

Prevalence of anaemia in pre -school and school aged children in Nigeria

Osazuwa F, *Ehigie F[^]

¹ Department of Medical microbiology, University of Benin Teaching Hospital, Benin City .Nigeria

² Department of Nutritional biochemistry, Ladoké Akintola University of Technology, Ogbomosho.

Corresponding author: Osazuwa favour: E mail- osazuwafavour@yahoo.com.

ABSTRACT: Anaemia continues to be a major public health problem worldwide .the most common cause of anemia is a deficiency of iron; but it may also be caused by deficiencies of folate, vitamin B₁₂ and protein. Some anaemia is not caused by nutritional factors, but by congenital factors and parasitic diseases such as malaria. This study attempted to estimate the prevalence of anemia among children in three rural communities of Ovia North East Local government area. A total of 316 children between the ages of 1 and 15 years were included in the study. The World Health Organization (WHO) age-adjusted cut-off for hemoglobin was used to classify anemia. 38.6 of the children were anemic, having hemoglobin levels lower than the 11g/dl. Malnutrition was patent; 37.0% of the children were stunted, 19.3% wasted and 44.0% underweight. Serum ferritin was more sensitive than haemoglobin concentration in detecting anemic children. Anaemia was also significantly higher in Evbuomere village school than in Ekosodin and Isiohor villages ($P<0.001$). The serum ferritin levels were more sensitive than haemoglobin in detecting anemic children. The anaemia detected in this population may be due more to under-nutrition.

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INTRODUCTION

Anaemia continues to be a major public health problem worldwide. According to estimates of the world Health Organization, 2 billion people suffer from anaemia in the world (WHO, 2001) .The highest prevalence of anaemia exists in the developing world where its causes are multifactorial ranging from micronutrient deficiencies such as iron, folate, vitamin B₁₂ and infectious diseases such as malaria and worm infections (Yip and Ramakrishnan, 2002). Iron deficiency anaemia is thought to affect the health of more than one billion people worldwide and it is the most common form of anaemia in the developing world (Latham, 1997).

Iron deficiency anaemia accounts for most of the anaemia that occurs, most seriously affected are young children and women in less developed countries (Calis *et al.*, 2008). Iron requirement varies from one stage in life to the other. It is very high in pre-term babies, low birth weight infants, adolescents, and in pregnancy, when it might be necessary to give an extra supply of iron (Dallam,

1991).Recent research indicates that iron deficiency has very important implications which include poorer learning ability and behavioral abnormalities in children, lower ability to work hard, poor appetite and growth (Latham, 1997).

The aim of this study was to estimate the prevalence of anemia in three rural villages in Ovia Local Government area of Edo State, Nigeria.

Patients and methods

The study was carried out in Isiohor, Evbuomere and Ekosodin villages located in Ovia Local Government area of Edo State, Nigeria. The villages are good representations of the area because they are well homogenized. There was not much difference in their style of living, culture and occupations practiced.

Both male and female children aged 1-155 years in schools were the study population. Prior to the commencement of the study, permission was obtained from

the Local education authority Ovia Local Government Areas and from the elders of the community.

Personal hygiene and environmental sanitation information were obtained from the children; this was done directly through the teachers or health centre nurses who were familiar with the local conditions. Information on Age, sex and nutritional level were obtained with an administered questionnaire.

The blood samples were collected by ante-cubital venipuncture, by qualified personnel from the Ekosodin Health Centre, into sample tubes containing anti-coagulant (citric acetate) and stored on ice for transport to the laboratory later in the day. The weight, height and mid upper arm circumference (MUAC) measurements were taken following standard procedures and necessary precautions. Laboratory analysis of the samples was done at the hematology laboratory of the department of Hematology University of Benin teaching, Hospital Benin City Nigeria.

Haemoglobin concentration was measured using Sysmex kx-21N haemoglobin auto analyzer instrument (Hedwin, 2008). Anaemia was defined as $Hb < 10g/dl$ (Anumudu *et al.*, 2007).

An enzyme immunoassay kit for the determination of ferritin in serum (BIOTEC laboratories Ltd, UK) was used to test 122 samples from the three villages. The assay was based on the principle of a sandwich formed by the serum ferritin, which is detected between two specific monoclonal antibodies directed against two different epitopes on the serum ferritin molecule. The capturing monoclonal antibody was conjugated to biotin, while the second monoclonal antibody was labeled with horseradish peroxidase. The plates had been pre-coated with streptavidin. 20ul of serum and ferritin standards (containing different concentrations of human liver ferritin: 0, 5, 20, 100, 400, 1000ng/ml in human protein buffer with gentamycin) were added to all but the blank wells in row A. 100ul of a preparation containing the two monoclonal antibodies to ferritin were also added and the whole incubated at room temperature for 1 hour. Afterwards, plates were washed 5 × with PBS/Tween 20. The chromogen, tetramethylbenzidine (TMB) was mixed in equal volume with the substrate solution containing stabilized hydrogen peroxide, and 200ul was dispensed into the wells. After incubation at room temperature (29°C) for 10min in the dark, 100ul of IN hydrochloric acid was added to stop the color

reaction. Plates were read at an absorbance of 405nm. Absorbance values were converted to their concentration by reading off the ferritin standard (dose response) curve./

STATISTICAL ANALYSIS

A correlation analysis to determine the relationship between anemia and wasting stunting and underweight, were carried out using the SPSS software. Each of the dependent variables Hb and MUAC was regressed on the dummy variables of normal, mild- moderate and severe malnutrition as arrived at using the categories of weight for height (W/H), height for age (H/A) and weight for age (W/A). The models allowed us to know if there was any significant difference between the Hb and MUAC of normal and malnourished children. Two dummy variables were introduced into the regression model to avoid perfect co- linearity of regressors. The category of normal nutritional status was used as the base dummy, in order to allow the directly estimated coefficients of the dummy variables in the model to be estimated as the deviation in the level of the dependent variable of the normal from that of the category in question.

RESULTS

A total of 316 school children were enrolled in the study; 140 from Isiohor, 32 from Evbuomere and 144 from Ekosodin. 162 (51.26%) were males and 154 (48.73%) were females (table 1). The mean age of the children is 5.67 years .The overall prevalence of anaemia in the three communities is 38.6%, 75.0%, 42.3% and 26.8% for Evbuomere, Isiohor, and Ekosodin respectively ($P < 0.001$) (table 2).

Subjects were used to determine the nutritional status based on underweight and stunting i.e. W/Age and H/A respectively Table 3. 36% of the children were stunted, 18.3% wasted and 44.2% underweight. Underweight was the most prevalent form of malnutrition, while the most severe form was stunting. There was a significant positive correlation between stunting and Underweight ($P < 0.001$). Regression analysis showed that mid-upper arm circumference (MUAC) differed significantly between children with a normal nutritional status and those severely malnourished ($P = 0.01$).

The hemoglobin values were significantly different between normal and mild to moderate malnourished children.

The serum ferritin levels were more sensitive than haemoglobin in detecting anemic children. About 9.8% (12/122) had serum ferritin values near normal i.e., less than 10ug/ml. Serum ferritin concentration was significantly lower among children in the Evbuomore (110ng/ml) than among children in Isiohor and Ekosodin (175ng/ml) ($P < 0.001$). There was no significant difference in serum ferritin values in age group 1-5 (150ng/ml, 6-10(153) and 11-15 (115ng/ml), all age groups were anemic.

Table 1: Characteristics of the studied population

Parameters	No. Examined
Sex	
Male	162
Female	154
Total	316
Age	
1-5	72
6-10	165
11-15	79
Total	316

Table 2: Prevalence of anaemia in the three communities.

Community	Anaemic(Hb<10g/dl)	Non-Anaemic (Hb>10g/dl)
	No. (%)	No. (%)
Isiohor	60(42.3)	82(57.7)
Evbuomore	24(75.0)	8(25.0)
Ekosodin	38(26.8)	104(73.2)

Table 3: Types and degree of malnutrition

Type of malnutrition	Number.
Stunting	117(37.0)
Wasting	61(19.3)
Underweight	139(44.0)

DISCUSSION

Anaemia is very common in developing countries and a multi-country survey in sub-Saharan Africa showed that it is generally a serious problem in school children (Anumudu et al., 2007). This study recorded a prevalence of 38.6% for anaemia which confirms that anaemia in school children is a worrying public health problem in Edo State. It has been reported that preschool children (<8years) and adolescents (>15 years) during growth spurts have the greatest physiological demands for iron and are at highest risk of iron deficiency anaemia (Crowley, 2004). The mean age of children in this study is 5.67 years, which is the age range that is at the highest risk of anaemia as reported by Calis et al (2008). When compared to the two other communities studied, Evbuomore had a higher prevalence of anaemia. The mean age of children in this community is 2.75 years, and this may explain the reduced haemoglobin concentration in these children most of whom are in their period of rapid growth spurts. This high rate may be indicative of the fact that the diet of the preschoolers is not adequate for their iron needs. Interviews carried out during these studies, with the children, and observations by the community health workers revealed that the staple food of this area is garri. Farming is the major occupation and only crops that are likely to yield some income are planted. The level of income of family breadwinners is also low, judging by their houses and the yield from their farms. Their financial access to meat and other good animal sources of iron is therefore very limited. Efforts by the public health workers in the health centre in Evbuomore to encourage the mothers to have home vegetable gardens have not met with much success. These reasons could account for the very high prevalence of anemia observed in the study area.

The commonest form of malnutrition in the children studied was underweight (44.0%) followed by stunting (37.0%) and wasting (19.3%).

The prevalence of stunting in this study (36%) was similar to that estimated in the 4th World Nutrition Situation Report for the West African sub-region (34.9%). The estimated prevalence of underweight in this study is higher than the current rate for West Africa (36.5%) (UN/ACC/SCN, 2000). Even though underweight affects fewer children globally than stunting (UN/ACC/SCN, 2000), west Africa has seen an increase of 0.32% per year in recent years. Wasting is not as common as stunting and underweight in any region of the world and a similar pattern was observed in the results of this study. West Africa has a wasting prevalence of 15.5% and in this study, 19.3%. There has been a substantial increase in wasting among West African children, and this increase could explain the high rate of underweight in these countries. Chronic malnutrition appeared to be a more pressing problem than acute malnutrition as indicated by the levels of stunting and underweight compared to the levels of wasting, and the higher prevalence of anemia in preschool than in school age children. It is necessary therefore, to educate the mothers in this study area on the importance of feeding their children appropriately from their early life. There were significant differences in the MUAC of normal children and wasting and underweight children, suggesting that MUAC could be accurately used for rapid assessment of on-going malnutrition in specific populations, since it will be easier to establish local standards. The significant correlation between MUAC and PCV, underweight and wasting also supports this argument.

Serum ferritin levels, as measured by ELISA can be reliably used to diagnose anemia, as this study has shown. The test for it is very sensitive and easily done. This suggests that the anemia measured in this population may have been due mostly to nutrition basis. This conclusion is confirmed by work done in Lagos (Odunukwe et al., 2001). The most likely explanation for the high rate of anaemia in this population is therefore insufficient dietary intake of micronutrients, especially iron. It may explain a delayed recovery of iron deficiency anaemia after the control of parasitic infections. Haemoglobinopathies and thalassaemia may also contribute to anaemia, attempt to investigate this in my study area have not been successful thus far. The effect of malaria and helminthiasis on anaemia status in these rural communities is been studied, this will be reported later.

In conclusion, In rural communities of Edo State, Nigeria, anaemia is highly prevalent this is

probably caused by the marginal nutritional status .Infection control programme should be accompanied by monitoring of iron deficiency and when needed an iron supplementation programme should be organized within the context of other infection control programmes.

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