ORIGINAL ARTICLE

Determination of The Prevalence and Risk Factors of Anaemia Among Children Aged 0-5 Years in Gwagwalada Area Council, Federal Capital Territory(Fct), Abuja, Nigeria

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Abstract

Background: Anaemia is a major public health problem in developing countries, contributing significantly to morbidity and mortality in children under five years of age. About 43.0% of children under five years are anaemic worldwide, and two-third are residing in sub-Saharan Africa. The objectives of this study were to determine the prevalence and risk of anaemia, age and sex-related prevalence among the children aged 0-5 years in Gwagwalada area Council, Abuja.

Methods: This is a cross-sectional descriptive study conducted between February 2018 and October 2019 in four selected operating Clinics (Township; Angwan-Dodo Primary Health; Dagiri Primary Health and Paiko Primary Health Clinics); one hundred and fifty blood samples were collected using cluster random sampling from 0-5 year old children to determine the prevalence of anemia among them, using the standard Cyanmethaemoglobin method, with a view to establishing the age and sex mostly affected. Statistical analysis was done using Odds ratio (OR), Chi-square, and simple percentages.

Results: Out of the 150 children with the mean standard deviation of 2.9±1.09 years screened for anemia, 88(58.7%) had anemia, while the age-related prevalence was higher in 2-3 year old age group with 26(70.3%; OR=2.03) followed by those within the age range of 3-4 years with 24 subjects (64.9%; OR=1.59). The sex-related prevalence was higher in females with 48 subjects (61.5%); economic status, educational and job status of the children's parents had a significant effect on the prevalence of anemia.

Conclusion: The total prevalence rate of 58.7% of anemia among the children demands urgent attention to prevent anaemia associated complications among them. Continuous public health education programs for the mothers and caretakers of the children are suggested to upgrade their knowledge on anemia, higlighting the need and importance of proper nutrition with iron-supplement.

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Introduction

Anaemia is defined as the below-normal red blood cell count or haemoglobin level per unit volume in the peripheral blood[1] and is a major public health problem in developing countries including Nigeria. The

complications of anaemia depend on what causes it in a child. Some may have few complications, but others have frequent and serious complications. Clear ones are problems with growth and development, joint pain, swelling, bone marrow failure, and leukaemia. Data from World Health Organization showed that the prevalence of anaemia among children aged 6 to 59 months was 42.6% globally in 2011, and maximized in Africa (62.3%) and Southeast Asia (53.8%).[2] It is considered to be a major public health problem with a prevalence of 67.0%, equivalent to 83.5 million children in Subsaharan Africa and Moreso, one of the largest killers of children in the region even when blood transfusion is available.[3] There is a significant case fatality rate of 6-18% in East Africa; approximately 75.0% of children less than five years old suffer from anaemia.[4]

In addition, more than 100 million African children are anaemic, and community based estimate of anaemic prevalence among children in settings where malaria is endemic ranges between 49.0% and 76.0%; the consequences in terms of years of life lost in such a high level of anaemia are hard to quantify.[5] Certainly, children admitted to hospitals with severe anaemia are more likely to die than those admitted without anaemia.[6] Most children at high risk of severe anaemia live beyond the reach of hospital, which is the most common type of health facility that can perform blood transfusion.[7, 8] Anaemia is defined as the reduction in red blood cell mass or blood haemoglobin concentration, and in practice, it is most commonly defined as reduction in either haematocrit or haemoglobin or both.[9, 10] A study recorded an overall prevalence of 51.2% anaemia among the children in the indigenous villagers in Brazil. In their study, the higher risk of presenting anaemia was documented for boys, lower maternal schooling, lower household socio-economic status, poor sanitary conditions, presence of maternal anaemia, and anthropometric deficits.

In Africa, the prevalence of severe anaemia in a number of hospital-based studies ranges from 8% to 29% and is associated with case fatality rate of 9%-18%;[11] in West Africa, a study involving 3 countries including Burkina Faso, Ghana and Mali revealed that the incidence of mild anaemia was 24.3%, moderate 64.3%, and severe 10%.[12] Moreover, in Uganda, anaemia was found to be a severe public health problem among children less than 5 years of age with a prevalence of 68.9% and 27.3%, respectively.[13] Also, another study in Tanzania showed that anaemia incidence among children was 87%.[14]

Several studies have been carried out in Nigeria. For instance,[15] in their study 'the determinant of mortality in Nigerian children with severe anaemia in the University Teaching Hospital, Ado Ekiti, Ekiti state involving 1732 children, the prevalence of anaemia was reported18.0%;[16] in a study entitled "prevalence of moderate and severe anaemia in children under 5 years of age in University of Nigeria Teaching Hospital Enugu", it was revealed that the prevalence in Southeast Nigeria was 49.2%.[17] Another study recorded 13.6% case fatality rate among children under five years; according to the report, the factors associated with anaemia were malnutrition, tarchycardia, coma, and absence of blood transfusion.[18]

Moreso risk factors associated with anaemia vary in different settings; they include intestinal worms, malaria, HIV infections, nutritional deficiencies, and chronic diseases like sickle cell disease in childhood. In early childhood, bad feeding habits, especially during the weaning period, can exacerbate the problem. Further, anaemia develops as breast milk is replaced by foods that are poor in iron and other nutrients including vitamin B_{12} and folic acid.[19] Low oxygenation of the brain tissues, a consequence of anaemia, may lead to impaired cognitive function, growth and development in children and infants. Children under 5 years old and pregnant women have greater susceptibility to anaemia due to increase in iron requirements because of rapid expansion of the red blood cells. In Gwagwalada area council, the report of anaemia among children under five years is scarce and requires updating in order to create awareness among the parents and care-takers.

This study, therefore, aimed at provide the field baseline data on the prevalence of anaemia among children less than 5 years of age who referred to Gwagwalada Town Clinic in Gwagwalada area council.

Methods

Study Area

This study was conducted in four selected operating clinics in some parts of Gwagwalada area council, Abuja. The clinics were Gwagwalada Township clinic, Angwan-Dodo Primary Health clinic, Dagiri Primary Health clinic, and Paiko Primary Health clinic. Gwagwalada area council is located about 55km from the Federal Capital City and has a population of 410,000. It lies on Latitude 8° 55 North, 9° 00 West, and Longitude 7° 05 East.[20] The area covers a total of 65sq kilometre of very fertile land with abundance of grass.[20]

The study area falls into the Guinea savannah vegetation zone of the country, which is the broadest of all the vegetation types, constituting about 50% of the land area of Nigeria. There are two seasons within this vegetational zone: dry season that lasts between four to seven months and a rainy season that lasts between four to five months. The rainfall ranges between 106mm and 1524 mm with relative humidity of between 60% and 80%. However, the

temperature is highly influenced by the Niger-Benue trough where heat is trapped. The highest diurnal temperature ranges between 27^{oC} and 37^{Oc} in the months of November-April (dry season). Rainy season comes between the months of April to October with a temperature range of 23 °C and 36 °C (Figure 1).

Study Design

This is a cross-sectional descriptive study on the prevalence of anaemia among children aged 0-5 years in Gwagwalada area council, Federal Capital Territory (FCT), Abuja.

Study Population

This study was conducted on children aged0-5 years who referred to paediatric medical care, outpatient department of the children's emergency units of all the clinics used.

Ethical Approval

Ethical clearance (The code of ethics in this context include five codes: Confidentiality, Professional competence, objectivity, integrity and Professional behaviour) was obtained from the Public Health department of Gwagwalada area council, while the informed consent was obtained from the mothers/ caretakers after explaining the importance and details of the study.

Sample Size Determination

A sample size of 150 children was selected within the target population. It was estimated as follows: A prevalence rate of 11% was chosen;[21] the margin of a sampling error tolerated was set at 5%, at 95% confidence interval using the formula:

$$n = \frac{N^2 P(1-P)}{d^2}$$

where n=sample size; N=1.96 (constant); P=Population based=11%(0.07); d=marginal error=5% (0.05).

$$n = \frac{N(1.96)^2 \times 0.11 \times (1-0.11)}{0.05^2} = 150$$

Cluster Random Sampling Technique

The children were randomly selected (This started by dividing the children met in each of the clinics chosen into groups or clusters and each cluster was a representative of the population like the children under consideration. Then, within each group, the entire cluster was selected to sample, and their samples were taken by pricking the fingers of those who could not even stand the children's needles after swabbing with 70% alcohol.

Collection of Blood Samples and Test Procedures

With the help of the Medical Laboratory Scientists

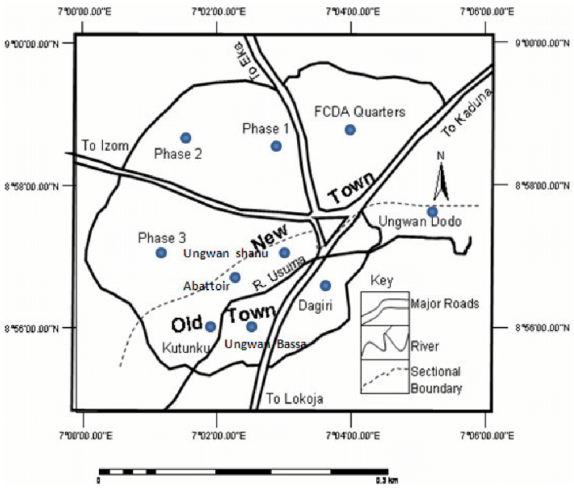

Figure 1: Map of Gwagwalada Area Council, Federal Capital Territory (FCT), Abuja. Source: Ideal Cartographic Services, Bwari-Abuja (2002)

in laboratory sections of the clinics, 2mls or drops of venous or peripheral blood samples were collected from each child after cleaning the sites of collection with 70% alcohol or spirit; some others who were too small to receive children's needles were pricked. The collected samples were put into Ethlene diamine tetra-acetic disodium acid (EDTA) containers to avoid clotting and ensure preservation of the samples. The samples were taken to the laboratory for testing. The blood samples were used for packed cell volume and haemoglobin estimation.

The haemoglobin estimation was done using the standard Cyanmethemoglobin method as recommended by Grantham-Mcgregor & Ani, 2001.[18] and children with a haemoglobin concentration less than 11.0g/dl were considered anaemic.

Method of Data Analysis

The data were analyzed using Odds ratio (OR), Chi-square and simple percentages.

Results

Out of 150 children with an age range of 2.2-3.5 years and mean age of 2.9 years that participated in the study, 48.0% were males, while 52.0% of them were females. 88 participants (58.7%) were anaemic. The prevalence of anaemia was higher in children aged 2^{+}- 3 years with 26 (70.3%; OR=2.03), followed by 3^{+}- 4 years with 24(63.9%; OR=1.59), and 4^{+}- 5 years with the prevalence of 20 (54.1%; OR=1.00), while 0-2 year old ones showed the least prevalence with 18(46.2%; OR=0.73). The study of anaemia was chosen in this environment because of the poverty and low level of education among the parents and caregivers in the Council. The average haemoglobin level was 9.5g/dl, and children with a haemoglobin concentration less than 11.0g/dl were considered anaemic.

Table 1 shows the gender-related prevalence of anaemia in Gwagwalada area council. Out of the 72 males screened, 40 (55.6%) had anaemia, while 48 (61.5%) of the females were suffering from anaemia. The overall prevalence of anaemia among the children studied was 58.7%.

The prevalence of anaemia was higher in children aged 2^+ - 3 years with 26 subjects (70.3%; OR=2.03), followed by 3^+ - 4 years with 24(63.9%; OR=1.59) and 4^+ - 5 year old ones with the prevalence of 20 (54.1%; OR=1.00), while 0-2 year old children had the least prevalence with 18 (46.2%; OR=0.73) (Table 2).

The multilevel analysis of determinants (predictors) of anaemia prevalence among children aged 0-5 years in Gwagwalada showed that anaemia status was strongly associated with economic status, educational status, and job status of the parents of the children; nevertheless, the gender of the child had no significant association with anaemia (Table 3).

Discussion

The result of this study confirmed the high prevalence of anaemia (58.7%) among children aged 0-5 years in Gwagwalada area council of FCT, Abuja. The overall prevalence of 58.7% seen in this study is embarrassing and constitute a major public health threat to the children living in the area (Table 1). Children living in poverty-stricken areas, particularly in Sub-Saharan Africa, were associated with a high rate of anaemia and morbidity.[1] The prevalence of 58.7% was high when compared with the studies carried out by,[16, 15, 22] who variously reported 49.2%, 51.2%, and 51.8%, respectively in their studies. However, when compared with the study carried out[23] in Ghana who revealed a prevalence of 78.4%, it is low. The relatively high rate of anaemia in the council among the children may not only be the result of illiteracy, but could also be attributed to a number of factors including intestinal worm infestation, malaria, nutritional deficiencies and chronic diseases.[19, 22] It shows that diarrhoeal diseases could be a factor as well. Other reasons of high rates of anaemia could be lack of enhanced maternal-child-health intervention, such as antenatal care for pregnant women (which aimed at reduced low births and anaemia during pregnancy), breastfeeding promotion education and anaemia detection (leading to treatment) in the child visits. Food-fortification strategies

Table 1: Gender (sex)-related prevalence of anaemia among the children

Gender (sex)	No. Screened	No. normal (%)	No. anaemic (%)
Male	72	32 (44.4)	40 (55.6)
Female	78	30 (38.5)	48 (61.5)
Total	150	62 (41.3)	88 (58.7)

Table 2: Age-related prevalence of anaemia among the children in Gwagwalada area council

Age (years)	No screened	No normal(%)	No anaemic(%)	OR
0-2	39	21(53.8)	18(46.2)	0.73
2^+ - 3	37	11(29.7)	26(70.3)	2.03
3^+ - 4	37	13(35.1)	24(64.9)	1.59
4^+ - 5	37	17(45.9)	20(54.1)	1.00
Total	150	62(41.3)	88(58.7)	

Table 3: Multilevel analysis of determinants of anaemia prevalence among children aged 0-5 years in Gwagwalada Area Council

Cross-tabulation of anaemia status versus predictor variables					
Variable	**Anaemic (%)**	**Non-Anaemic (%)**	**DF**	**Chi-square**	**P value**
Sex					
Male	40(55.6)	32(44.4)	1	1.05	0.218
Female	48(61.5)	30(38.5)			
Economic status					
Low	80(53.3)	70(46.7)	2	73.52	0.001
Middle	60(40.0)	90(60.0)			
High	10(6.7)	140(93.7)			
Job status/occupation					
Unemployed	80(53.3)	70(46.7)	1	10.5	0.003
Farmer	50(33.3)	100(66.7)			
Trader	20(13.3)	130(86.7)			
Civil servant	10(6.7)	140(93.3)			
Educational status					
None	80(53.3)	70(46.7)	1	75.6	0.001
Primary	50(33.3)	100(66.7)			
Secondary	30(20.0)	120(80.0)			
Tertiary	10(6.7)	140(93.3)			

could help avert anaemia in children.

The variations in the reported prevalence rates could be due to skills and experiences of those in diagnostic laboratories who did the blood tests and estimations. This could be reduced by making sure by employing well trained professionals with experiences in the clinical or medical laboratories to human resources and materials, thereby curtailing the errors. Other factors that contribute to the differences could be several environmental and socio-economic factors prevailing in the locality, where the study was conducted, such as socio-economic condition of the study population, ignorance, as well as level of education, and economic status of the parents.

This study reported the level of education, economic status, job status of the mothers and parents as the factors associated with anaemia status among children aged 0-5 years in Gwagwalada area council and is consistent with the reports of earlier researchers; for instance.[24] It was indicated that under five-year-old children of uneducated mothers and poor parents suffer from anaemia compared to those of educated and wealthy parents. This is consistent with the results of this study. Moreso, giving strong support to the findings,[25] reported that the current employment status of the mother and educational status of the parents were statistically significant determinants of the severity of childhood anaemia. In a study[26] entitled ''Factors associated with anaemia status among children aged 6 to 59 months in Ghana", it was confirmed that children whose families were poor and mothers were less educated had greater odds of being severely to moderately anaemic. Nevertheless, all the variations in the data and reports of the studies indicate that anaemia is prevalent in children below 5 years of age. Hence, this group of children should continuously do medical check-up including haemoglobin and haematocrit estimation [27] to avoid crisis due to anaemia among them.

The relationship between the children's age and anaemia is shown in Table 2. There was a high prevalence of anaemia (70.3%; OR=2.03) in the age group of 2^+ - 3 years, while 3^+ - 4 year old cohort recorded a prevalence of 64.9% (OR=1.59); 4^+ - 5 year old group had 54.1% (OR=1.00), and 46.2% (OR=0.73) was recorded among the 0-2 year old group. This may result from the fact that from 2 years and above, when the children are weaned out, they could not make up with their poor nutritional diet provided by their parents. However, this observation was not in agreement with the study of,[23] who revealed that anaemia was more in 0-2 year old age cohort, indicating that at less than 2 years of age, there is (a) high prevalence of maternal micronutrient deficiency. Since the children born to malnourished mothers have poor stores of iron, zinc, vitamin A and B_{12} and folate (b) low concentration of iron in breast milk which may be insufficient to meet the daily iron requirement of the children or infants (c), the introduction of complementary foods often occurs within this period which is also a period for rapid physical development with increased blood volume and decrease in iron storage from the maternal source; it is said[28] that the susceptibility of infants to infections affects their nutrition and feeding, thereby decreasing their ability to ingest and absorb iron. Anaemia in this group of children is really a serious threat to both kids and their parents. Therefore, efforts should be made towards improving their nutritional quality and care, especially food fortification.

Gender (sex) analysis (Table 1) of this result showed that anaemia was more seen (65.5%) in the females than in their male (55.6%) counterparts. This is nor in the same line with the results of [23], who maintained that there was no significant difference between the males and females in anaemia. However,[23] another study reported that boys were more susceptible to iron deficiency than girls, because of their more rapid growth in the first months of life.[29] Nevertheless, the differences seen in the occurrence of anaemia between males and females by various researchers are probably related to the level of poverty, accuracy of analysis, and educational level of the parents rather than a true question of sex susceptibility to anaemia. Observations and records have shown that children under 5 years of age suffer from anaemia. It is recommended that the parents and government should take comprehensive measures, such as food fortification and planning on dietary supplements, food diversification, and surveillance to monitor anaemia and evaluate the effectiveness of the intervention.

Limitations

The use of capillary blood in some cases instead of venous blood samples may introduce a source of bias or error owing to the possibility of haemoglobin dilution with extracellular fluid through manipulation of the fingers when the fingers are pricks to collect the blood drop and the design does not allow for cause-and-effect relationship to be established. However, this technique of sample collection has a great practical advantage and does not compromise the quality of the tests as it is a standard method of collection of blood samples in the age group under consideration.

Strengths

The results are consistent with the results from other parts of the country especially in the northern part. In each Clinic representative samples were collected.

Conclusion

In conclusion, anaemia is a serious threat in 5 year old children, and this study demonstrated that the prevalence of the disease in children below the age of 5 years in Gwagwalada area council, FCT, Abuja, remained high and especially affects children between the ages of 2^+ - 3 and 3^+ - 4 years. Furthermore, this study recommends that the preferred anaemia prevention strategy for this age group should be ferrous sulphate supplementation. Promotion of exclusive breastfeeding until the age of 6 months and above, diversification of food supplementation of diet, fortification of foods, and improvement of the living condition of the mothers in the area are suggested. Above all, health education programmes and other health strategies should be improved to create more awareness in the area.

Conflicts of interest: None declared.

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