Research Article

Serum Lipid Profile İn Children with Thalassemia Major: A Study On 184 Cases

ÖZLEM TERZİ

University of Health Sciences, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Department of Pediatric Hematology and Oncology, Istanbul, Turkey

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Abstract:
Background: Patients with thalassemia major are at risk of developing abnormal lipid profiles.

Aim: In this study, the relationship between iron accumulation and blood lipid profile in TM children was evaluated.

Methods: In this study, blood hemoglobin, ferritin, and lipid levels of pediatric patients with TM aged 1-18 years were investigated. Those with other chronic diseases were excluded from the study.

Results: The median age of 184 patients included in the study was 8 (range 1-18), and 96 (52.2%) of the patients were girls. There is an inverse and statistically significant relationship between age and total cholesterol (TC) level (p<0.05) and age and low-density lipoprotein cholesterol (LDL-C) level (p<0.05). There was an inverse, and statistically significant correlation between ferritin- high-density lipoprotein cholesterol (HDL-C) levels (p:0.015).

Conclusion: As ferritin levels increase in children with thalassemia, HDL-C levels decrease. For cardiac iron accumulation, HDL-C level may be a guide instead of ferritin.

Keywords: Thalassemia major, lipid profile, total cholesterol, triglyceride, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol.

Introduction
Thalassemia major (TM) is a hereditary anemia resulting from defects in the production of β-globin chains and is one of the most common genetic disorders world (1). Patients with TM are at risk of developing iron overload in the heart, liver, and endocrine glands that results from repeated blood transfusions and increased iron absorption by the gastrointestinal tract (1,2). Blood transfusion and chelation are the mainstays of treatment which have considerably increased the life expectancy and significantly improved the quality of life of these patients (3).

It is known that thalassemia is associated with changes in plasma lipids and lipoproteins (4,5). An abnormal lipid profile in thalassaemic patients has been reported in various studies, but its pathophysiology is still not defined (6). This dyslipidemia includes high triglyceride (TG), low total cholesterol (TC), low high-density lipoprotein cholesterol (HDL-C), and high TC to HDL ratio (TC: HDL-C) in young thalassemia patients (4,5,7,8). Causes of lipid abnormalities in thalassemia include higher bone marrow activity with an increased cholesterol requirement for red cell membrane formation, decreased production secondary to liver injury, and lipid peroxidation associated with iron overload (4,9-11). There is a relationship between dyslipidemia and early atherosclerosis (4,7). There are studies showing that children with TM are at risk of developing subclinical atherosclerosis (12). Subclinical atherosclerosis begins early in life and may develop into coronary heart disease later in life. Thalassaemic patients are subject to oxidative tissue injury due to free radicals and LDL-C (4,5,13). In our study, we investigated whether there is a relationship between iron load and lipid profiles in patients with TM.

Materials and methods
Patients with a diagnosis of beta-thalassemia major between the ages of 0-18 who were followed up in the Pediatric Hematology Clinic of Şanlıurfa Training and Research Hospital were included in the study. Patients’ age, gender, hemoglobin and ferritin levels, and lipid profiles (LDL, HDL, TC, TG) were retrospectively scanned from patient records, and the results were examined.

Those with chronic diseases such as viral and/or chronic liver disease, diabetes mellitus, hypothyroidism, hyperthyroidism, and renal failure and children having a family history of dyslipidemia were excluded from the study.

This study was approved by the hospital ethics committee of SBU Bakirköy Sadi Konuk Training and Research Hospital Ethical Committee.

Statistical Analysis
While evaluating the findings obtained in the study, IBM SPSS Statistics 22 program was used for statistical analysis. The suitability of the parameters to the normal distribution was evaluated with the Kolmogorov-Smirnov test and it was determined that the parameters did not show normal
distribution. Spearman’s rho correlation analysis was used to examine the relationships between the parameters. Significance was evaluated at the p<0.05 level.

Results

The median age of 184 patients included in the study was 8 (range 1-18), and 96 (52.2%) of the patients were girls. The median values of Hb, Ferritin, TG, TC, HDL-C, and LDL-C of the patients are summarized in Table 1.

Table 1. Descriptive characteristics of operating parameters

<table>
<thead>
<tr>
<th>Hemoglobin (g/dL)</th>
<th>8.69±1.15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferritin (ml/ng)</td>
<td>2916.49±1844.78</td>
</tr>
<tr>
<td>TG (mg/dl)</td>
<td>146.82±69.34</td>
</tr>
<tr>
<td>TC (mg/dl)</td>
<td>103.14±19.34</td>
</tr>
<tr>
<td>HDL-C (mg/dl)</td>
<td>32.25±13.16</td>
</tr>
<tr>
<td>LDL-C (mg/dl)</td>
<td>52.41±27.63</td>
</tr>
</tbody>
</table>

TG: Triglyceride. TC: Total cholesterol. HDL-C: High-density lipoprotein cholesterol. LDL-C: Low-density lipoprotein cholesterol.

There is an inverse, weak (22.5%), and significant relationship between age and TG level (p:0.002; p<0.05). There is an inverse, weak (26.3%), and statistically significant relationship between age and LDL-C level (p:0.002; p<0.05). There was no statistically significant correlation between age and TG and HDL-C (p>0.05) (Table 2).

Table 2. Correlation of age with TG, TC, HDL-C and LDL-C

<table>
<thead>
<tr>
<th>Yaş</th>
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<tbody>
<tr>
<td>TG</td>
<td>0.029</td>
</tr>
<tr>
<td>TC</td>
<td>-0.225</td>
</tr>
<tr>
<td>HDL-C</td>
<td>-0.023</td>
</tr>
<tr>
<td>LDL-C</td>
<td>-0.263</td>
</tr>
</tbody>
</table>

Spearman’s rho korelasyon testi *p<0.05

TG: Triglyceride. TC: Total cholesterol. HDL-C: High-density lipoprotein cholesterol. LDL-C: Low-density lipoprotein cholesterol.

Discussion

Iron overload and oxidative stress are postulated mechanisms for causing dyslipidemia in patients with thalassemia (4,14,15). Low levels of serum TC, HDL-C and LDL-C, and elevated TGs in pediatric patients with thalassemia were reported in the studies of Ragab et al. (7) in Egypt and Bordbar et al. (16) in Iran. These alterations are likely due to diminished hepatic biosynthesis due to anemia and accelerated erythropoiesis, with excess uptake of cholesterol by macrophages of the reticuloendothelial system, while reduced extrahepatic lipolytic activity could account for the rise in the circulating TG (10). In the study of Daswani et al., a positive correlation was found between Hb-TG levels (10).

In our study, however, a relationship was found between Ferritin-TG levels (p:0.020; p<0.05). A positive, weak (23.7%) and significant relationship between Ferritin-TG level was found (p:0.001; p<0.05). There is a positive, weak (21.9%) and significant relationship between Ferritin-LDL-C levels (p:0.003; p<0.05) (Table 3).

Table 3: Correlation of hemoglobin and ferritin with TG, TC, HDL-C and LDL-C

<table>
<thead>
<tr>
<th></th>
<th>Hemoglobin</th>
<th>Ferritin</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>-0.173</td>
<td>0.134</td>
</tr>
<tr>
<td>P</td>
<td>0.020*</td>
<td>0.070</td>
</tr>
<tr>
<td>TC</td>
<td>0.237</td>
<td>0.039</td>
</tr>
<tr>
<td>P</td>
<td>0.001*</td>
<td>0.600</td>
</tr>
<tr>
<td>HDL-C</td>
<td>0.282</td>
<td>-0.179</td>
</tr>
<tr>
<td>P</td>
<td>0.001*</td>
<td>0.015*</td>
</tr>
<tr>
<td>LDL-C</td>
<td>0.219</td>
<td>0.037</td>
</tr>
<tr>
<td>P</td>
<td>0.003*</td>
<td>0.618</td>
</tr>
</tbody>
</table>

Spearman’s rho korelasyon testi *p<0.05

TG: Triglyceride. TC: Total cholesterol. HDL-C: High-density lipoprotein cholesterol. LDL-C: Low-density lipoprotein cholesterol.
this hypothesis.
The limitation of our study was a small sample size. More extensive studies will provide further insight and information regarding cardiovascular complications in children with thalassemia having deranged lipid profiles. This may also help in framing guidelines for monitoring lipid profiles in these children, in order to reduce long-term morbidity and mortality.

Conclusion
Ferritin is associated with iron overload and places patients at an increased cardiovascular risk. As ferritin levels increase in children with thalassemia, HDL-C levels decrease. Such as low HDL-C may contribute as an important risk marker for future cardiac events in these patients.

Ethics
Ethics Committee Approval:
The questionnaire and methodology for this study were obtained from the Ethics Committee of University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital.

Acknowledgment
We like to thank everyone who took part in this study for their time and effort

Conflict of Interest:
No conflict of interest was declared by the authors.

References