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Original Research Article

Descriptive Observational Study to Determine the Clinico-Pathological Profile of Paediatric Patients with Thalassemia Major

Nishant[1], Hemant Kumar Thakur[2]

[1]Assistant Professor, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India
[2]Assistant Professor, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

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Corresponding author: Dr Hemant Kumar Thakur
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Abstract

Aim: Clinico-pathological profile of paediatric patients with thalassemia major.

Methods: This Descriptive observational study conducted in the Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 1 year. This study was conducted on 100 children with β-Thalassemia major patients aged between 1-15 year being regularly transfused. A preformed and pre-checked proforma was used for data collection that included personal information, data regarding the number of transfusions and pre-transfusion. haemoglobin and serum ferritin, at what dose of chelators they were with clinical examination finding and laboratory investigation reports.

Results: β– Thalassemia major affects both male and female equally but gender status in the present study shows male predominance with 65 male (65%) and 35(35%) female. In 1-3 years, cases, 14 had low, 05 had high and 03 had a normal level of serum phosphorus. In 4-11years, 24 cases had low, 26 cases had high, and 13 cases had normal serum phosphorus levels. In 12-15 years, the only 2 cases had hypophosphatemia, 4 cases had high, and 8 cases had a normal level of Serum Phosphorus. In the present study, there were 27 (27%) patients who have been found short stature on the growth chart, out of which 18 cases were boys and 9 cases were girls who showed that, short stature was more in boys as compared to girls.

Conclusion: There is a direct adverse impact of increasing serum ferritin values and transfusion index on anthropometric, clinical parameters and the biochemical parameters.

Keywords: Thalassemia, Biochemical Parameters, Transfusion Index.

Introduction

It has been estimated that approximately 7% of the world population are carriers of thalassemia and hemoglobinopathies and that 3, 00,000 –4, 00,000 babies with severe forms of these diseases are born each year [1]. With a population of 1000 million at the millennium year 2000 and approximately 27 million born with pathological hemoglobinopathies each year, India is among the countries worst hit by thalassemia and hemoglobinopathies [2,3]. The frequency of carriers of hemoglobinopathies varies from 3 to 17% in different population groups of India [4].

The cumulative gene frequency of the three most predominant abnormal hemoglobin's, i.e. sickle cell, hemoglobin D and hemoglobin E has been estimated to be 5.35% in India [5].

The abnormal hemoglobins so far detected in India include Hb D, E, H, J, K, L, M, Q, S, Lepore, Norfolk, Koya Dora, Chandigarh and the hereditary persistence of HbF.

The distribution of different thalassemias and hemoglobenopathies show remarkable variation in different parts of the country and in different ethnic and tribal population [6].

The most commonly found abnormal hemoglobins in India are sickle cell hemoglobin (S), hemoglobin-E and hemoglobin-D.

In the very few studies done in West Bengal, mainly in adult population- based study or prevalence-based study during pre-marital screening, β-thalassemia was found to be most prevalent Hb disorder with β-thalassemia carriers in the range 3.5% to 10% [7,8]. HbE comes second with carrier about 4.5% [7]. Most thalassemias and hemoglobinopathies produce anemia with smaller i.e., microcytic RBCs (red blood cells) and thus are grouped together with other causes of microcytic anemia, notably iron deficiency anemia, anemia of chronic disorders and sideroblastic anemia. Microcytic hypochromic anemia is fairly common and significant microcytosis is detected in nearly 3% of all patients who require admission to the hospital [9].

Material and Methods

This Descriptive observational study conducted in the Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 1 year..

This study was conducted on 100 children with β-Thalassemia major patients aged between 1-15 year being regularly transfused. A preformed and pre-checked proforma was used for data collection that included personal information, data regarding the number of transfusions and pre-transfusion. haemoglobin and serum ferritin, at what dose of chelators they were with clinical examination finding and laboratory investigation reports. A detailed history of all the registered patients including personal data, history of consanguineous marriage, nutrition, frequency of transfusion, use of iron-chelating agent including dose, duration and compliance).

A thorough physical examination was performed including anthropometry, general examination and systemic examination and was recorded in the proforma. Following anthropometric measurements were recorded: Weight, Length/Height, and mid-upper-arm circumference using standard methods. Anthropometry details (weight, height and mid-upper arm circumference) were reviewed as per WHO criteria and patients were classified accordingly in SAM and MAM category. Transfusion index is calculated by the formula blood volume received in ml/kg/month. The serum ferritin level was measured in all Thalassemic patients. Iron chelating agents were advised to all patients with serum ferritin level above 1000 ng/ml. Haemoglobin was measured before transfusion by Sahli's method. Blood group cross-matching was done by blood typing.

Standard references were used. Data regarding various clinical and laboratory parameters were recorded and tabulated and presented as frequency, percentage and mean.

All the diagnosed β-Thalassemia major patients between the age group of 1 to 15 years attending the Department of Pediatric were included in the study.

Patients are less than one year and more than 14 years of age group, Children having multiple congenital anomalies along with Thalassemia major, Coexisting cardiac or pulmonary disease, Chronic haemolytic anaemia, other than β-Thalassemia major

and Thalassemia minor were excluded from the study.

Statistical analysis

The data collected were analysed with SPSS statistical software version 21. Continuous variables were presented as mean for parametric data. The student t test was applied for the calculation of statistical significance whenever the data followed normative distribution. P <0.05 was taken to indicate a statistically significant difference. Correlational analysis was done by calculating the correlation coefficient.

Results

β– Thalassemia major affects both male and female equally but gender status in the present study shows male predominance with 65 male (65%) and 35(35%) female. In 1-3 years, cases, 14 had low, 05 had high and 03 had a normal level of serum phosphorus. In 4-11years, 24 cases had low, 26 cases had high, and 13 cases had normal serum phosphorus levels. In 12-15 years, the only 2 cases had hypophosphatemia, 4 cases had high, and 8 cases had a normal level of Serum Phosphorus. In the present study, there were 27 (27%) patients who have been found short stature on the growth chart, out of which 18 cases were boys and 9 cases were girls who showed that, short stature was more in boys as compared to girls.

Table-1: Distribution of cases according to sex.

Sex	No of cases (N=100)	Percent
Females	35	35
Males	65	65

Table-2: Showing distribution of patients according to Height for age (n=100).

	Short stature (below 3rd centile)	Normal stature
Male	18 (18%)	47 (47%)
Female	9(9%)	26 (26%)
Total	27 (27%)	73 (73%)

Table-3 Serum Phosphorus values (mg/dl)

Age (Years)	Decreased	Normal	Increased	Total
1-3	14	3	5	26(26%)
4-11	24	13	26	60 (60%)
12-15	2	8	4	14 (14%)
Total	**40**	**24**	**36**	**100**

Table-4: Serum Alkaline Phosphatase (I/U)

Age (Yr)	Normal	Increased	Total
<8	45	27	72(72%)
>8	5	23	28(28%)
Total	**50**	**50**	**100**

Table-5: Correlation of liver function test, renal function test with serum ferritin.

Dependent Indices	Correlation to Serum ferritin (R-square)	p-Value
SGOT	0.011	p>0.05
SGPT	0.0039	p>0.05
Serum Bilirubin Total	0.036	p>0.05
Serum Bilirubin Direct	0.00015	p>0.05

Total Serum Protein	0.014	p>0.05
Serum Albumin	0.018	p>0.05
Serum Urea	0.014	p>0.05
Serum Creatinine	0.0068	p>0.05

Discussion

Children with β-Thalassemia major usually demonstrate no symptoms until about 2-3 months of age, when beta chains are needed to pair with alpha chains to form HbA, since gamma chains production is turned off. However, in some cases, the condition may not be recognized until 3-5 years of age due to delay in the cessation of HbF production. In the present study, at the time of enrolment, out of total 100 cases, 52 patients (52%) were between 1-5 years, 30 patients (30%) were between 6-10 years and 18 patients (18%) were between 11-14 years. β– Thalassemia major affects both male and female equally but gender status in the present study shows male predominance with 65 male (65%) and 35(35%) female [10,11].

In the present study, Icterus was found to be present in 52% of cases. All the cases of this study had a normal feature which is commonly found in Thalassemic children like bony abnormalities, frontal bossing, prominent facial bones and dental malocclusion in the form of haemolytic facies were present. Oedema which can be a manifestation of both severe anaemia as well as SAM was found to be present in 10 cases [12].

In the present study, there were 27 (27%) patients who have been found short stature on the growth chart, out of which 18 cases were boys and 9 cases were girls who showed that, short stature was more in boys as compared to girls. The current study had a lower percentage of short stature as compared to Quaish Abdullal Salehe et al study in the year 2015, in which, 79% of the β-thalassemia patients had short stature [13].

In patients with β-thalassemia, low bone marrow density and fractures occur frequently and independently of the particular syndrome.

In less than 08 years, 23% cases had high i.e. hypercalcemia, 21% cases had low i.e. hypocalcemia and 56% cases were having normal levels of serum calcium. In greater than 08 years, 10% cases had hypercalcemia, 14% cases had hypocalcemia and 24% cases had a normal level of serum calcium. This showed that thalassemic patients who were less than 08 years of age were more hypercalcaemic as compared to patients more than 08 years of age. Similarly, hypocalcemia was seen more in thalassemic patients below 08 years of age.

In 1-3 years, cases, 14 had low, 05 had high and 03 had a normal level of serum phosphorus. In 4-11years, 24 cases had low, 26 cases had high and 13 cases had normal serum phosphorus levels. In 12-15 years, the only 2 case had hypophosphatemia, 4 cases had high and 8 cases had a normal level of Serum Phosphorus [14,17]. The present study found 40 cases to have hypophosphatemia which account for 40%, which may be due to renal function derangements and abnormality of bone marrow turnover [18,19].

Renal profile of the patients showed almost 1/3rd cases 30(32%) case had high levels of creatinine, rest were having normal levels. Serum urea was high in 64(64%) cases [20,24]. Though most of the urea and creatinine were only mildly elevated which may be due to chelator therapy in the higher age group.

In the present study, 50 patients of 1 to 5 years of age, 34(68%) patients showed hepatomegaly with the mean liver span of 8.96±3.24 cm. and mean serum ferritin 1564±1096. There was a positive correlation with serum ferritin

concentration, transfusion index with respective correlation coefficients (r) of 0.177, 0.1512 and 0.468. Correlation of hepatomegaly with Transfusion index ($p<0.0001$) and was statistically significant. Mean serum ferritin found in 06 to 10 years age group was 2956+/- 2231 and was also having p value 0.021. In the present study, liver, span in patients of 1-5 years of age group was correlated significantly in serum ferritin levels less than 1000 ng/ml with transfusion index ($p=0.0003$) [25].

Conclusion

There is a direct adverse impact of increasing serum ferritin values and transfusion index on anthropometric, clinical parameters and the biochemical parameters.

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