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Association of Hyperparathyroidism with Patients of Beta Thalassemia Major in a Tertiary Care Hospital

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ABSTRACT

Background: Beta-thalassemia is an inherited disorder that leads to abnormity of hemoglobin. There is a significant frequency of endocrine disorders among beta thalassemia major patients. Objective: The aim of this study was to determine the Association of hyperparathyroidism with patients of beta thalassemia major in a tertiary care hospital. **Material and method:** The present study was carried out at women and children hospital karak after taking permission from the ethical board of the hospital. A total of 120 children already diagnosed with beta thalassemia major of both gender and different age groups were included. Children were evaluated by a detailed medical history and clinical examination. Blood samples were collected from children using extremely strict aseptic methods and forwarded to a medical laboratory for analysis. Serum levels of calcium, phosphorus, hemoglobin, and parathyroid hormone were checked. The participants' bio data (name, age, gender, and address) was collected using a pre-designed proforma. The collected data was analyzed through SPSS version 20. **Results:** A total of 120 children with beta thalassemia major were evaluated in this study, out of which 90(75%) were male and 30(25%) were female. Biochemical data revealed a mean hemoglobin level of 11.48±2.70 mg/dl, with 48 (40%) having high serum ferritin, 47 (39.1%) had low serum calcium, 46 (38.3%) showed high serum phosphorus, and 46 (38.3%) reported low parathyroid hormone. Hypoparathyroidism has been noted in 38.3% of thalassemic individuals. There was no significant association between age or gender and hypoparathyroidism. This study found a substantial correlation between serum calcium, phosphorus, and parathyroid hormone levels and hypothyroidism in thalassemic individuals. PTH levels between 10-60 pg/ml were considered normal, but those below 10 pg/ml were classified as hypoparathyroid. **Conclusion:** The current study concluded that hyperparathyroidism had a prime association with beta thalassemia major. The frequency of hyperparathyroidism was 38.3% in the beta thalassemia major participants in the present study.

INTRODUCTION

Beta-thalassemia is a genetic autosomal recessive blood disorder where the β-globin chain of hemoglobin fails to develop effectively, resulting in a decreased oxygen binding ability.[1] Beta-thalassemia major, a homozygous illness, causes severe hemolytic anemia and need frequent blood transfusions.[2] In Pakistan, an estimated 70 thousand people suffer from thalassemia, with 6 thousand new cases presented for treatment annually.[3] In the late 1970s, over 50% of thalassemic patients in Italy died before the age of 12.[4] Safe transfusions and adjuvant chelation treatment have significantly increased the life expectancy of thalassemic individuals, enabling them to live into their 4th and 5th decades.[2] Frequent blood transfusions can cause serum iron excess, leading to hypogonadism, hyperglycemia, hypothyroidism, hypoparathyroidism, and other endocrine problems.[5] Thyroid dysfunction affects 9% to 60% of thalassemia individuals, however the severity varies among populations.[6] Various studies showed a significant frequency of endocrine disorders among beta thalassemia major patients.[7,8] Hypo-parathyroidism is common consequence of beta-thalassemia major, typically accompanied by hypocalcaemia.[9] Thalassaemia can cause neurological symptoms such as tetany, seizures, carpopedal spasms, and paresthesia. Not much is known about these problems

in individuals.[9] The majority of BTM individuals have elevated iron levels in various tissues in their bodies. Similarly, the endocrine system also deposits iron. Accumulation of iron in the parathyroid glands causes impaired function of the hormone, resulting in hypothyroidism. A reduction in parathyroid hormone leads to bone resorption.[10] A study found that 18 percent of children with beta thalassemia major also have hypoparathyroidism that is characterized by low calcium and phosphorus levels along with low PTH levels.[11] This may cause calcification of various brain tissues. Iron accumulation in the parathyroid gland is a known contributor to the development and progression of hypoparathyroidism in thalassemic children. However, there is no correlation between serum ferritin levels and HPT development.[12] The present study was carried out to find out the Association of hyperparathyroidism with patients of beta thalassemia major in a tertiary care hospital.

MATERIAL AND METHOD

The present study was carried out at women and children hospital Karak from August 2024 to January 2025 after taking permission from the ethical board of the hospital. A total of 120 children already diagnosed with beta thalassemia major of both gender and different age groups were included while individuals with beta minor, intermedia , acute medical illness , family history of thyroid disorders and on hormonal therapy were excluded. Parents/guardians provided written informed consent for their children. Children were evaluated by a detailed medical history and clinical examination. Blood samples were collected from children using extremely strict aseptic methods and forwarded to a medical laboratory for analysis. Serum levels of calcium, phosphorus, hemoglobin, and parathyroid hormone were checked. The participants' bio data (name, age, gender, and address) was collected using a pre-designed proforma. The exclusion criterion was closely followed to prevent confounding & unfairness in the research project. The collected data was analyzed through SPSS version 20. Variables such as age, serum calcium, phosphorus, hemoglobin, weight, and parathyroid hormone levels were presented as mean and standard deviation. For gender and hypoparathyroidism, frequency and percentage were used. Hypoparathyroidism was stratified based on hemoglobin, age, and gender. After stratification, we employed the chi square test to identify significant results with a p-value of less than 0.05. All findings were presented in tables and charts.

RESULTS

A total of 120 children with beta thalassemia major were evaluated in this study, out of which 90(75%) were male and 30(25%) were female. The mean age of the study participants was 11.78±1.81 years while the mean was 18.40±4.85 kg and height was 120.87±6.37 centimeter. Biochemical data revealed a mean hemoglobin level of 11.48±2.70 mg/dl, with 48 (40%) having high serum ferritin, 47 (39.1%) had low serum calcium, 46 (38.3%) showed high serum phosphorus, and 46 (38.3%) reported low parathyroid hormone as presented in **table 1.** Hypoparathyroidism has been noted in 38.3% of thalassemic individuals as presented in **figure 1.** There was no significant association between age or gender and hypoparathyroidism. This study found a substantial correlation between serum calcium, phosphorus, and parathyroid hormone levels and hypothyroidism in thalassemic individuals. **Tables 2, 3, 4, and 5** show the stratification of hypoparathyroidism based on hemoglobin, calcium, phosphorus, and parathyroid hormone levels. PTH levels between 10-60 pg/ml were considered normal, but those below 10 pg/ml were classified as hypoparathyroid.

Table 1

Biochemical parameters of the study population

Parameters		Frequency(%) /mean SD
Sex	Male	90(75%)
	Female	30(25%)
Age in years		11.78±1.81 years
Hemoglobin	Normal (above 12 mg/dl)	72(60%)
	Low (below 12 mg/dl)	48(40%)
Serum ferritin	Normal (7 to 142 Nano gram/ml	72(60%)
	High (above 142 Nano gram/ml	48 (40%)
Serum calcium	Normal (8 to 10 mg/ dl)	73(60.8%)
	Low (<8 mg/dl)	47 (39.1%)
Serum phosphorus	Normal (3.7-4.5mg/dl)	74(61.6%)
	High (above 4.5 mg/dl)	46(38.3%)
Parathyroid hormone	Normal (10-60pg/ml)	74(61.6%)
	Low (<10 pg/ml)	46(38.3%)

Figure 1

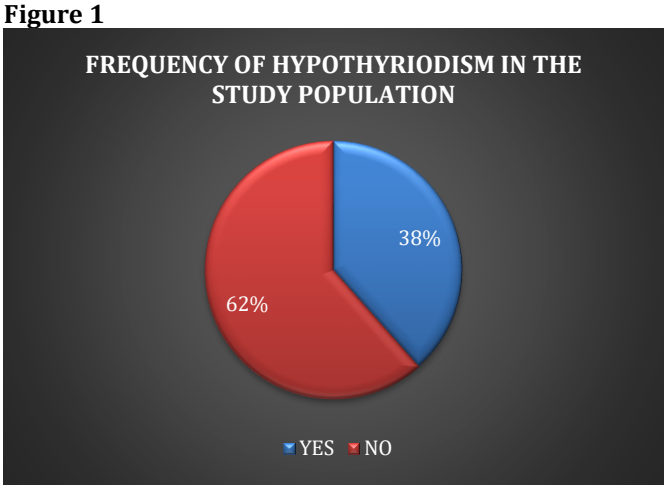

Table 2

Stratification of Hypoparathyroidism by Haemoglobin Level

Parameter		Frequency		Value of P
HB		Yes	No	
	Normal	4	69	0.00
	Low	42	5	

Table 3

Stratification of Hypoparathyroidism by Level of calcium

Parameter		Frequency		Value of P
calcium		Yes	No	
	Normal	4	69	0.00
	Low	42	5	

Table 4
Stratification of Hypoparathyroidism by Level of phosphorus

Parameter		Frequency		Value of P
phosphorus		Yes	No	
	Normal	4	70	0.00
	Low	42	4	

Table 4
Stratification of Hypoparathyroidism by Parathyroid hormone

Parameter		Frequency		Value of P
Parathyroid		Yes	No	
hormone	Normal	2	72	0.00
	Low	44	2	

DISCUSSION

Beta thalassemia major is a common hemolytic disease in children. Iron deposition can cause problems, such as endocrinopathies, in BTM patients receiving regular blood transfusions.[12] Hypoparathyroidism is a frequent consequence of endocrinopathies among individuals approaching the end of their first and second decade of life.[13] HPT is a prevalent endocrinopathy linked with BTM, however it is less common nowadays due to regular chelation treatment worldwide. Our study revealed a 38.3% prevalence of hypoparathyroidism among individuals with beta thalassemia major. The study findings align with previous research by Gambirine et al. [14] & Khedir et al. [15] Studies by Mustafevi et al.[16] and Adel et al. [17]found a frequency of HPT of 23.8% and 36.4%, respectively. Tangngam et al[18] observed 39% of HPT cases, although not all of them were clinically exhibited. In fact, many HPT individuals were asymptomatic. Studies reported a low incidence of Hypoparatyriodism among beta Thalassemic major participants (14.6 percent to 13.6%).[19,20] In our study, the average age was 11.78±1.81 years, with 75% of the participants being male. However, there was no significant association between age or gender and hypoparathyroidism. Tangngam et al[18] found no significant variations in the correlation of HPT with sex and age which support our study findings. This study found a substantial correlation between serum calcium, phosphorus, and parathyroid hormone levels and hypothyroidism in thalassemic individuals. Hypoparathyroidism is diagnosed based on parathyroid hormone levels. Normal physical activity maintains blood calcium levels, as does vitamin D. Calcitonin also assists. Bsha et al[19] found substantial decreases in levels of parathyroid hormone, calcium, and serum phosphate. Serum ferritin levels were found to be elevated in 40% of thalassemic individuals with hypoparathyroidism in the current study. HPT has been linked to increased blood ferritin levels, according to various studies. Patients with beta thalassemia major who have high blood ferritin levels (≥ 2500 ng/ml) are more likely to develop hypoparathyroidism.[21,22] In a study of thalassemic individuals, weight and height were found to be substantially linked with hypoparathyroidism. Other studies have shown that most people with beta thalassemia major experience slowed growth, which is especially noticeable throughout puberty. Several causes contribute to this condition, notably folic acid deficiency, chronic anemia, and serum ferritin accumulation in glands such as the hypothyroid, thyroid, and pituitary glands.[23] Beta thalassemic individuals often have hypoparathyroidism, which is linked to metabolic imbalances such as calcium and phosphorus. HPT is a typical consequence of BTM that requires early identification and care. Hypoparathyroidism is linked to elevated blood ferritin levels in beta thalassemia major patients. Regularly assessing beta individuals with thalassemia for endocrionopathies, particularly hypoparathyroidism and serum ferritin, might improve their health.

CONCLUSION

The current study concluded that hyperparathyroidism had a prime association with beta thalassemia major. The frequency of hyperparathyroidism was 38.3% in the beta thalassemia major participants in the present study.

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