# Assessment of Thyroid Function in Patients with ß-Thalassemia

**THESIS**

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# Abstract

**Objectives:** In this study, we tried to asses thyroid function among thalassemia patients .

**Patients and Methods**: This cross sectional study was conducted on 50 β-thalassemia major and intermedia patients (24 males and 26 females). Age range 15-37 years (Mean 21.4±5.8 years).Patient were subjected to full history taking including transfusional and chelation history, clinical examination, performing complete blood count, measuring serum ALT (Alanine transaminase) and AST (Aspartate transaminase), measuring serum ferritin, and thyroid profile evaluation by measuring FT3(free triiodothyronine), FT4(free thyroxine) and TSH (thyroid stimulating hormone) using Immulite analyzer by chemiluminescent immunometric assay.

**Results:** 12 (24%) cases out of 50 cases were diagnosed as primary hypothyroidism (increased serum TSH) one of these 12 cases had biochemical overt hypothyroidism (low FT4 and/or FT3, increased TSH) and the 11 other patients had subclinical hypothyroidism (normal FT4, FT3, increased TSH). No cases of central hypothyroidism nor hyperthyroid were detected. A weak positive correlation was found between TSH level and AST *($r=0.28$, $P<0.05$),*accordingly, mean AST levels were also found to be high in hypothyroid patients than those euthyroid ones (mean AST of hypothyroid patients: 87.583±70.760, mean AST of euthyroid patients: 46.855±29.731, $p=0.006$). This AST elevation may be explained by the associated iron overload in the liver. No statistically significant correlation was found between thyroid functions and each of the following parameters: anthropometric measures , age, hemoglobin level, serum ferritin, frequency of blood transfusion and chelator types. Comparison between well & poorly chelated patients revealed that the difference was statistically significant in mean AST level ($p=0.003$) and ALT level ($p=0.003$) which were higher in poorly chelated groups than those who are well chelated . This result shows a negative correlation between increase in serum aminotransferases levels (ALT and AST) and well chelation. Also, Highly significant positive correlation was found between serum ferritin level and AST ($r=0.77$, $p<0.001$) and ALT (0.77, $p<0.001$)

**Conclusion:** Primary hypothyroidism is prevalent among thalassemia patients mostly in the form of sublinical hypothyroidism. Overt laboratory hypothyroidism was also reported. Accordingly, screening for thyroid dysfunction in β-thalassemia major and intermedia patients is mandatory for early detection, diagnosis and treatment of primary hypothyroidism.



**Key words:** Thalassemia -Thyroid – Hypothyroidism-Iron overload

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# List of Abbreviations

| | |
|---|---|
| **α** | Alpha |
| **β** | Beta |
| **ALT** | Alanine transaminase |
| **AST** | Aspartate transaminase |
| **BMI** | Body Mass Index |
| **BMT** | Bone Marrow Transplatation |
| **DFO** | Desferrioxamine |
| **δ** | Delta |
| **ε** | Epsilon |
| **FT3** | Free T3 |
| **FT4** | Free T4 |
| **γ** | Gamma |
| **Hb** | Hemoglobin |
| **HPLC** | High Performance Liquid Chromatography |
| **LIC** | Liver Iron Concentration |
| **PLT** | platelets |
| **SD** | Standard Deviation |

| | |
|---|---|
| **TPO** | Thyroid Peroxidase |
| **TSH** | Thyroid Stimulating Hormone |
| ζ | Zeta |

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# INTRODUCTION

In recent years, with significant increase in the lifespan of patients with β-thalassemia major several authors reported a high incidence of endocrine abnormalities in children, adolescents and young adults suffering from thalassemia major. However the incidence of the various endocrinopathies changes among different series of the patients due to a mixture of reasons other than iron overloads **(Gulati et al., 2000).**

The combination of transfusion and chelation therapy has dramatically extended the life expectancy of thalassemic patients who can now survive into their fourth and fifth decades of life. On the other hand, frequent blood transfusion in turn can lead to iron overload which may result in hypogonadism, diabetes mellitus, hypothyroidism, hypoparathyroidism and other endocrine abnormalities. **(Shamshirsaz et al., 2003)**

Primary hypothyroidism is one of the most frequent complications observed in patients suffering from thalassemia**(Filosa et al., 2006).**Decreased thyroid hormone alter erythropoiesis aggravating anemia, also it affects cardiac functions causing left ventricular

disfunction, cardiac failure and pericardial effusion. The patient's presentation may be asymptomatic, mild to overt hypothyroidism, **(Tsironi et al., 2006)**

# Aim of Work

Assessment of the thyroid function in the patient with ß-thalassemia major and intermedia, for early diagnosis and treatment of hypothyroidism caused by thalassemia.

# CHAPTER 1

# Thalassemia

In 1925, Thomas Cooley and Pearl Lee described a form of severe anemia, occurring in children of Italian origin and associated with splenomegaly and characteristic bone changes **(Cooley and Lee, 1925).** Over the next decade, a milder form was described independently by several Italian investigators**(Rietti, 1925; Greppi, 1928 ; Mecheli et al., 1935)** Because all early cases were reported in children of Mediterranean origin, the disease was later termed thalassemia, from the Greek word for sea, *thalassa* **(Whipple and Bradford, 1936).** Over the next 20 years, it became apparent that Cooley and Lee had described the homozygous or compound heterozygous state for a recessive mendelian disorder not confined to the Mediterranean, but occurring widely throughout tropical countries. In the past 20 years, the two important forms of this disorder, α- and ß-thalassemia, resulting from the defective synthesis of the α- and ß-globin chains of hemoglobin, respectively, have become recognized as the