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Frequency of Hypothyroidism in Patients of Beta Thalassemia Major

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ABSTRACT

Objective: To check the frequency of hypothyroidism in children suffering from beta thalassemia major. **Study Design:** Cross sectional study. **Settings:** Department of Pediatrics Allied hospital, Ali Zaib Foundation and Sundas Foundation, Faisalabad. **Duration:** Six months. **Methodology:** 75 diagnosed cases of beta thalassemia major of age between 5 to 15 years of either gender were enrolled from pediatric ward Allied hospital, Ali Zaib foundation and Sundus foundation, Faisalabad. Blood sample of 2ml was taken from children for TSH and T4 and was sent to pathology Lab Allied Hospital Faisalabad. Levels of TSH and T4 were estimated by Elisa kit. Data was statistically analyzed to determine the frequency and percentage of Hypothyroidism. **Results:** Mean age of children suffering from hypothyroid was 10.48 ± 2.6 years. Out of these 14 (28.6%) were male and 8 (30.8%) were female. Hypothyroidism was seen in 22 (29.3%) patients. **Conclusion:** Hypothyroidism can occur in thalassemia major patients without particular clinical signs. Screening of thalassemic patients for hypothyroidism is very important for early diagnosis and prompt treatment of affected children to decrease their sufferings.

Keywords: Beta thalassemia, Hypothyroidism, Anemia, Hemoglobin, TSH, T4.

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INTRODUCTION

Beta thalassemia includes a group of autosomal recessive hemoglobin disorders characterized by decreased or nil production of a beta globin chain.[1] The homozygous state become symptomatic in the form of severe anemia in the last six months of first year of life, and requires regular blood transfusions.[2] Thalassemia is most common monogenic disorder in the world, especially in people of Mediterranean, Indian subcontinent and middle east origin; approximately 9000 children of beta thalassemia are born per year; although no documentary data is available in Pakistan. The estimated carrier rate is 5-7% with 9.8 million carriers in the total population.[4]

Treatment options include regular blood transfusions and stem cell transplantation. Repeated blood transfusions result in excessive accumulation of iron in different body organs which results in early death. Use of iron chelators have improved the survival rate but frequency of endocrine complications including cardiomyopathy, hypothyroidism, hypogonadism, diabetes mellitus and hypoparathyroidism have increased in long term survivors.[5,6]

Primary, sub-clinical and central type of hypothyroidism has been reported in thalassemia major patients,[3-5,8] subclinical type being the most common.[1,3,10,11] Patients with hypothyroidism have lethargy, poor school performance, constipation, cold intolerance and weight gain. Depending upon region, quality of management and treatment protocols there is variation in frequency of hypothyroidism in thalassemia major patients ranging from 7-78%.[1-3,7,9] A local study was conducted at department of Hematology, The Children's Hospital, Lahore on 70 patients of thalassemia major in which 25.7% patients were diagnosed to have hypothyroidism.[1]

Rationale of study is to determine the frequency of hypothyroidism in children with beta thalassemia major as there is considerable variation in the results of previous studies. Moreover, results of the study may emphasize the importance of screening of thalassemic patients for this important endocrine problem, so that the affected children be diagnosed earlier. Thus, timely treatment may decrease morbidity related to it.

METHODOLOGY

Study Design: Cross Sectional Study

Settings: Department of Pediatrics Allied Hospital, Ali Zaib Foundation and Sundas Foundation, Faisalabad

Duration: Six Months

Sample Technique: Non-probability consecutive sampling technique

Sample Size:

By using WHO sample size calculator
P = 25.7%
Confidence level: 95%
Absolute precision required: 10%
Sample size: 75

Inclusion Criteria:

- Age between 5 – 15 years of either gender
- Diagnosed cases of β- thalassemia

Exclusion Criteria:

- Patients of thalassemia intermedia and minor
- Patients with acute illness

- Patients with family history of hypothyroidism

Methods: A total of 75 diagnosed cases of beta thalassemia cases between 5-15 years of either gender were included in the study and those with thalassemia intermedia and minor, patients with acute illness and having a family history of hypothyroidism were excluded. The study was conducted at Allied Hospital, Faisalabad, Ali Zaib foundation and Sundas foundation, Faisalabad. A blood sample of 2cc was taken from children for TSH and T4 and sent to pathology department of Allied hospital, Faisalabad. Level of TSH and T4 was estimated by immunotech kit and Gama counter analyzer and was reported by the pathologist.

RESULTS

Out of 75 thalassemic major children 49 (65.3%) were male and 26 (34.7%) were female. Table 1

Table 1: Gender distribution (n=75)

Gender	Frequency	Percent
Male	49	65.5
Female	26	34.7
Total	75	100.0

Their age was between 5 to 15 year and they were divided into two groups, group A had children of 5-10 years (46.7%) and group B had children of 11-15 years (53.3%). Table 2

Table 2: Age distribution (n=75)

Age Distribution	Frequency	Percent
5-10 years	35	46.7
11-15 years	40	53.3
Total	75	100.0

Mean TSH level was 4.4400 ± 1.73 and mean T4 level was 9.2267±1.46. Table 3

Table 3: Mean TSH and T4 levels (n=75)

TSH/T4	Mean	Std. Deviation
TSH	4.4400	1.7339
T4	9.2267	1.4665

Primary hypothyroidism was found in 22 (29.3%). Table 4

Table 4: Frequency of hypothyroidism frequency

Hypothyroidism	Frequency	Percent
Yes	22	29.3
No	53	70.7
Total	75	100.0

DISCUSSION

For several decades, hyper transfusion has improved the expectancy of life in thalassemia major patients. On the other hand, iron chelation therapy is costly, difficult to administer and is not easily available therefore the compliance is mostly poor despite regular transfusions, causing iron overload.[10]

One important aspect in the management of hyper transfused thalassemic patients is to early diagnosis and prompt treatment of endocrine dysfunction. This is especially important for thyroid dysfunction, because hypothyroidism is associated with growth problems which are common in thalassemic patients. This study shows that T4 levels were in normal range in all patients except one while TSH level was high in 22 patients and normal in remaining 53 patients. Out of 75 patients who were tested 22 had hypothyroidism, these results are comparable to the study carried by Malik et al[1] which mentioned the frequency of hypothyroidism as 25.7% (in a study with sample size of 70 patients aged 5-14 years) in thalassemia major patients. In our study this was a little high, this variation has been attributed to difference in treatment regimens including different transfusion protocols and chelation therapies in different centers.

Deposition of iron in thyroid gland may partly be the cause of gland dysfunction.[11] Iron overload is the major complication of thalassemia and is the most important concern for management.[12]

Although most patients present with symptoms of iron overload in second decade of life, evidence from several liver biopsies done in very young patients showed that the toxic effects of iron start quite earlier. The exact mechanism of tissue damage caused by iron overload is still not completely known, though it is suggested that tissue iron deposits cause damage at cellular level by free radicals and lipid peroxidation as a result of which damage occur to mitochondrial, lysosomal and sarcolemmal membranes. In thyroid gland it decreases the production of thyroid hormones and manifests as varying degrees of primary hypothyroidism.

Thyroid failure is found to be more prevalent in older children, thus a correlation between old age and hypothyroidism is predicted in thalassemia major patients. The mean age of patients in our study is 10.48 year. It is also found that ferritin level has a relation with age. This is because the older patients would have received more blood transfusion and consequently need chelation therapy to decrease iron overload. In our study 22 patients were found to have subclinical hypothyroidism, were approximately eleven years old moreover they were not receiving regular chelation therapy. We also noticed that there is no significant relationship between hypothyroidism and gender, however a little higher rate of hypothyroidism was found in females.

More investigation is required to associate the relationship between iron overload and thyroid dysfunction in beta thalassemic patients. Since serum ferritin is a poor indicator in massively over loaded patients, there is possibility of underestimation of role of iron on thyroid functions in this study.

CONCLUSION

A high frequency of hypothyroidism in beta thalassemia patients found in this study supports the rationale for regular screening of thalassemic patients to ensure early diagnosis and timely treatment of the complications. Early detection and prompt treatment can improve the quality of life in these patients.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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