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Frank Iron Deficiency in Sickle-cell Anaemia: A Case Report

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Summary

Isah HS and Fleming AF. Frank Iron Deficiency in Sickle-cell Anaemia: A Case Report. *Nigerian Journal of Paediatrics* **1985; 12:25.** An account is given of an adolescent Nigerian girl with sickle-cell anaemia and iron deficiency. No intracellular stainable iron was found in the bone marrow and serum iron (SI), total iron binding capacity (TIBC), transferrin saturation (TS), free erythrocyte protoporphyrin (FEP) and serum ferritin (SF) levels were within iron deficient ranges. This report demonstrates that severe iron deficiency can co-exist with sickle-cell anaemia, thus highlighting the importance of investigating iron status in children with this common haemoglobinopathy.

Introduction

IRON deficiency as a complication of sickle-cell anaemia is often thought to be rare, but some such patients have been reported[1-8].

However, it is only in a few of the above studies[2 6 7] that definitive laboratory investigations to demonstrate iron deficiency were employed. Accurate assessment of iron status of children with sickle-cell anaemia is essential because of the dangers of increased total body iron following chronic haemolysis and repeated blood transfusions or non-haematological effects of co-existing iron deficiency[9]. The present report documents the clinical and laboratory features seen in an adolescent girl with frank iron deficiency superimposed on the chronic haemolysis of sickle-cell anaemia.

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Case Report

An adolescent girl, said to be between 12 and 15 years of age, was referred from Jega Rural Health Centre (Gongola State) to the Ahmadu Bello University Hospital, Zaria on June 4, 1981. There was a history of abdominal swelling and jaundice for seven years and of recurrent episodes of epistaxis for five years. The last bout of epistaxis occurred a year prior to referral.

On examination, the patient was pale and ill-looking but afebrile, well hydrated and normotensive. She was stunted in growth and showed no signs of adolescent sexual development. Bilateral cervical lymphadenopathy, clubbing of fingers, koilonychia and jaundice were present. The ear, nose and throat were normal. The liver and spleen were enlarged (13cm and 8cm below the costal margin respectively). The patient was admitted with a provisional diagnosis of sickle-cell disease and impending cardiac failure; treatment was started with analgesics, chloroquine and folic acid supplements.

Laboratory findings on admission were haemoglobin (Hb) 4.4g/dl, packed cell volume (PCV) 0.08, reticulocytes 32.0×10^9/l, platelets 45.0×10^9/l and white cell count (WBC) 4.8×10^9/l; the peripheral blood film showed hypochromic microcytes besides the usual features of sickle-cell anaemia.

Two days later, serum electrolytes, transaminases and alkaline phosphatase were found to be normal, but blood urea was 1.1mmol/l (normal range 2.5-6.5mmol/l), total bilirubin 57 umol/l (normal range 5-17umol/l) and conjugated bilirubin 46 umol/l. Four days after admission, electrophoresis on cellulose acetate (pH 8.6) confirmed the presence of haemoglobins S+F. Hookworm ova were not seen in the faeces and cerebrospinal fluid (CSF) was essentially normal. Histological examination of a cervical lymph node showed reactive hyperplasia.

Iron was not seen in the bone marrow aspirate obtained a week after hospitalization and parameters of iron status were serum iron (SI) 7umol/l (normal range 13–32 umol/l), total iron binding capacity (TIBC) 80 umol/l (normal range 45–75umol/l), transferrin saturation (TS) 9% (normal range 20–48%), free erythrocyte protoporphyrin (FEP) 456.7ug/dl (normal range 20–70ug/dl) and serum ferritin (SF) 18ug/l (normal range, females 20–200ug/l). The patient was placed on frusemide 40mg daily for three weeks and continuous daily proguanil 100mg and folic acid 5mg. Two and half weeks after admission, the prothrombin time was found to be normal compared with the control.

Packed cell volume on three occasions within this period were 0.11, 0.10 and 0.10 respectively and blood transfusion was initiated. Three days after the transfusion of the concentrated red cells from two units (450ml each) of blood, Hb was 11.1g/dl, PCV 0.35, MCHC 35g/dl and WBC 8.9×10^9/l. The patient was then given 10ml of intramuscular *Ferastral* (500mg Fe) daily for three days. One week after blood transfusion and four days after iron therapy, serum electrolytes and transaminases were again found to be normal, but the blood urea was 1.5mmol/l, and alkaline phosphatase 29KAU (normal range for infants and adolescents 6.9–22.1KAU); the bilirubin levels remained elevated. Further haematological findings obtained three weeks after blood transfusion and iron therapy were Hb 6.9g/dl, PCV 0.22, MCHC 31g/dl, reticulocytes 4.4×10^9/l and WBC 6.1×10^9/l. The patient was kept on appropriate dose of analgesics, antimalarials, folic acid supplements, antibiotics as and when indicated, diuretics and fluid balance regimen. She improved clinically and was discharged seven weeks after admission.

Discussion

Iron deficiency is not commonly seen in patients with sickle-cell anaemia in northern Nigeria[10], but the co-existence of severe iron lack in this patient was proven by biochemical parameters of iron status. Intracellular bone marrow iron was absent, SI and TS were low, TIBC and FEP elevated and SF, which correlates significantly with body iron stores[11], was lower than the lower limit of the normal range for females in our environment. Pathological conditions, other than iron deficiency, which could cause low SF concentrations are rare.

Hookworm infestation was not seen in the patient described. It can be postulated that her iron deficiency could have resulted from (*i*) low

intake of bioavailable iron (*ii*) malabsorption as a chronic sequel of infarction in the gastrointestinal tract (*iii*) occult gastrointestinal haemorrhage (*iv*) urinary iron loss[12] or (*v*) any combination of these factors.

Some of the clinical features seen in this patient are associated with iron depletion. Growth retardation is a recognized feature of patients with sickle-cell disease, but Judisch and colleagues[13] have also demonstrated that iron deficient children were significantly underweight at all ages and that iron therapy resulted in appreciable weight gain. Reduced or absent activities of iron-containing tissue enzymes like catalase and cytochrome oxidase[14] are thought to be responsible for angular stomatitis, glossitis and koilonychia associated with iron deficiency. Behavioural disturbances[15] and impaired intellectual capacity[16] have also been described in iron-deficient infants and children from low socio-economic homes. Children with sickle-cell anaemia and frank iron deficiency could thus be doubly disadvantaged because of the chronic anaemia and the adverse non-haematological effects of iron deficiency[9].

Diagnosis of iron deficiency in childhood poses considerable difficulties in the tropics because of coincidental conditions which affect the parameters of iron status. In inflammations, protein-energy malnutrition and folic acid deficiency, iron is immobilized in the reticulo-endothelial system, causing low TIBC, high SF and high bone marrow iron and consequently under-diagnosis of iron deficiency. Conversely, iron deficiency may be over-diagnosed in inflammations which may present with hypochromia, microcytosis and hypoferraemia or when there is haemolysis and erythroid hyperplasia which elevates FEP.

The response to intramuscular iron was poor in this patient, possibly due to co-existing pathological conditions. However, the abnormal biochemical indices of iron status, including the absence of stainable bone marrow iron, show that severe iron depletion may co-exist with sickle-cell anaemia. This report therefore, highlights the significance of evaluating iron status in children with this common haemoglobinopathy.

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