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PREVALENCE OF ANAEMIA AMONG CHILDREN ATTENDING A TERTIARY HEALTH FACILITY IN NORTHEASTERN NIGERIA

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SUMMARY

Anaemia is a public health problem, particularly in Maiduguri and its environ. 120 children referred to the Haematology Department, University of Maiduguri Teaching Hospital for routine investigations were enrolled randomly and prospectively into the study. Subjects from ages 0-14years comprising of 73 males and 47 females were investigated. Using standard methods, Haemoglobin concentration (Hb), packed cell volume (PCV), total red blood cell count (RBC), peripheral films for red cell morphology and red cell indices were carried out. Anaemia was defined according to the WHO cut-off value of Hb <11.0 g/dl. Of the 120 subjects studied, 68 were anaemic, a prevalence of 56.7% out of which, 41 (60.3%) were males while only 27 (39.7%) were females. Of the 68 anaemic subjects, 50(73.5%) were of the pre-school age group. The majority of these subjects, 83.8%, were mildly anaemic, 11.8% were moderately anaemic while only 4.4% had severe anaemia. Out of the 68 anaemic children, 19 (27.9%) showed pure features of iron deficiency anaemia, 34 (50%) showed features suggestive of haemolytic anaemia (probably malaria-induced anaemia), while only 2 (2.9%) had pure features of megaloblastic anaemia. Thirteen (19.1%) had dimorphic blood picture. The contribution of iron deficiency to childhood anaemia is therefore underscored.

INTRODUCTION

Anaemia is one of the most far-reaching pandemics that affect mostly developing countries. For example, about 3.5 billion people are affected by anaemia in developing countries.[1]

Childhood anaemia poses a major public health concern because it leads to an increased risk of child mortality as well as the negative effects of iron deficiency anaemia on cognitive and physical development of the child. [2] Anaemia is now recognized as an important cause of morbidity and mortality in African children admitted to hospitals.[3]

The World Health Organization has suggested a level of haemoglobin below which anaemia is said to be present. These levels are <11g/dl in children aged 6-59 months; <11.5g/dl in children aged 5-11 years and <12g/dl in older children, aged 12-14.[4]

Therefore, mild anemia was defined as haemoglobin concentration <11.0 g/dl, moderate anemia as <7.0 g/dl and severe anaemia as a haemoglobin concentration of <5g/dl or packed cell volume of <0.15.[5,6]

The etiology of childhood anaemia is multi-factorial. However, the most common cause of

childhood anaemia all over the world is iron deficiency, [7, 8] although, a smaller portion is due to deficiencies of other micronutrients such as folate, Vit. A and B_{12}. [9] For example, recent data from Côte d' Ivoire demonstrated that 40-50% of children and adult women were anaemic and iron deficiency anaemia accounted for about 50% of the anaemia in school children and women, while 80% in preschool children, aged 2-5 years old. [10] It has also been documented that in developing countries, infectious diseases such as malaria, helminth infection, HIV and tuberculosis cause anaemia in children. [11, 12] For instance, *Plasmodium falciparum* malaria-related anaemia contributes significantly to maternal and childhood mortality. Helminth, hookworm infection and schistosomiasis in particular cause blood loss and thus contribute to the etiology of anaemia.[13]

In 2003, the United Nations' General Assembly set a goal at its special session on children, to reduce the prevalence of anaemia by one-third by 2010. [7] Although, estimates of the prevalence of anaemia vary widely, accurate data are often lacking, [7] particularly in the local community.

In Northeastern Nigeria, there is virtually little or no work done to obtain an accurate data on the prevalence of childhood anaemia. Therefore, the knowledge of prevalence rates provides information on the degree of anaemia that will enhance the management of childhood anaemia, thus contributing to the actualization of the Millennium Development Goals (MDGs) on child health.

SUBJECTS AND METHODS

The subjects for this study comprised of 120 patients who were referred to the haematology laboratory for routine investigations from paediatric wards and clinics of University of Maiduguri Teaching Hospital (UMTH), Nigeria. UMTH is a tertiary health care centre located in Borno State, Nigeria and serves as a reference centre for the six States of Northeastern Nigeria as well as neighbouring African Countries (Chad, Niger and Cameroon). These patients were recruited from December, 2010 to February, 2011. Samples were collected randomly and processed accordingly.

Ethical approval was sought and obtained from the Hospital's Ethics and Research Committee. Some demographic characteristics such as age and gender were extracted from the patients' laboratory request form. Two milliliters (2ml) of venous blood was collected aseptically by venepunture using a disposable syringe and needle, into ethylene diamine tetracetic acid (EDTA) at a concentration of 1.5mg/ml of blood. The sample collected was thoroughly mixed with the anticoagulant (EDTA) by repeated gentle inversion of the container and used for the estimation of Packed Cell Volume (PCV), Haemoglobin Concentration (Hb), Red Blood Cell Count (RBC) and red blood cell morphology.

PCV was determined by microhaematocrit method using glass capillary tube of specified length bore size and wall thickness two-third filled with whole blood, sealed at one end and centrifuged at a constant speed of 12,000g for 5 minutes using a microhaematocrit centrifuge. The proportion of red cells to the whole column (packed cell volume) was measured using a Hewkley Microhaematocrit Reader. Haemoglobin concentration was determined by the cyanmethaemoglobin method as described by Barbara and Bates[14] and as recommended by the International Committee for Standardization in Haematology (ICSH) [15] and WHO.[4] Haemoglobin standard graph and conversion table were prepared by a method modified from the method described by Lewis *et al.* [16] The optical density of mixture sample and diluents (Drabkin's solution) after at least 10 minutes for complete conversion was read using 6100 Spectrophotometer, JENWAY at a wavelength of 540nm and converted to Hb using the standard (calibration) table prepared

earlier. Also, total red cell count (RBC) was counted by making a 1 in 200 dilution of well mixed whole blood with an isotonic diluted (Formal Citrate) to avoid lysis of the red cells. The red cells were counted microscopically using an improved Neubauer ruled counting chamber (haemocytometre) and the number of RBCs per litre of blood calculated. Absolute values (Red cell indices) such as the mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC), were calculated from the results of the accurate red cell count, haemoglobin concentration and PCV, by standard methods as reported by Baker *et al.* [17] for classification of anaemia and a drop of well mixed whole blood was spread on a clean grease free glass slide, stained with a Romanowsky stain (Leishman's stain) and examined under the microscope with the oil immersion objective as described by Cheesbrough[18] were used for morphological classification of anaemia. Data were entered and analysis was done using SPSS version 15.0

RESULTS

Of the one hundred and twenty (120) paediatric patients studied, 68 (56.7%) were anaemic using the WHO cut-off value of haemoglobin concentration of less than 11.0g/dl.

Table 1 shows some demographic characteristics of anaemic paediatric patients. 50 (73.5%) preschool-age children were anaemic against 18 (26.5%) of the school-age children in the study. It also reveals that 41 (60.3%) of male paediatric patients studied were anaemic while 27 (39.7%) of the female patients were anaemic. The ratio of anaemic males to females in this study is 1.5:1.

Table 2 illustrates the distribution of paediatric patient with anaemia according to severity. The majority of the patients, 83.8% were mildly anaemic, 11.8% were moderately anaemic while 4.4% were severely anaemic.

It is revealed in Table 3 that according to morphological classification based on Red Cell Indices, of the 68 anaemic paediatric patients, 21 (30.9%) had normocytic-normochromic anaemia, 23 (33.8%) had microcytic normochromic anaemia, 2 (2.9%) had macrocytic normochromic anaemia, 18 (26.5%) had microcytic hypochromic anaemia while 4 (5.9%) had macrocytic hypochromic anaemia. Whereas in Table 4, 34 (50.0%) showed features of normocytic normochromic anaemia, 2 (2.9%) showed features of macrocytic normochromic anaemia, 19 (27.9%) showed features of microcytic hypochromic anaemia, while 13 (19.1%) showed dimorphic blood picture.

DISCUSSION

In this study, the prevalence of anaemia among paediatric patients attending UMTH, Maiduguri is 56.7%. This falls within the WHO definition of =40% for classifying a country into the level of severe public health significance.[4]

Of the 120 patients in this study, 73 were of the preschool age. Fifty out of seventy-three preschool age children were anaemic resulting to 68.5%. This is similar to report from another part of the sub-Saharan region of Africa[19] and from South-Western Nigeria.[20]

Although most of the studies on the severity of anaemia were carried out among the pre-school age group, the prevalence of severe anaemia in this study is 2.5%. This is lower than those reported in other centers in Nigeria, [21-23] but compares favourably with the report of Jiya *et al*, who noted a prevalence of 2.7%.[24]

A nationwide survey involving 12 States in Nigeria in 2001 only assessed the children population for iron deficiency of which 22.3% of the children under five years of age were found to be iron deficient.[25] Similar prevalence rates of 19.8 and 32.4% have also been reported in Western Kenya and Kazakhstan, respectively. [26, 27] In this study, microcytic hypochromic morphology was considered consistent with iron deficiency, and both the red cell indices as well as peripheral blood film

shows prevalence of 26.5% and 27.9% respectively. This signifies that iron deficiency is not only a public health problem but a common feature of developing countries.

Malaria has been reported as one of the major causes of childhood anaemia in the tropics.[28] Prevalence as high as 61.2% and 51.5% have been documented in Azare and Abakaliki respectively.[21, 23] Malaria has also been associated with haemolytic anaemia.[29-31] Evidences have supported the nature of the normocytic normochromic anaemia with haemolytic evidence of malarial anaemia.[32] In this study normocytic normochromic anaemia accounted for 30.9% and 50.0% from red cell indices and peripheral blood film respectively. This again, is in consonance with the established fact that malaria is one of the major causes of childhood anaemia.

In conclusion, childhood anaemia still remains a major public health problem. This underscores the morbidity burden in Nigerian children especially those of the preschool age. Malaria and iron deficiency are major contributing factors. A greater percentage of patients had mild anaemia because they presented with asymptomatic anaemia. The high prevalence may not be unconnected with socio-economic status of patients and the endemicity of Malaria infection in this part of the world.

It is therefore recommended that asymptomatic anaemia should be given attention in all tiers of health care delivery in Nigeria even when anaemia is not the presenting complaints. Also, more intensive and sustained efforts should be made in the prevention and treatment of malaria infection in our community; there is the need to provide iron supplements to preschool and school age children as this will reduce the negative effects of iron deficiency anaemia on cognitive and physical development of the child.

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Table 1. Some Demographic Characteristics of the Anaemic Paediatric Patients Studied

Characteristics	Total No of pts.	No anaemic (%)
Age		
< 6 months	23	9 (39.1)
6months – 4.99 yrs	50	41 (82.0)
5.00 yrs – 11.99 yrs	39	15 (38.5)
12.00 yrs – 14.00 yrs	8	3 (37.5)
Total	**120**	**68 (56.7)**
Gender		
Male	73	41 (56.2)
Female	47	27 (57.4)
Total	**120**	**68 (56.7)**

Table 2. Distribution of Anaemic Paediatric Patients According to Severity

Severity	Hb Conc. (g/dl)	Frequency (%)	% of all patients
Mild	7.1 – 11.0	57 (83.8)	47.5
Moderate	5.1 – 7.0	8 (11.8)	6.7
Severe	≤ 5.0	3 (4.4)	2.5
Total		**68 (100)**	**56.7**

Table 3. **Distribution of Anaemic Paediatric Patients According to Morphological Classification Based on Red Cell Indices**

Morphological Classification	No of pts. (%)	% of all patients
Normocytic-normochromic	21 (30.9)	17.5
Microcytic-normochromic	23 (33.8)	19.2
Macrocytic-normochromic	2 (2.9)	1.7
Microcytic-hypochromic	18 (26.5)	15.0
Macrocytic-hypochromic	4 (5.9)	3.3
Total	**68 (100)**	**56.7**

Table 4. **Distribution of Anaemic Paediatric Patients According to Morphological Classification Based on Blood Film Appearance**

Morphological Classification	No of pts. (%)	% of all patients
Normocytic-normochromic	34 (50.0)	28.3
Macrocytic-normochromic	2 (2.9)	1.7
Microcytic-hypochromic	19 (27.9)	15.8
Dimorphic blood picture	13 (19.1)	10.8
Total	**68 (100)**	**56.7**