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Assessment of Serum Ferritin Levels in Transfusion Dependent Thalassaemic Patients at Rajasthan Southern Region

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Abstract: ***Background: The thalassemia is a common monogenic disorder globally. India has a huge burden with an estimated 100, 000 patients with a β thalassemia syndrome. An option for control is to promote awareness programmes, and develop adequate facilities for genetic counselling.10, 000 – 15000 babies with thalassaemia major born per year in India, hence regular Blood Transfusion is the only Mainstay. Materials and Methods: The study included 96 consecutive patients undergoing primary and repeated blood transfusion at our institutional blood bank. Patient and disease details from patient file and hospital information system. This study is a prospective observational study of all thalassemic patients between October 2023 to December 2023. Results: The median age at the first transfusion was six months (range 4–16 months) and blood group analysis revealed Group O to be the most common amongst our sample (45%). Strong history of consanguineous marriage of parents was found. Conclusion: All centres shall establish standard operating procedures describing the cause, morbidity and transfusion support in Thalassaemic children, developing specific blood management strategy to rationalize blood transfusion and overall successful parenteral counselling and organising awareness programmes***

Keywords: Thalassemia, NAT Blood, Prospective Study, SOP. Audit, Neocytapheresis.

1. Introduction

It is the most common inherited single - gene disorder in the world, by inherited mutations resulting in decreased synthesis of either alpha or beta chains that form the adult haemoglobin.

Leading to anemia, tissue hypoxia, red cell hemolysis.10, 000 – 15000 babies with thalassaemia major born per year in India, hence regular Blood Transfusion is the only Mainstay.

In Transfusion dependent Thalassaemic patients – Multiple Blood Transfusions, Ineffective Erythropoiesis, Increased GIT Iron

Absorption, lead to Iron Overload which leads to Impairment of the Immune system, GIT System, Cardio - vascular System, Nervous System etc.

2. Aims/ Objectives

- The aim of the prospective observational study is to assess the serum ferritin levels in Transfusion dependent thalassaemic patients.
- The study was also done to estimate the present situation of awareness of iron overload in them covering period of 3 months with regular 10 to 12 units of blood supply to thalssaemic patients.

3. Methodology

- **96 blood samples** from clinically diagnosed thalassaemia patients, who were blood transfusion dependent, were collected from Thalassaemic ward for period of **3 months from OCTOBER 2023 TO DECEMBER 2023 (**10 to 12 units of daily supply), Paediatrics Department, RNT Medical College, Udaipur, for their serum ferritin estimation.
- Detailed history (age, sex, history of blood therapy) was taken and serum Ferritin measurement was performed using indirect enzyme linked immune sorbent based serum ferritin assay kit.
- Data were analyzed to determine association between variables including the association between age, sex, and serum ferritin level.

4. Result

- This study included 96 thalassaemic patients who were blood transfusion dependent, with 25 females and 71 males
- The study subjects were classified into three age groups: 3 - 5 years, 6 - 10 years and 11 - 17 years. The mean age was 9.45±4.9 years with a range of 3–17 years
- The median age at the first transfusion was six months (range 4–16 months) and blood group analysis revealed Group O to be the most common amongst our sample (45%)
- Strong history of consanguineous marriage of parents was found.
- 86.4% of the Transfusion dependent thalassaemic patients showed very high ferritin levels (normal - 12 - 250ng/ml).
- The mean serum ferritin levels was found to be 2176 ng/ml. Approx 62.4% patients had serum ferritin between 1000 to 2500 ng/ml, while 24% patients had values above 2500 ng/ml.

- These levels reflect poor knowledge among patients and their attendants, inadequate chelation and vulnerability to develop iron overload related complications

Table 1: Age and sex wise distribution of transfusion dependent Thalassaemic patients

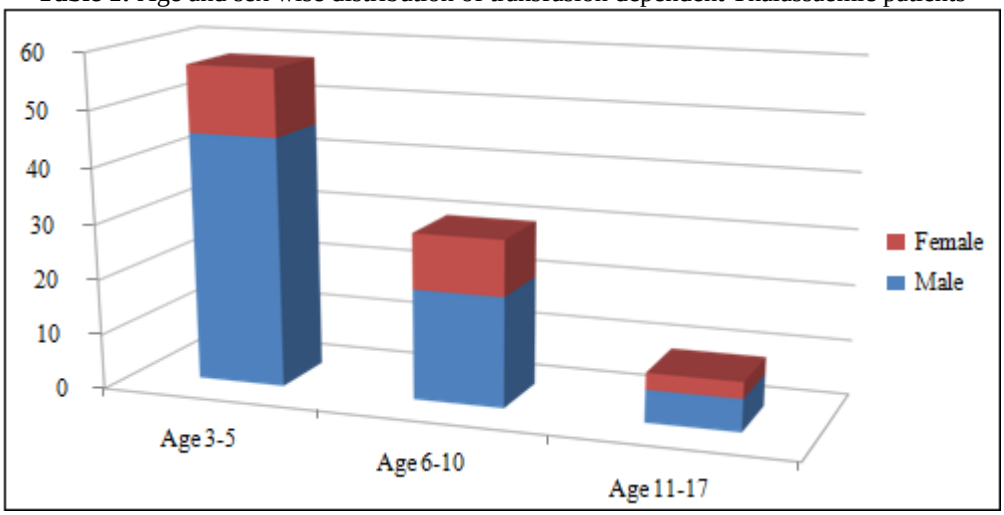

Table 2: Age wise distribution of mean serum ferritin level in beta thalassemia major patients

Age Group (in year)	Serum Ferritin (Mean±SD)	Total patients
03-May	1667 ± 297	57
06-Oct	2675 ±719	30
Nov-17	3744 ± 715	9

Table 3: Correlation between mean serum ferritin level and number of blood transfusions

Number of blood transfusions	Serum ferritin (mean ±SD)	p. value
<150	2109 ± 734	<0.001
>150	3956±925	

5. Discussion

- Thalassemia is one of the commonest hemolytic anemia in India. And erious complications are due to iron overload
- In our observational study we analysed Transfusional hemosiderosis is the major cause of late morbidity and mortality.
- Prevention can be majorly done - by use of iron - chelation therapy (by reducing the concentration of serum ferritin) under supervision of treating physician.
- Serum ferritin is the most commonly used parameter for monitoring iron overload as it correlates with cardiac impairment and survival.
- Parabiopsy, SCQID, and T2 MRI assessment of liver and cardiac iron, in conjunction with functional testing such as echocardiography and measures of endocrine function, dual energy CT for measurement of liver iron has also been performed in some centres for better analysis.
- At our centre we observed people coming from far away areas due to lack of transfusion facility, are facing more morbidity and mortility due to unavailability of blood or if whole blood if present is transfused without proper phenotyping or doing no phenotyping and NAT test resulting in morbidity in later years of childhood.
- Out of the 96 thalassaemic patients, 52 patients belong to age group 3 - 5 years, 24 patients belong to age group 6 - 10 years, and 20 patients belong to age group 11 - 17 yrs. Males 71 (73.9%) were more than females 11 (26%).
- Serum ferritin level was found to be elevated in all the thalassaemic patients ranging from 557 to 5573µg/l with a mean value of 2968µg/l.
- The age of patients at the time of diagnosis ranged from 4 months to 6
- years.
- The interval between successive transfusions varied between one weak to four weeks in different patients.
- This studys significance lies in addressing the critical issue of iron overload in thalassemic patients, contributing to better management strategies and improving patient care in the region.
- The study underscores the prevalence of significant iron overload in transfusion dependent thalassemic patients in Southern Rajasthan, highlighting the urgent need for comprehensive monitoring and management strategies, including regular serum ferritin assessments and iron chelation therapy.

6. Conclusion

- Majority of the patients had very high ferritin levels, with a mean value of 2176 µg/l.
- 62.4% patients had serum ferritin between 1000 to 2500 ng/ml, while 24% patients had values above 2500 ng/ml
- Thus it can be concluded from the present study that serum ferritin concentration which is considered to be a marker for liver iron concentration was found to be increased in all the beta thalassemia major patients.
- Serum ferritin is a easy, cost effective and best indirect test for determination of iron overload.
- What this study adds to existing knowledge?
- Iron chelation therapy should be started when serum ferritin level exceeds 1000µg/L, with proper

monitoring at regular intervals, to avoid the systemic effects of iron overload.

- Regular counselling of patients and their guardians regarding routine ECHOS, MRI (for cardiac iron assessment), monitoring of height and weight, regular assessment of ferritin levels, should be done through discussions, seminars.
- Techniques like Neocytapheresis should be employed by Institution and Government Programmes. All centers should establish standard operating procedures to describe the causes of morbidity and support transfusion in thalassemic children, develop specific blood management strategies, and organize successful parental counselling and awareness programs.

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