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Pattern of Erythropoietin and Haematological parameters in Infancy and Childhood iron deficiency Anaemia in Lokoja, Nigeria.

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Abstract

Studies on erythropoietin and some haematological parameters in children who were referred to the Primary Health Care Centre, Lokoja, Nigeria for the first time within 1 month were conducted. Exclusion criteria were iron therapy before and during the study period, a history of chronic illness or failure by parents to give consent. Acute-phase reactants such as erythrocyte sedimentation rate and C-reactive protein levels were measured in all cases indicative of infectious diseases. Hospital charts were further evaluated and patients with any current illness known to interact with iron status of the patients were discarded. After informed consent and pre-test counselling, blood sample was obtained in each case by venipuncture. Serum erythropoietin estimation was carried out using Abcam's human erythropoietin in vitro SimpleStep Enzyme-Linked Immunosorbent Assay. All other haematological tests were done by standard methods. Children with childhood anaemia had erythropoietin (10.85 ± 2.63) and reticulocyte count (0.84 ± 0.27) levels lower than the controls though the differences in the results were statically insignificant. In the same vein, the children with anaemia had lower levels of PCV (28.99 ± 2.26), RBC Count (3.74 ± 0.32), Serum iron (29.52 ± 3.83) and Ferritin (33.92 ± 5.34) than controls and the differences in results being statistically significant, $p < 0.05$. However, the anaemic children also had TIBC values (474.48 ± 1.62) higher than controls, but were statistically insignificant. Close monitoring and treatment of iron deficiency is advised especially in early childhood in Lokoja, Nigeria.

Keywords: pattern of erythropoietin, childhood, haematological, iron deficiency, anaemia

Introduction

Iron deficiency is the most frequently encountered nutritional deficiency and ranks first among the etiologic factors of childhood anaemia (1,2). The frequency of iron deficiency is still considerable in infancy, school age and adolescence in developing countries (3,4). It is associated with deleterious effects such as growth and development retardation, gastrointestinal alterations, impaired immune responses, reduced cognitive functions, behavioral changes and intolerance to exercise (5,6,7). Iron deficiency anaemia manifests with symptoms such as pale skin, lips, hands or under eyelids, increased heart rate, breathlessness etc (8). Erythropoietin (EPO) is a glycoprotein hormone, naturally produced by the peritubular cells of the kidney that stimulates red blood cell production (9). The lower the pO_2 , the greater the production of EPO. EPO is a cytokine for red blood cell precursors in the bone marrow (10).

In this study, we aimed to determine the erythropoietin levels and red blood cell parameters and frequency of iron deficiency which were hitherto unrecognized in ill children between the ages of 2 years and 13 years at the Primary Health Care Centre, Lokoja, Kogi State, Nigeria.

Materials and Methods

Children between 2 years and 13 years of age who were referred to the Primary Health Care Centre Lokoja, Nigeria for the first time during 1 month were enrolled in the study prospectively and consecutively.

Informed consent was obtained from the parents and the Ethics Committee of the Local Government Council who also approved the study protocol. Exclusion criteria were iron deficiency

treatment before or during the study period and any history of chronic illness. Acute phase reactants such as Erythrocyte Sedimentation Rate and C- reactive protein levels were measured in all cases suggestive of infectious disease.

Blood samples were obtained from the patients and the age-and-sex matched controls by venipuncture and the hospital charts evaluated and the samples of patients with any illness known to interact with iron status were discarded. Erythropoietin levels were estimated by an ELISA method based on standard procedure (11). All other laboratory tests, PVC, RBC Count, Retics Count, TIBC, and Ferritin were done by standard methods (12).

For statistical evaluations, X^2 and Student's t-test were performed on the data using a software (SPSS 23.0). $P < 0.05$ was inferred to be statically significant.

Results

Two hundred and seventy-six children were evaluated (Table 1). These were 141 males (51%) and 135 females (49%). Significant differences in mean age were not detected in the patients with Iron Deficiency Anaemia (IDA). The distribution of the patient population according to age (years) was as follows: 0-2, 39.13%, 3-5, 18.84%, 6-8, 16.67%, 9-11, 17.75%, 12-14, 7.61%. The patients showed laboratory evidence of IDA with the results of tests such as PCV, RBC count, Serum Iron and Ferritin, being much lower than the results of the controls, and the differences in results between the groups being statistically significant, $p < 0.05$ (Table 2).

The blood pictures of the patients with IDA were microcytic and hypochromic.

Table 1: Age and gender distribution of the subjects studied.

Age Group (Yrs)	GENDER			
	TEST		CONTROL	
	M	F	M	F
	141	135	185	91
	276		276	
0 – 2	108 (39.13%)		93 (33.69%)	
3 – 5	52 (18.84%)		60 (21.74%)	
6 – 8	46 (16.67%)		68 (24.65%)	
9 – 11	49 (17.75%)		41 (14.85%)	
12 – 14	21 (7.61%)		14 (5.07%)	
Total	276*		276*	

* Considering the normal lower limits for haemoglobin and PCV levels in children, the males and females were merged (13)

Table 2: Erythropoietin and haematological results of the patients and control subject.

Parameter	Anaemic (n = 276)	Control (n = 276)	P value
RBC Count (X10 ¹² /L)	3.74 ± 0.32	4.23 ± 0.24	0.001*
PCV (%)	28.99 ± 2.26	33.63 ± 1.89	0.001*
Retics Count (%)	0.84 ± 0.27	0.88 ± 0.51	0.742
Serum Iron (ug/dl)	29.52 ± 3.83	40.27 ± 3.09	0.03*
TIBC (ug/dl)	474.48 ± 16.02	43.12 ± 2.5	0.11
Ferritin (ng/ml)	33.92 ± 5.34	71.75 ± 14.84	0.04*
EPO (miU/ml)	10.85 ± 2.63	13.46 ± 2.75	0.52
MCV (fl)	77.61 ± 3.85	78.85 ± 8.81	0.257
Blood Picture	Microcytic Hypochromic	Normocytic	

Discussion

Data on the prevalence of IDA in various populations are valuable because they contribute to the evaluation of this common and significant health problem in national and global perspectives.

In the study, there is significant lowering of the values of PCV, RBC Count, Serum Iron, and Serum Ferritin (a measure of transferrin) in the patients studied in Lokoja, Nigeria. The patient's blood picture showed hypochromia and microcytosis, all confirming the presence of iron deficiency anaemia. These results are in

agreement with previous reports elsewhere (14, 15, 16).

In agreement with our study, previous studies showed a high rate of IDA in Turkey (17, 18). Negatively variable iron levels during childhood have unfavorable effects on growth and development. Therefore, during early childhood, close monitoring of the iron status of children is important to be able to initiate early treatment if necessary.

In developing countries, IDA remains common and is still frequently observed in infancy, school age and adolescence. It is associated with deleterious effects such as growth and developmental retardation, gastrointestinal alterations, impaired immune responses, reduced cognitive functions, behavioral changes and intolerance to exercise (19). It is also necessary to investigate the presence of parasitosis and occult blood in faeces of ill children.

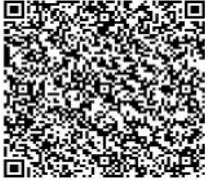
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