

Research Article

A cross sectional study on correlation of serum TSH with serum ferritin in children with beta thalassemia major

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[Received: 20/11/2018; Accepted: 28/02/2019; Published: 01/03/2019]

ABSTRACT

Objectives: To find out the correlation between mean serum Ferritin and mean serum TSH levels in cases of β thalassemia major.

Material and methods: This cross sectional study was conducted at Department of Pediatric Medicine, Children Hospital, Lahore from March 2018 to September 2018 over the period of 6 months. Total 85 Patients with β thalassemia major as per operational definition, on blood transfusion from last 5 years, having age 6-15 years either male or female and patients taking 1-3 transfusion per month. Non-probability Consecutive sampling technique was used.

Results: Total 85 patients of beta thalassemia major were enrolled in present study. Mean age, mean TSH, mean Ferritin and mean duration of disease was 8.81 ± 2.533 years, 3.6883 ± 2.14636 μ IU/ml, 3087.64 ± 1.625 ng/dl and 7.88 ± 2.622 years respectively. The Pearson correlation test showed that the level of serum TSH increased with increasing serum ferritin levels. This positive correlation was statistically insignificant ($r = 0.008$, $P = 0.939$).

Conclusion: Findings of present study showed positive correlation between serum TSH and serum ferritin levels which was statistically insignificant. Most of the patients were male and difference of mean TSH level between male and female patients was statistically insignificant. But difference of mean ferritin level between the male and female patients was found significant.

KEY WORDS: β thalassemia major, serum TSH, Serum ferritin, RBC

INTRODUCTION

Beta-thalassemia syndromes are a group of hereditary blood disorders characterized by reduced or absent beta globin chain synthesis, resulting in reduced Hb in red blood cells (RBC), decreased RBC production and anemia.¹As a consequence of this, repeated blood transfusions are needed to maintain life, which in turn results in excessive iron being deposited in various organs resulting in early fatalities. In Beta Thalassemia Major (BTM) patients, the

frequency of hypothyroidism ranges from 6 to 30 % among various countries depending on chelation strategies.²

Frequent blood transfusions can lead to iron overload which may result in several endocrine complications. Hemosiderosis of various endocrine glands including the thyroid gland has been documented histologically in chronically transfused patients including thalasseemics. Iron

deposition in various endocrinal glands is responsible for the hormonal derangements.³

The frequency of hypothyroidism associated with β thalassemia major and its relation with iron overload has been a topic of controversy in the recent years, with some studies reporting that there is a definite relation between iron overload and hypothyroidism and other studies showing that there is no relation between the two whatsoever citing other causes for the reported hypothyroidism.⁴⁻⁵ Garadah TS et al. in their study reported that higher serum TSH levels of the patients of β thalassemia major correlated positively with the levels of serum Ferritin ($r=0.34$, $p=0.014$) implying the link between the two.⁶ Some studies conducted in the south Asian region demonstrate that prevalence of hypothyroidism in β thalassemia major varies according to the region, quality of management and treatment protocols, thus questioning the link between hypothyroidism and iron overload.⁷

As serum ferritin level raises in blood transfusion dependant Beta Thalassemia Major Patients and causing Endocrinopathies. A study is plan to determine the correlation between serum ferritin levels and serum TSH levels. The result of this study will guide us in the management of elevated serum TSH level in blood transfusion dependent Beta Thalassemia Major Patients if correlation found.

OPERATIONAL DEFINITIONS

β thalassemia major:

Patient was labelled as patient of β thalassemia major when $Hb < 7 \text{ gm/dl}$, microcytichyochromic anemia on peripheral blood picture and have $> 70\%$ HbF on hemoglobin electrophoresis with hepatosplenomegaly (on clinical basis).

Mean serum ferritin level:

It was measured in ng/dl.

Mean TSH level:

It was measured in $\mu\text{IU/ml}$.

METHODS AND MATERIALS

This cross sectional study was conducted at Department of Pediatric Medicine, Children Hospital, Lahore from March 2018 to September 2018 over the period of 6 months. Total 85 Patients with β thalassemia major as per operational definition, on blood transfusion from last 5 years, having age 6-15 years either male or female and patients taking 1-3 transfusion per month. Non-probability Consecutive sampling technique was used. An approval was taken from ethical committee before starting the study.

Patients with history of malignancy, chemotherapy or radiotherapy, goiter, thyroxine intake and patients undergoing bone marrow transplant were excluded from the study.

Confounding Variables were removed by strictly following the exclusion criteria.

Detailed history of all the patients was taken. Blood samples were drawn from all the patients before they undergo their current scheduled transfusion. Mean serum Ferritin and mean serum TSH levels were determined by chemiluminescence method on hormone analyzer Cobas e 411 by Roche. All patients were given same standard treatment. All the data was recorded on the specially designed Performa.

Data analysis

Collected data was entered on SPSS version 18 and analyzed. Mean and SD was calculated for numerical data and percentages were calculated for categorical data. Pearson correlation coefficient was calculated for mean serum TSH and mean serum Ferritin levels. P value ≤ 0.05 was considered as significant.

RESULTS

Total 85 patients of beta thalassemia major were enrolled in present study. Mean age, mean TSH, mean Ferritin and mean duration of disease was 8.81 ± 2.533 years, 3.6883 ± 2.14636 $\mu\text{IU/ml}$, 3087.64 ± 1.625 ng/dl and 7.88 ± 2.622 years respectively. (Table 1) Table 2 showing correlation of serum TSH level with serum ferritin level. The Pearson correlation test showed that the level of serum TSH increased

with increasing serum ferritin levels. This positive correlation was statistically insignificant ($r = 0.008$, $P = 0.939$). Out of 85 patients, male patients were 55 and female patients were 30. Mean TSH in male patients was 3.7334 ± 2.141 $\mu\text{IU/ml}$. In female patients, mean TSH was 3.605 ± 2.189 $\mu\text{IU/ml}$. Statistically insignificant difference between mean TSH levels between male and female patients was noted with P value 0.795. Mean ferritin level in male patients was 3374.96 ± 1678.189 ng/dl and in female patients was 2591.03 ± 1234.816 ng/dl. Difference of mean ferritin level between male and female patients was statistically significant with p value 0.035. (Table 3)

Patients were divided into two age groups i.e. age group 6-10 years and age group 11-15 years. In age group 6-10 years, mean TSH levels was 3.4760 ± 2.023 $\mu\text{IU/ml}$ and in age group 11-15 years, means TSH level was 4.296 ± 2.410 $\mu\text{IU/ml}$. Difference of mean TSH level between the both groups was statistically insignificant

Table 1: Mean and SD of different variables

Variable	Mean	SD
Age	8.81	2.533
TSH	3.6883	2.14636
Ferritin	3098.28	1.574
Duration of blood transfusion	7.88	2.622

Table 2]: Correlation of serum TSH with serum ferritin

	TSH ($\mu\text{IU/ml}$)	
	Pearson correlation (r)	P-value
serum ferritin (ng/dl)	0.008	0.939

Table 3: Comparison of mean TSH and mean ferritin level between male and female patients

Gender	n	Mean	SD	P Value
Comparison of mean TSH level				
Male	55	3.7334	2.141	0.795
Female	30	3.605	2.189	
Comparison of mean ferritin level				
Male	55	3374.96	1678.189	0.035
Female	30	2591.03	1234.816	

Table 4: Comparison of mean TSH and ferritin level between different age groups

Age Group	n	Mean	SD	P Value
Comparison of mean TSH level				
6-10	62	3.4760	2.023	0.123

with p value 0.123. Mean ferritin level was 2976.95 ± 1519.769 $\mu\text{IU/ml}$ and in age group 11-15 years, means TSH level was 4.296 ± 2.410 ng/dl. Difference of mean ferritin level between the both groups was statistically insignificant with p value 0.317. (Table 4)

Patients were divided into two groups according to duration of disease. In 5-10 years group, there were 68 patients and in 11-15 years group, there were 17 patients. Mean TSH level in 5-10 years group was 3.488 ± 1.989 years and in 11-15 years group was 4.487 ± 2.60 years. Difference of mean TSH level between the both groups was statistically insignificant with p value 0.086. (Table 5)

Mean ferritin level in 5-10 years group was 3090.71 ± 1531.553 years and in 11-15 years group was 3128.59 ± 1786.242 years. Difference of mean ferritin level between the both groups was statistically insignificant with p value 0.362. (Table 5)

11-15	22	4.296	2.410	
Comparison of mean ferritin level				
6-10	63	2976.95	1519.769	0.317
11-15	22	3445.73	1710.534	

Table 5: Comparison of mean TSH and ferritin level for duration of blood transfusion

Duration of blood transfusion	n	Mean	SD	P Value
Comparison of mean TSH level				
5-10 years	68	3.488	1.989	0.086
11-15 years	17	4.487	2.60	
Comparison of mean ferritin level				
5-10	68	3090.71	1531.553	0.362
11-15	17	3128.59	1786.242	

DISCUSSION

Thyroid hormones are important for the proper development, differentiation and metabolism of cells. Thyroid dysfunction has been reported in a number of studies on thalassemia patients. A wide range of pathogenic mechanisms may be involved. Tissue chronic hypoxia and iron overload have a direct toxic effect on the thyroid gland⁸. High concentrations of labile plasma iron and labile cell iron may lead to the formation of free radicals and the production of reactive oxygen species resulting in cell and organ damage⁹. In severe iron overloaded thalassaemic patients the anterior pituitary may also be damaged and regulatory hormonal secretion (LH, FSH, and TSH) may be disrupted. Organ siderosis (liver, cardiac and skeletal muscle, kidney) may affect specific receptors, which regulate thyroid hormone action and convert T4 to the bioactive T3.¹⁰

In present study mean age, mean TSH, mean Ferritin and mean duration of disease was 8.81 ± 2.533 years, 3.6883 ± 2.14636 μ IU/ml, 3087.64 ± 1.625 ng/dl and 7.88 ± 2.622 years respectively. In one study Malik et al¹¹ mean age of thalassaemic patients was 7.6 ± 2.5 years which is comparable with our study. Similar mean age (7.65 ± 3.61) of thalassaemic patients was also reported by Karim et al¹² in their study. In present study male patients were 65% and female patients were 35%. Similar results were reported by Karim et al¹² in their study. Solanki et al¹³

reported mean serum TSH and mean serum ferritin as 7.14 ± 9.04 and 2927.40 ± 783.39 which is comparable with the findings of my study.

In present study Pearson correlation test showed that the level of serum TSH increased with increasing serum ferritin levels. This positive correlation was statistically significant ($r = 0.008$, $P = 0.939$). Solanki et al¹³ reported that there was no correlation between serum TSH and serum ferritin level (P -value= 0.38). Farooq MS et al¹⁴ reported negative correlation between serum ferritin and serum TSH which was statistically insignificant. Garadah TS et al¹⁵ in their study reported that higher serum TSH levels of the patients of β thalassemia major correlated positively with the levels of serum Ferritin ($r=0.34$, $p=0.014$) results of this study are supporting my study. Eshragi et al¹⁶ also reported a Correlation between TSH and serum ferritin level which was not significant ($p=0.584$)

In present study mean TSH in male patients was 3.7334 ± 2.141 μ IU/ml. In female patients, mean TSH was 3.605 ± 2.189 μ IU/ml. Statistically insignificant difference between mean TSH levels between male and female patients was noted with P value 0.795. Farooq MS et al¹⁴ mean serum TSH in male and female patients as 3.67 ± 0.69 and 4.73 ± 1.20 and the different statistically insignificant p value 0.143. Findings of this study are comparable with our findings.

In present study mean ferritin level in male patients was 3374.96 ± 1678.189 ng/dl and in

female patients was 2591.03 ± 1234.816 ng/dl. Difference of mean ferritin level between male and female patients was statistically significant with p value 0.035. Irshaid et al¹⁷ reported serum ferritin level in male and female patients as 2699 ± 858 and 2412 ± 750 which is comparable with my study.

CONCLUSION

Findings of present study showed positive correlation between serum TSH and serum ferritin levels which was statistically insignificant. Most of the patients were male and difference of mean TSH level between male and female patients was statistically insignificant. But difference of mean ferritin level between the male and female patients was found significant.

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