Original article

Anemia in Kassala Area

Eastern Sudan

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Abstract:

Objective

The objective of this study was to determine the types and the ways of diagnosis of anemia at Kassala region, Sudan.

Methods

In this study we examined and investigate 210 patients with anemia.

Full blood cell count including peripheral picture**,** blood film for malaria, urine analysis and stool examination were done for every patient.

Bone marrow aspiration was done for patients with splenomegaly with or without pancytopenia and or presence of immature cells in the peripheral blood. Serum iron and serum ferritin, for confirmation of iron deficiency were measured in some patients.

Results

Out of all patients, 45(21%) had chronic illness, 42(20%) had history of repeated attacks of malaria and 3(18%) patients had nutritional anemia.

Sixty three (30%) patients presented with severe anemia, 32(15%) with mild anemia and 115(55%) with moderate anemia.

Eighty patients presented with enlarge spleen**.** 26 (33%) out of the latter group had features of hypersplenism.

Conclusion

Common causes of anemia in this area were chronic illness, followed by nutritional and repeated malaria infection. Splenomegaly and hypersplenism are common.

We recommended that full blood count, peripheral blood picture and estimation of serum iron and serum ferritin should be performed for every anaemic patient. Blood film for malaria should be done for every anaemic patient and negative films should be repeated by immunochromatography test for *plasmodium falciparum* and *vivax*.

Keywords: Splenomegaly, hypersplenism, immunochromatography, malaria.

Anemia indicates decreased sized of red blood mass associated with a decrease in oxygen caring capacity of the blood[1]. Anemia occurs throughout the world, the prevalence and geographical distribution of which depends on the etiological factors. One of the most important causes of anemia is nutritional deficiency of variety of vitamins and trace elements**.**

Vitamins like B12 and folic acid and trace elements like iron and copper are the important cause of nutritional anemia, beside vitamin A, C and E. Pyridoxine and riboflavin member of vitamin B group are also important[2].

In Africa millions of people were affected by nutritional anemia during the famines and malnutrition, especially children and women[3, 4]. In the Sudan nutritional anemia is common among children with protein calorie malnutrition, especially in rural areas**,** refugees and displaced people[5]. Anemia is also encountered in children with nutritional

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vitamin D deficiency rickets. The possible causes were poor socioeconomic background, inadequate dietary intake and imbalanced diet[5].

Malaria is endemic in Kassala area. Anemia is one of the most prominent complications of malaria infection, especially with *Plasmodium falciparum*, the commonest species in the area[4,6, 7].

Anemia in malaria is due to direct haemolysis of parasitized red cells. Also increase osmotic fragility of infected red cells leads to their sequestration and destruction within the spleen. Attachment of malaria parasite antigen to the non parasitized red cell leads to their haemolysis via a complement-mediated immune response. This explains the positive direct Comb's test found sometimes during malaria infection[8, 9]. Splenomegaly in malaria contributes to anemia either by raised plasma volume, sequestration or as a result of hypersplenism resulting from tropical splenomegaly syndrome[10].

Until recently diagnosis of anemia in this area depends on clinical manifestation and anemia is treated by haematemics. If no response the patient will be transfused. This faulty approach of anemia management must be replaced by proper diagnosis of the cause and then start the appropriate treatment.

Objectives:

The objective of this study was to determine the types and the ways of diagnosis of anemia at Kassala region, Sudan

Patients and methods

In this study we examined and investigate 210 patients with anemia- hemoglobin less than10 gram/100 ml- who were referred to hematology laboratory, from hospitals, health centers and private clinics. An informed consent was taken from each patient after explaining the nature of the study. Children consents were taken from their parents.

Full blood cell count including peripheral picture**,** blood film for malaria, urine analysis and stool examination were done for every patient. Bone marrow aspiration was done for patients with splenomegaly with or without pancytopenia or presence of immature cells in the peripheral blood. Serum iron and serum ferritin for confirmation of iron deficiency were measured in some patients.

Pregnant ladies were excluded.

Study area:

The laboratory receives patients from Kassala Teaching Hospital, Kuwait Paediatric Hospital, Saudi Maternity Hospital, Kassala Military Hospital, Kassala Police Hospital, health centers and private clinics. Some cases were referred from Halfa Elgadida and Khashm El Geriba rural hospitals.

Patient enrolled in the study were interviewed by a pre-tested questionnaire. Patients were examined by physicians or pediatricians, according to age. The clinical examination results were added to the questionnaire.

Sampling procedures:

Five mls of venous blood were taken under aseptic technique. Two and half mls were kept in EDTA and the rest left to clot in a plain container. Thick blood film for malaria was then prepared. Mid stream urine and stool sample were also taken for analysis.

Laboratory procedures:

Complete blood count was performed on each patient's sample. Hemoglobin was estimated by cyanomethaemoglobin colorimetric methods using Drabkin solution[11].

Total and differential white blood cell count was manually done by a trained technician.

The serum separated after centrifugation was examined for serum iron, serum ferritin using TPTZ – colorimetric method from Spin react, SA Ctra – Sanata Colombia Spain for 31 patients.

Thick blood films were prepared, stained by Gimsa stain and examined under oil emersion for malaria by a trained technician. Samples with negative blood film for malaria were tested by immunochromatography technique (ICT) for the qualitative detection of antibodies specific to *plasmodium falciparum* and *plasmodium vivax*. (From Standard Diagnostics INC, Korea)[12].

Urine and stools were also examined for possible causes of anemia by a trained

technician. Patients with enlarged spleen and or with peripheral pancytopenia and or presence of immature cells in the peripheral blood were advised to proceed for bone marrow aspiration. This was done through the posterior, superior iliac spine. The aspirate was processed in a microscopic slide, fixed with methanol**,** stained by Gimsa stain and examined by hematologist, and another film was stained for iron (Perl's reaction)[11].

Patients were grouped into three groups; children below 5 years, children between 5 and 16 years, and adult patients (more than 16 years old).

Severe anemia was take at Hb level < 5 gram /dl, moderate anemia at 5-7 gram /dl and mild anemia at Hb concentration >7 gram /dl.

Results

We examined and investigated 210 patients. 113 (53.8%) of them were adults, 55(26.2%) were children between 5- 16 years old, and 42 (20%) children younger than 5 years.

Anemia of chronic illness, constituted the commonest cause of anemia in our study i.e. 45 (21 %) of patients. Most of them were adults (table 1).

Nutritional anemia was found in 17 % of our patients and most of them were less than 5 years old (table 1).

Repeated malaria infection was reported in 20 % of our patients.

26 patients presented with clinical evidence of hypersplenism associated with severe anemia. Most of them were adults. Malignancy also participates as a cause of anemia in 10 % of patients (table 1).

Table 1: Age distribution of causes of anemia

Age Group	IDA	Nutritional	Malaria	Chronic illness	Hereditary Anemia	Hyper-splenism	Malignancy	Total
>16 year	19	2	22	35	4	23	8	113
5-16 year	6	14	13	6	5	2	9	55
<5 year	6	21	7	4	-	1	3	42
Total	31	37	42	45	9	26	20	210
%	14%	17 %	20 %	21 %	4 %	14 %	10 %	100%

Most of our patients were from Beni Amir tribe (33%) mainly adults (table 2), followed by those from north Sudan and west Sudan (17.1% and12.9% respectively). Hadandawa and Rashaida tribes constituted 12% and11% respectively (see table 2). The degrees of anemia were show in table 3

Eighty patients presented with splenomegally. Twenty six (33 %) showed features of hypersplenism, however, most of them were in the adult group (Table 4).

Discussion

The causes of anemia in Kassala region Eastern Sudan as in other tropical areas are usually multifactorial. We found the predominant anemia in children below 5 years to be nutritional. This is consistent with another study in the tropical area[4]. We also found that 17% of these children had history of repeated malaria infection. Six of these children showed features of iron deficiency anemia, which accompanies malnutrition. The cause of anemia in three cases of this group was acute leukemia. This indicates that malignancy as a cause of anemia should be looked for.

Chronic diseases like tuberculosis also participate in causation of anemia in this age group as four children had tuberculosis. The common cause of anemia among children between 5 and 16 years was also nutrition but in this age group we found more previous

attacks of malaria. These findings are the same as in other studies in malaria endemic areas[13]

Hereditary anemias such as haemoglobinopathies also participated as causes of anemia in this age group. The anemia in nine per cent of our patients in this age group were due to hereditary causes such as sickle cell anemia, same as in other areas with prevalence of haemoglobinopathies[14]

In adults the predominant anemia is due to chronic illness such as tuberculosis which is expected in areas endemic with tuberculosis[15]

Table (2) Tribal distribution

Tribe	> 16 year	5 – 16 year	< 5 year	Total & %
Beni Amir	44	18	7	69 (33 %)
Hadandawa	11	7	7	25 (12 %)
Rashiada	11	7	5	23 (11 %)
Halanga	2	-	5	7 (3.33 %)
North-Sudan	19	11	6	36 (17 %)
West-Sudan	12	7	8	27 (12.9 %)
Shukriea	8	5	2	15 (7.14 %)
0thers	6	-	2	8 (3.08 %)

Table (3) Degree of anemia

Age groups	Severe anemia (< 5 gram /dl)	Moderate anemia (5 g – 7 g / dl)	Mild anemia (> 7 g / dl)
> 16 year	33	66	13
5 – 16 year	7	40	8
< 5 year	23	8	11
Total	63 (30 %)	115 (55 %)	32 (15 %)

Table (4) Anemia and Splenomegaly

Age groups	Splenomegaly	Hypersplenism
> 16 year	62	23
5 - 16 year	13	2
< 5 year	5	1
Total	80	26

More than half of the adults have splenomegaly. This is in keeping with the fact that splenomegaly and hypersplenism are important cause of anemia[16]. The common causes of splenomegaly in this area are repeated malaria infection and tuberculosis, though other causes may occur. These chronic diseases by themselves may be the cause of anemia[15]. Enlarged spleen may aggravate anemia by sequestration, dilution and destruction. In younger age group (5 to 16 years) only 13 patients with enlarged spleen and two (15%) showed features of hypersplenism.

Malignancy can also be a cause of anemia as well as enlarged spleen. In our study five cases had hematological malignancy, four of them with chronic myeloid leukemia and one with acute lymphocytic leukemia

Most of the children below 5 years presented with severe anemia. In our study 55 % of this group presented with hemoglobin less than 5 gram / 100 ml. This may be due to multiple factors acting mainly malnutrition, repeated chest infection and malaria.

Most of the older children presented with anemia with hemoglobin of 5-7g/100 ml.

Conclusion:

We concluded that nutritional anemia is common in this area, especially among young children, aggravated by repeated malaria infection.

Anemia of chronic illness is also common in this area, mainly due to tuberculosis. Enlarged spleen is common among anemic patient in this area and many of them show the features of hypersplenism.

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