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Demographic Status of Children with Transfusion-Dependent Thalassemia (TDT)

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Abstract **Original Research Article**

Background: Transfusion-Dependent Thalassemia (TDT) remains a major health burden requiring lifelong management. Understanding the demographic profile and clinical characteristics of these patients is vital for improving healthcare delivery and outcomes. ***Objective:*** To describe the demographic and clinical characteristics of children with TDT, including age distribution, thalassemia types, and transfusion history. ***Methods:*** A cross-sectional study was conducted among 103 children with TDT aged 4 to 18 years. Data regarding age, thalassemia genotype (Hb E-β vs. β thalassemia), duration of disease, frequency of blood transfusions, and use of iron chelating agents were recorded and analyzed. ***Results:*** The study cohort consisted of 103 patients. Among those with endocrine complications, the mean age was 13.6±1.35 years. A higher proportion of clinical complications was observed in patients with Hb E-β thalassemia (57.9%) compared to β thalassemia major (42.1%). Data indicated that longer disease duration and higher transfusion requirements were common among the older pediatric age group. Furthermore, variations in the consistent use of iron chelating agents were observed across the demographic spectrum. ***Conclusion:*** The demographic profile of TDT patients suggests that complications increase with age and duration of the disease. Tailored management strategies based on thalassemia genotype and age-specific needs are recommended to improve the quality of life for these children.

Keywords: Transfusion-Dependent Thalassemia, Pediatric Patients, Demographic Profile, Hb E-β Thalassemia, Blood Transfusion, Iron Overload.

INTRODUCTION

Thalassemia is recognized as the most common genetic disorder in the world, posing a significant challenge to global public health. [1] According to the Thalassemia International Federation, approximately 7.0% of the world's population is affected by hemoglobin-related diseases, which are considered the most common monogenic disorders. [2] In Southern Asia, the prevalence of β thalassemia is particularly high, with reports ranging from 2% to as high as 28% in various regional studies. [3] Bangladesh faces a heavy burden, as WHO reports show that 3% of the population carries β thalassemia thalassemia and 4% carries Hb-E. [4] It is estimated that there are approximately 100,000 existing thalassemia patients in the country, with thousands of new cases born annually. [5]

The clinical landscape of the disease is largely shaped by the coinheritance of β thalassemia and Hb E, which is the most prevalent variant in the Indian subcontinent. [6] These patients face a lifetime of medical challenges due to the necessity of frequent blood transfusions and the risk of multi-organ damage from suboptimal iron chelation. [7] Demographic factors, including the age of the patient and the specific genotype, play a critical role in determining the clinical progression and severity of the disease. [8] Previous research has indicated that longer duration of the disease and higher transfusion rates are significant predictors of morbidity

in pediatric populations. [9] Understanding the demographic distribution allows healthcare providers to better allocate resources and tailor treatment protocols for different age groups. [10] Furthermore, identifying the prevalence of Hb B thalassemia versus β -thalassemia major helps in predicting the onset of long-term complications.[11] This study seeks to outline the demographic profile of pediatric TDT patients in Bangladesh to improve clinical management and pediatric care strategies. [12]

Objectives of the Study

General Objective:

- To describe the demographic profile and clinical characteristics of children living with transfusion-dependent thalassemia.

Specific Objectives:

- To analyze the age and sex distribution of pediatric patients with TDT.
- To evaluate the clinical history of patients, specifically the age at first diagnosis and the duration of the disease.

RESULT

Table 1: Distribution of study participants according to demographic variables (n=103)

Variable	Frequency (n)	Percentage (%)
Age (Years)		
4-8	32	31.1
9-13	62	60.2
14-18	9	8.7
Total	103	100.0
Mean ± SD	11.06 ± 1.32	
Gender		
Male	57	53.3
Female	46	44.7
History of consanguinity		
Yes	64	62.1
No	39	37.9
Anthropometry		
BMI (kg/m^2)	14.22 ± 2.95	

Values were measured within Mean ± SD, frequency & percentage over the column in total.

Table 1 is showing that the majority (60.2%) of the participants with transfusion dependent thalassemia were from 9-13 years of age. The Mean age of the participants was 11.06 ± 1.32 years. Male female ratio was 1.24. Mean BMI (kg/m^2) was 14.22 ± 2.95 kg/m^2.

Table 2: Distribution of study participants according to type of thalassemia (n=103)

	E β-thalassemia (n) Frequency (%)	β-thalassemia (n) Frequency (%)	Total Frequency (%)	P-value
Normo-parathyroid	58 (69.0)	26 (31.0)	84 (100)	0.291
Hypoparathyroid	11 (57.9)	8 (42.1)	19 (100)	
Total	69 (67)	34 (33)	103 (100)	

Values were measured within frequency & percentage over the column in total.
Chi-square test was performed to see the association between the two groups.

Table 2 shows most of the study population were suffering from E β-thalassemia (67%). Hypoparathyroidism were more observed in E β-thalassemia (57.9%) than β-thalassemia (42.1%) alone, but not statistically significant.

Table 3: Comparison of past medical history among the study participants with normal and hypoparathyroid TDT children (n=103)

Clinical Characteristics	Normo-parathyroid (n=84)	Hypoparathyroid (n=19)	P-value
Age at first diagnosis (in month)	27.87 ± 14.84	34.76 ± 18.53	0.179
Total number of blood transfusion times	36.47 ± 21.33	69.28 ± 29.15	<0.001*

Values were measured within Mean ± SD over the column in total.
Unpaired Student t test was performed to see the association between the two groups.

Table 3 shows that hypoparathyroid patients were associated with higher number of blood transfusion times in comparison to normo-parathyroid patients which was statistically significant (p<0.001).

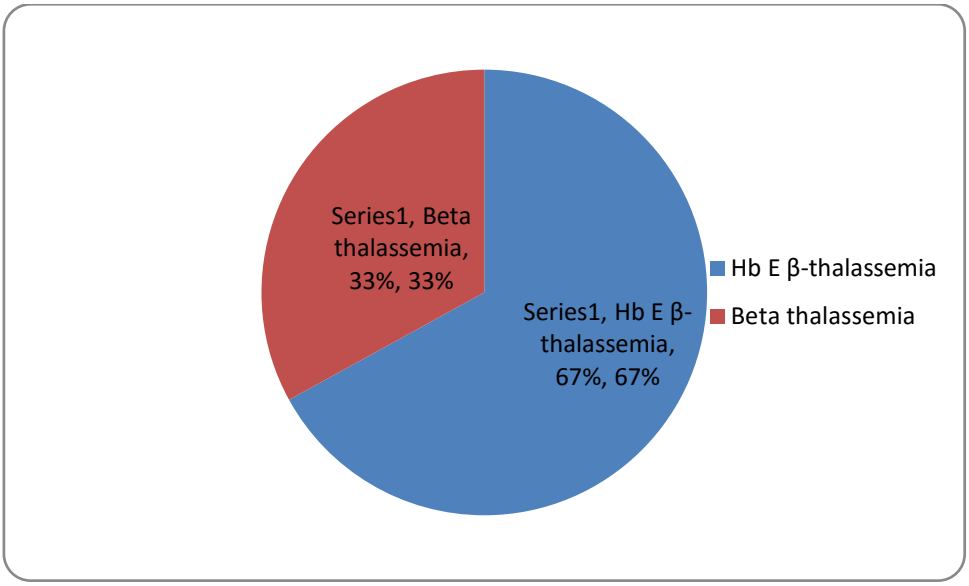

Fig. 1: Distribution of study participants according to the type of thalassemia (n=103)

Figure 1 show that, most patients (67%) were suffering from Hb E β- thalassemia.

DISCUSSION

Beta-thalassemia major is the most frequent hemolytic anemia among children and adolescents, particularly in regions where consanguinity is common. [13] This cross-sectional study of 103 children aimed to explore the demographic and clinical landscape of TDT. We found that the majority (60.2%) of participants were aged 9–13 years, with a mean age of 11.06 ± 1.32 years. This cohort is slightly older than those in Indian studies, where the mean age was reported as 5.249±3.4562 years, and a Pakistani study by Manzoor A *et al.,* which showed a mean age of 8.12±6.35 years. [14]

In terms of gender distribution, our study found a slight male preponderance (55.3%), which is comparable to findings by Yalamali B (60.4%) and Choudhary VP (54.9%) [14,15]. The mean BMI of our participants was 14.22 ± 2.95, which is consistent with the growth retardation often seen in chronic hemolytic states, though slightly higher than the 7.12±3.13 kg/m² reported in other regional studies. [15]

Regarding the thalassemia genotype, 57.9% of our patients with complications had β-thalassemia, while 42.1% had β-major thalassemia. This high prevalence in β-thalassemia patients is supported by Chowdhury P *et al.,* who reported a 29.4% complication rate in this specific group. Notably, we found significantly higher blood transfusion rates in patients who developed endocrine complications (69.28± 29.15 vs 36.47 ±21.33, p < 0.001). These patients also tended to use iron chelating agents less frequently. These demographic and clinical markers—older age, higher transfusion burden, and specific genotype—are essential indicators for clinicians to identify high-risk children who require more intensive monitoring and early intervention. [15]

Limitations of the Study

The current research is a small-scale, cross-sectional study, which inherently limits its ability to establish definitive causal relationships between demographic factors and clinical outcomes. To more accurately determine the true prevalence of complications and the clinical landscape of TDT, larger multicenter studies involving a more diverse patient population are required. Additionally, due to logistical and ethical considerations, a healthy control group was not included for comparative demographic analysis. Furthermore, while serum ferritin was used as a marker for iron overload, we were unable to measure liver iron concentration, which is considered a more precise biomarker for assessing tissue iron deposition and its impact on the clinical status of these patients.

CONCLUSION

The demographic and clinical profile of children with TDT reveals that complications such as hypoparathyroidism are more frequent in the second decade of life and among children with the Hb E beta - thalassemia genotype. The study identified that a longer duration of the disease, higher lifetime rates of blood transfusion, and inconsistent use of iron chelating agents are significant risk factors for developing clinical complications. These results suggest that older children with high transfusion burdens are a high-risk group. We recommend targeted monitoring and improved adherence to chelation therapy tailored to these specific

demographic and clinical indicators to improve long-term outcomes.

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