant increase in LAF for T major compared to T minor and control was found.

Increased levels of LAF in different types of leukemia were reported (24).

Serum LAF levels have been suggested to be a useful tumor marker, more satisfactory than other fucose related compounds. Some authors have observed increased levels of fucose containing glycoconjugates in sera of
malignancy patients. These investigators reported significantly elevated serum concentration of total fucose and its lipid associates (25-27).

Lipid associated fucose levels were evaluated in sera of the three major types of leukemia. The results of analysis revealed a significant increase of LAF values in sera of all leukemic patients compared with normal subjects (28).

On the other hand, the levels of LAF were reported to decrease in neuroblastoma and Yolk sac tumors after a successful treatment of the malignancy (29).

The diversity in the results of fucose containing glycoconjugated could be due to the difficulties inherent in studying the biological function of carbohydrates and it is likely that many additional functions for fucosylated lipids remain to be established.

Table (1): Cholesterol and triglyceride levels in sera of three studied groups

| Groups | No. | Ch (mmole/l) | Mean±S.D. | TG (mmole/ml) | Mean±S.D. |
|--------|-----|--------------|-----------|--------------|-----------|
| Control | 40  | 4.75±0.21    | 2.39±0.33 |
| T minor | 40  | 5.00±0.33    | ≥0.05     | 2.56±0.28    | ≤0.05     |
| T major | 45  | 5.62±0.58    | ≥0.05     | 4.68±0.52    | ≤0.05     |

* Represent P value between minor and major thalassemic patients

Table (2): HDL, LDL and VLDL in sera of three studied groups

| Groups | No. | HDL (mmole/L) | Mean±S.D. | LDL (mmole/L) | Mean±S.D. | VLDL (mmole/L) | Mean±S.D. |
|--------|-----|--------------|-----------|--------------|-----------|----------------|-----------|
| Control | 40  | 1.60±0.21    | 2.07±0.78 | 1.08±0.17    |
| T minor | 40  | 1.81±0.11    | ≤0.05     | 2.03±0.11    | ≤0.05     | 1.16±0.11    | ≤0.05     |
| T major | 45  | 2.73±0.28    | ≥0.05     | 0.77±0.53    | ≤0.05     | 2.12±0.33    | ≤0.05     |

* Represent P value between control, minor and major thalassemic patients.

Table (3): Lipid associated fucose (LAF) in sera of three studied groups

| Groups | No. | LAF (mg/dl) | Mean±S.D. |
|--------|-----|-------------|-----------|
| Control | 4   | 3.88±0.39   |
| T minor | 4   | 5.03±0.91   | ≤0.05     |
| T major | 5   | 8.22±1.63   | ≤0.05     | ≤0.05*    |

* Represent P value between minor and major thalassemic patients.
P represent value between control, minor and major thalassemic patients.

* represent P value between minor and major thalassemic patients.

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Zeyan A. et al. in Oral Cancer and Oral Precancerous Conditions, CANCER, 113(2), pp. 336-346. The study aimed to determine the cholesterol and fucose levels in the serum of T major and T minor patients and their group of control. The study showed that LDL and VLDL levels of T major were lower than T minor and the control group. The cholesterol, TG, HDL, and LDL levels of T minor were found to be increased compared to T major and the control group. Additionally, the fucose levels were found to be increased in the serum of T major compared to T minor and the control group.
Tminor