

Assessment of Thyroid Function in Major Thalassaemia Patients above 12 Year of Age

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Abstract

Thyroid dysfunctions in patients with beta-thalassaemia are the result of iron toxicity to thyroid cells. The present study was conducted in 160 subjects divided into two groups - Group A comprised of 80 diagnosed cases of β -thalassaemia major above 12 years of age receiving regular blood transfusions for more than last 3 years and at least 10 transfusions in a year. Group B comprised of age and sex matched 80 healthy individuals. We found that prevalence of hypothyroidism in patients with beta-thalassaemia major was 20% patients, which was significantly ($p < 0.0001$) higher than the group B, in which prevalence of hypothyroidism was only 3.75%.

Keywords : β -thalassaemia major, Hypothyroidism

I. INTRODUCTION

Beta-thalassaemia major (BTM) is a common health problem in the Africa, Southeast Asia and Indian subcontinent. Beta-thalassaemia major is a hereditary, severe hemolytic anemia resulting from defects in synthesis of both β chains of hemoglobin synthesis⁽¹⁾. These patients require lifelong blood transfusion every 2 to 4 weeks to maintain a hemoglobin level above 10 g/dl⁽²⁾. However, frequent blood transfusion can lead to iron overload and accumulation of iron in various organs such as liver, heart, and endocrine glands due to the lack of physiological pathway for iron excretion in the body⁽³⁾. Complications of iron overload include growth retardation and failure or delay of sexual maturation, dilated cardiomyopathy, arrhythmias, liver cirrhosis, diabetes mellitus, and insufficiency of the parathyroid, thyroid and pituitary glands. This massive accumulation of iron may cause organ dysfunction and failure and ultimately leads to death⁽²⁾. The gonadal axis is most sensitive to iron-induced damage followed by thyroid gland which appears to fail before the pituitary-thyroid axis⁽⁴⁾.

Hypothyroidism in BTM patients is mainly due to infiltration and destruction of gland by iron. Iron overload and chronic tissue hypoxia have a direct toxic effect on the thyroid gland which leads to free radical formation and the production of reactive oxygen species which causes cell and organ damage⁽⁵⁾. In severe iron overloaded β -thalassaemic major patients the anterior pituitary or hypothalamus may be damaged and secretion of TSH or TRH may be disrupted leading to secondary hypothyroidism, although it is rare^(4,9-11).

With the introduction of iron chelators, prognosis and survival in β -thalassaemia major have improved but the endocrine complications have become more frequent in longer survivors and substantially affect their quality of life⁽⁶⁾.

Hypothyroidism may create major cardiovascular changes, such as a decrease in cardiac output, a decrease in cardiac contractility, a reduction in heart rate and an increase in peripheral vascular resistance⁽⁷⁾. Thyroid hormones may also play a critical role in growth and development in infants and as well as in young adults⁽⁸⁾. It is now clear that without optimal thyroid function, mood disturbance, cognitive impairment and other psychiatric symptoms can emerge. The symptoms of hypothyroidism are non-specific, but the consequences affect virtually every organ system, so an early evaluation of thyroid function should be recommended in all thalassaemic patients annually.

Hypothyroidism can make an impact on morbidity and mortality of these patients. There are so many studies, directly or indirectly on thyroid dysfunctions in thalassaemia major, but exact burden of the disease is still controversial. In our study we tried to find out the thyroid dysfunction in patients with β -thalassaemia major along with comparing the results with age and sex matched normal individuals.

II. MATERIAL AND METHODS

This hospital based case-control study was done in SMS Hospital, Jaipur from Oct. 2012 to Oct. 2013 in which 160 subjects was enrolled and was grouped into two; with 80 subjects in each. **Group A** (Case group) - Patients of β -thalassaemia major of more than 12 years of age receiving regular blood transfusions for more than last 3 years and at least 10 transfusions in a year.

Group B (Control group) - Age and sex matched apparently normal individuals.

All subjects were evaluated for complete physical examination including height and weight of these patients. Blood samples were taken for Complete Blood Counts, Peripheral Blood Film, Renal and Liver functions, Serum Iron, Serum Ferritin level estimation along with Thyroid Function Tests (FT₃ FT₄ TSH).

Blood samples were taken at least 2 weeks after the last transfusion. CBC was performed using the principle of 'Light scattering and fluorescein dye absorption' by 'sysmex-xn 1000' with 5 parts differential count. Serum ferritin and thyroid function

tests were done by ‘Immulite 2000’ as per protocol of immulite 2000 kits supplied by Siemens, Siemens Medical Solutions Diagnostic Ltd. UK using the principle of chemiluminiscent immunoassay.

The patients, who have serum FT3, FT4 and TSH in normal range were considered as normal or Euthyroid. The patients, who had raised serum TSH but normal serum FT3 and FT4 were categorized as subclinical hypothyroid. The patients, who had raised serum TSH level with reduced serum FT3 and FT4 were considered as overt hypothyroid. The normal hormonal values in our hospital lab were as below:-

Serum FT3-	2.3-4.2 pg/ml
Serum FT4-	0.89-1.76 ng/ml
Serum TSH-	0.4-5.5 uIU/ml

Data obtained from both groups were analyzed statistically by SPSS software. Various statistical tests were applied as according to their indication. A p-value less than 0.05 was considered statistically significant.

III. RESULTS AND DISCUSSIONS

Table 1: Comparison of Mean Serum FT3 Level in Group A and B

	Range	Mean Serum FT3	SD
Group A	1.86-3.96	3.01	0.52
Group B	1.96-3.98	3.08	0.58

t = 0.8881 with 158 degrees of freedom: P = 0.3758

Table 1 shows mean serum FT3 measurement and its comparison in group A and B. Although; mean serum FT3 level in group A (3.01±0.52 pg/ml) was slightly lower than in group B (3.08±0.58 pg/ml), but the difference was not statistically significant (P = 0.3758).

Table 2: Comparison of Mean Serum FT4 Level in Group A and B

	Range	Mean Serum FT4	SD
Group A	0.74-1.64	1.14	0.18
Group B	0.92-1.56	1.16	0.16

t = 0.6124 with 158 degrees of freedom: P = 0.5412

Table 2 shows mean serum FT4 measurement and its comparison in group A and B. Mean serum FT4 in group A was 1.14±0.18 ng/ml and in group B was 1.16±0.16 ng/ml and this difference was statistically not significant (P = 0.5412).

Table 3: Comparison of Mean TSH in Group A and Group B

	Range	Mean TSH	SD
Group A	1.57-18.78	4.22	2.78
Group B	1.12-8.24	3.04	1.23

t = 3.4466 with 158 degrees of freedom: P = 0.0007

Mean serum TSH level in patients of beta-thalassemia major was 4.22±2.78 uIU/ml; which was significantly (p=0.0007) higher than mean serum TSH level (3.04±1.23 uIU/ml) in subjects of group B.

Table 4: Thyroid Function Status in Group A and B

	Group A		Group B	
Euthyroidism	64	80%	77	96.25%
Subclinical Hypothyroidism	11	13.75%	03	3.75%
Overt Hypothyroidism	05	6.25%	-	-
Total	80	100%	80	100%

Table 4 shows Thyroid function status in both groups. 64 (80%) patients were having normal thyroid function in group A; whereas in group B, 77 subjects (96.25%) were in Euthyroid state. Hypothyroidism was found only in 3 (3.75%) subjects in group B; whereas in group A hypothyroidism was present in 16 (20%) patients {out of which 11 patients (13.75%) were having subclinical hypothyroidism and 5 patients (6.25%) were having overt hypothyroidism}. The difference in two groups was statistically significant (P = 0.0001).

We found that in patients of β-thalassemia major, 7 out of 30 (23%) females were hypothyroid and 9 out of 50 (18%) males were hypothyroid. This difference was not statistically significant (P = 0.5763) suggesting that sex is not a predisposing factor for development of hypothyroidism in patients of thalassemia.

IV. CONCLUSION

We found that the prevalence of hypothyroidism in patients with beta-thalassemia major was 20% patients, which was significantly (p<0.0001) higher than the group B, in which prevalence of hypothyroidism was only 3.75%. Early diagnosis and early therapy with blood transfusion predisposes for development of hypothyroidism in patients of beta-thalassemia major. Prevalence of hypothyroidism in patients with beta-thalassemia major is not dependent on sex of patients. Further studies are needed to evaluate the longitudinal changes in thyroid dysfunction, and to find out any correlation between age, sex and serum ferritin level with thyroid dysfunction in β-thalassemia major.

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