STUDY OF IRON PROFILE IN SICKLE CELL PATIENTS

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ABSTRACT

BACKGROUND
Sickle cell disease is inherited as an autosomal recessive disorder that affects red blood cells. People with sickle cell disease contain abnormal haemoglobin, which is haemoglobin S. The aim of this study is to find out whether sickle cell patients are iron overloaded or iron deficient.

MATERIALS AND METHODS
This is a descriptive study. Concentrations of serum iron, total iron binding capacity and ferritin were analysed and compared between transfused and non-transfused sickle cell anaemia and sickle cell trait patients.

RESULTS
Serum iron was significantly more in sickle cell anaemia patients as compared with sickle cell trait patients. Serum ferritin was elevated more in patients who presented with features suggestive of vaso-occlusive crisis than those in steady state. Iron deficiency state was found more in sickle cell anaemia patients as compared to sickle cell trait patients, but iron overload state was also found only in those sickle cell patients who were hypertransfused.

CONCLUSION
Sickle cell disease, though a chronic haemolytic condition, can also present with iron deficiency and iron status of these patients varies according to their diet, number of transfusion received and number of crisis episodes. Therefore, we recommend that patients with sickle cell disease should be screened for iron deficiency by conventional laboratory tests.

KEY WORDS
Iron, Ferritin, Sickle Cell Disease, Total Iron Binding Capacity, Haemoglobin.

attending the Medicine OPD and those admitted in the Medicine wards included in the study. 100 Sickle cell disease patients obtained from estimation of sample size, who fulfilled inclusion and exclusion criteria as mentioned below were studied. Out of total 100 patients included in the study, 55 were Sickle cell anaemia (SS) patients and 45 were Sickle cell trait (AS) patients. History, general physical examination and systemic examination of the selected patients were taken according to the proforma. The study sample comprised of 100 patients, out of which 55 were Sickle cell disease and 45 were Sickle cell trait patients.

Inclusion Criteria: Patients more than 12 years of age, diagnosed cases of Sickle cell anaemia (SS) and Sickle cell trait (AS) patients in steady state or Sickle cell crisis.

Exclusion Criteria: History of surgery in last 3 months, history of blood transfusion in last 3 months, patients with acute or chronic blood loss e.g. bleeding piles, bleeding acid peptic ulcer disease, patient unwilling to take part in above study, pregnant females, patients with hemoglobinopathies other than SCD like Sickle thalassemia disorder. Estimation of Sr. ferritin was carried out on the principle of immunoenzymometric assay (IEMA) by Ferritina Kit. Serum Iron and TIBC was estimated by kit provided by Crest Biosystem.

The Sample Size was calculated from the Formula
\[ N = \frac{Z^2 \times \text{P} \times (1-\text{P})}{d^2} \]

N: Minimum sample size
Z: Confidence interval (1.96)
P: Prevalence rate (6%-7%)
d: Precision or Desired level of significance (0.05)

Thus, the sample size calculated was 100.

Statistical Analysis
All values were reported as mean ± SD. Chi-square test was used to assess the significance of the difference in the values in the sickle cell patients. The differences were considered as statistically significant at a probability value, p < 0.05.

RESULTS
(Table 1) Gender specific distribution of Sickle cell patients in the study, (Table 2) Age specific distribution of Sickle cell patients in the study, (Table 3) Level of serum iron (µg/dL) in Sickle cell patients, (Table 4) Level of serum ferritin (ng/mL) in Sickle cell patients, (Table 5) Level of TIBC (µg/dL) in Sickle cell patients, (Table 6) Level of % transferrin saturation in Sickle cell patients, (Table 7) Distribution of number of patients according to units of blood transfusion, (Table 8) Level of serum iron (µg/dL) in transfused and non-transfused Sickle cell patients, (Table 9) Evaluation of iron status among Transfused and Non-transfused Sickle cell patients in the study.

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Table 1. Gender specific distribution of Sickle Cell patients in the Study

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Table 2. Level of Serum Iron (µg/dL) in Sickle Cell Patients

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Table 3. Level of Serum Ferritin (ng/mL) in Sickle Cell Patients

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Table 4. Level of TIBC (µg/dL) in Sickle Cell Patients

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Table 5. Level of % Transferrin Saturation in Sickle Cell Patients
DISCUSSION

In our study, we found that serum iron was significantly (p<0.05) lower in more number of Sickle cell anaemia patients as compared with Sickle cell trait patients. Iron deficiency state was found more in Sickle cell anaemia patients as compared to Sickle cell trait patients. In our study it was also found that iron overload state was found only in those Sickle cell patients who received multiple blood transfusions. Majority of chronic haemolytic anaemia are iron loaded because of enhanced haemolysis and the same was also thought for sickle cell anaemia patients. Similar opinion was given by Reynold et al.[16] But the studies which are recently coming up show that the patients with sickle cell anaemia may be iron deficient. Patel et al.[10] found that 4 (2.9%) patients of Sickle cell anaemia (SS) and 0 (0%) of Sickle cell trait (AS) patients had decreased serum iron levels. Patra et al found that 35 (58.3%) patients out of 60 Sickle cell anaemia (SS) and 8 (20%) patients out of 40 Sickle cell trait (AS) patients had decreased serum iron levels. In the same study, it was also found that 5 (11.62%) transfused patients and 14 (25%) non-transfused patients had decreased serum iron. Kassim et al.[11] found that serum iron values were more in transfused patients as compared to non-transfused patients. The study done by Ikusemoro et al.[2] showed a positive correlation between serum ferritin and number of units of blood transfused with a linear increase in serum ferritin levels seen in cumulative transfusions. The study conducted by Das PK and Sarangi A et al.[13] also found high serum ferritin levels in 15.4% of Sickle cell anaemia patients, which was well correlated to the number of blood transfusion. The study conducted by Davies et al.[14] found that patients who were hypertransfused (≥ 5 units of blood within 6 months to 2 years) had significantly higher serum ferritin concentration than those who have never been transfused or who had received 4 or less than 4 units of blood transfusion in the past 2 years. Vihtinsky et al.[15] found 6 (16%) non-transfused patients had iron deficiency and none of the transfused patients had iron deficiency. The diet of these individuals is poor in iron content and other essential nutrients, which contribute to the iron deficiency in these individuals.[16][17][18] Other reason which results in decrease in serum iron levels in sickle cell patients are due to urinary iron excretion increased in sickle cell anaemia, interference of absorption of iron by Phytates.[19] Serum ferritin was elevated more in patients who presented with features suggestive of vaso-occlusive crisis than those in steady state. Serum ferritin is an acute phase reactant and varies according to their diet, number of transfusion which contribute to the iron deficiency in these individuals.[16][17][18] Other reason which results in decrease in serum iron levels in sickle cell patients are due to urinary iron excretion increased in sickle cell anaemia, interference of absorption of iron by Phytates.[19] Serum ferritin was elevated more in patients who presented with features suggestive of vaso-occlusive crisis than those in steady state. Serum ferritin is an acute phase reactant and varies according to their diet, number of transfusion which contribute to the iron deficiency in these individuals.[16][17][18] Other reason which results in decrease in serum iron levels in sickle cell patients are due to urinary iron excretion increased in sickle cell anaemia, interference of absorption of iron by Phytates.[19] Serum ferritin was elevated more in patients who presented with features suggestive of vaso-occlusive crisis than those in steady state. Serum ferritin is an acute phase reactant and varies according to their diet, number of transfusion which contribute to the iron deficiency in these individuals.[16][17][18] Other reason which results in decrease in serum iron levels in sickle cell patients are due to urinary iron excretion increased in sickle cell anaemia, interference of absorption of iron by Phytates.[19] Serum ferritin was elevated more in patients who presented with features suggestive of vaso-occlusive crisis than those in steady state. Serum ferritin is an acute phase reactant and varies according to their diet, number of transfusion which contribute to the iron deficiency in these individuals.

REFERENCES
