

Association of malaria and anaemia in under five children in a rural general hospital in northern Nigeria

Tyavyar J Akosu, Tolulope Afolaranmi

Abstract

Background: Anaemia is a major public health problem and contributes significantly to morbidity and mortality particularly in children under five. In endemic areas, malaria is a major contributor to its evolution. This study aimed to determine the association of malaria and anaemia in under five children presenting with fever.

Methods: Records of under five children that presented with fever in Mani General Hospital for the period June 2012 to May 2013 were reviewed and relevant data extracted and analyzed.

Results: There were 411 children aged 6- 59 months that presented with fever and had malaria parasite test and packed cell volume (PCV) done as part of their initial investigation. Median age was 24 months (range 6-54) and 33.3% of the children belonged to the 12 to 23 months age group. A great

majority the children had anaemia (87.1%) and malaria parasitemia (88.1%). Severe anaemia (PCV<21%) was found in 26% of the children. There was a statistically significant relationship between anaemia and malaria parasitemia ($p=0.01$) but none with sex or age group of the children.

Conclusion: This study has shown a high prevalence of anaemia among febrile children and brings to light the need for urgent interventions including the need for attending clinicians to always screen for anaemia when evaluating febrile children to ensure prompt identification and treatment.

Key words: Anaemia, fever, malaria, under five children

Highland Med Res J 2015;15(2):80-82

Introduction

Anaemia is one of the most serious public health problems affecting people all over the world and contributes significantly to the global burden of disease.¹ In developing countries, it has been reported that an estimated 3.5 billion people may be anemic from various causes.² A recent WHO report on the global prevalence of anaemia estimates that one in four people worldwide are affected by anaemia mostly pregnant women and children.³ Sub-Saharan African countries contribute significantly to the global burden of anaemia with 67% of the children in this region being anaemic of which Nigeria is not an exception as 76.1% of pre-school children are anaemic.³ Anaemia in children is of particular interest because it impairs their physical, mental and social development with resultant unfavourable behavioral and cognitive consequences culminating in poor school performance and work capacity in later years.⁴

Several factors contribute to the development of anaemia including micronutrient deficiency and malaria particularly among children and pregnant women with varying degrees of associated mortality and morbidity.^{5,6} Anaemia secondary to malaria accounts for

up to 70% of all prescribed transfusions in malaria endemic sub-Saharan African countries.⁷ Previous studies have revealed that severe anaemia secondary to malaria without any other complications leads to about 1% mortality, however, this rises to over 30% when both respiratory distress and coma are also present.⁷ In Nigeria malaria plays a prominent role in the development of anaemia in children in general and under five children in particular. Malaria accounts for 60% of outpatient clinic visits and 25% and 30% of infant and under-5 mortality, respectively.⁸ Children under the age of 5 years have up to two to four attacks of malaria annually with an increased likelihood of dying from its complications without prompt intervention.⁹ The 2013 National Demographic and Health Survey (NDHS) found that only 4% of children with fever received ACT within two days of onset of fever.¹⁰

The purpose of this study therefore was to determine the prevalence and severity of anaemia among under five children that presented with fever in a General Hospital, northern Nigeria as the findings may be used to guide clinical management of children with malaria.

Materials and Methods

This was a retrospective hospital based study of under-5 children seen in General Hospital Mani over a one year period (March 2012 to February 2013). Mani General Hospital is the only secondary health facility in Mani Local Government area of Katsina state northern Nigeria. The Local Government Area which is located in the Sahel savanna is predominantly rural and majority of

Department of Community Medicine, University of Jos,
PMB 2084 Jos Nigeria

All correspondences to:
Dr Tyavyar J Akosu
E-mail: akosu2002@yahoo.co.uk

the inhabitants practice subsistence farming. The General Hospital serves as the main health facility of the LGA, providing both primary and referral level services to the residents. It is a 30 bed hospital with two medical officers, 25 nurses and a laboratory technologist among others. The case notes of all under five children who presented with a history of fever and/ or a temperature = 37.5°C and had Packed Cell Volume (PCV) and malaria parasite tests as part of their initial investigation were retrieved from the records department and used for this study. For patients who presented with fever more than once within the specified period and satisfied the other conditions, only the results of the packed cell volume and malaria parasitemia in the first presentation were used in the analysis. Data was analyzed using statistical package for social sciences (SPSS) version 17. Anaemia was classified as mild (PCV 30- 32.9%), moderate (PCV 21-29.9%) and severe (PCV<21%) in line with the WHO anaemia assessment criteria which classifies anaemia in children under five years as mild hemoglobin (Hb) 10-10.9g/dl, moderate Hb 7- 9.9g/dl and severe as Hb < 7g/dl.¹¹ Chi square statistical test was used to determine the relationship between anemia and characteristics of the children. A 95% confidence interval was used in this study with a p =0.05 considered statistically significant.

Results

There were 411 children aged 6-59 months who presented with fever and had malaria parasite test and PCV done as part of their initial investigation. Table 1 shows the base line characteristics of study subjects.

Table 1: Characteristics of the under-fives

Characteristics	Frequency	Percentage
Age group (Months)		
6 – 11	66	16.1
12 – 23	137	33.3
24 – 35	105	25.5
36 – 47	67	16.3
48 – 59	36	8.8
Male	240	58.4
Malaria parasite	362	88.1
Anaemia	358	87.1
Grading of anaemia		
Mild	145	40.5
Moderate	120	33.5
Several	93	26.0

Most of the children (33.3%) were between 12 and 23 months of age with a median age of 24 months (range 6-54). Most of the children (88.1%) had malaria parasitemia but only one child had sickle cell disease. Anaemia (PCV<33%) was present in 87.1% of the

children. Severe anaemia (PCV<21%) was found in 26 % of the children. There was no statistically significant relationship between anaemia and sex or age group of the children. Anaemia was however significantly associated with malaria parasitemia (p=0.01).

Table 2: Relationship between characteristics of the under-fives and anaemia

Characteristics	Anaemia status		P-value
	Present Freq (%)	Absent Freq (%)	
Age group (Months)			
6 – 11	56 (84.8)	10 (15.2)	
12 – 23	118 (86.1)	19 (13.9)	
24 – 35	92 (87.6)	13 (12.4)	0.925
36 – 47	60 (89.6)	7 (10.4)	
48 – 59	32 (88.9)	4 (11.1)	
Sex			
Female	152 (88.9)	19 (11.1)	
Male	206 (85.8)	34 (14.2)	0.362
Malaria parasite			
Positive	321 (88.7)	41 (11.3)	
Negative	37 (75.5)	12 (24.5)	0.010

Discussion

The prevalence of anaemia in this population is high (87.1%). Though similar to the 76.1 % reported in the WHO global burden of anaemia,³ it is higher than the 57.1% found among under 5 year old children presenting in a tertiary hospital in Enugu, Eastern Nigeria.¹² This could be because the children in the Enugu study, although sick and presenting in a tertiary Hospital were sick of various causes some of which were not associated with anaemia. It is also possible that some of them even if anaemic prior to presentation at the tertiary facility, may have received treatment for anaemia in a lower level facility before presenting at the tertiary Hospital. We also found that the majority (88.1%) of the children had malaria parasitaemia preceded with fever which is similar to what was obtained in another study conducted at Federal Medical centre Azare North Eastern Nigeria.¹³ This synergy in finding further buttresses the fact that malaria is the leading cause of anaemia among children with fever as the main presentation.

Most of the children had mild to moderate anaemia (40.5% and 33.5% respectively). Severe anaemia was found in a quarter of the children in our study. This is lower than the 33% found among febrile children in a study conducted in three East African hospitals but is much higher than the 9.7% found in Abakiliki Nigeria.³ This difference could be attributable to the cutoff of 15% PCV used for definition of severe anaemia in the later study. It could also be because their subjects

were a mixed group presenting with various symptoms as against only fever in this study.^{14,15}

Although the high prevalence of severe anaemia in our study population could be a reflection of the intensity of malaria transmission in their communities since malaria parasitemia is also very high amongst them, several other factors apart from malaria contribute to the development of anaemia in children including micronutrient deficiencies, other infections, infestations like hook worm, and genetic polymorphisms, which could be at play here.⁶ Infestations like hookworm and micronutrient deficiency, in particular, are relevant in a rural farming community like the one from which the children in our study were drawn. These could have impacted our findings.

It is also possible that the children in this study may have presented late to hospital which contributed to the high prevalence of anaemia and its severity among them. In recent years, considerable efforts have been made to increase access to malaria treatment at the community level, including training of community health workers and role model caregivers in the treatment of febrile children with ACT. However, the 2013 NDHS found that only 4% of children with fever received ACT within two days of onset of fever.¹⁰

Conclusion

In view of the very high prevalence of anaemia and malaria parasitemia among febrile children in this study, we recommend that clinicians should evaluate for anaemia when treating febrile children to ensure that those with anaemia are promptly identified and treated. We recommend that further studies evaluating the effects of malaria on anaemia be embarked upon.

Conflict of interest: None declared in this work.

References

1. Hamid JS, Ewusie, JE, Ahiadeke C, Beyene J. Prevalence of anaemia among under 5 children in the Ghanaian population. *BMC Public Health*, 2014, 14:626. doi:10.1186/1471-2458-14-626
2. United Nations Administrative Committee on Coordination Nutrition (ACC/SCN) 4th Report on the world nutrition situation: Nutrition throughout the Life Cycle. Sub-Committee on Geneva: ACC/SCN; 2000:22-27
3. Benoist BD, McLean E, Egll I, Cogswell M. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia. In WHO. Geneva, Switzerland: WHO Press; 2008:1-24
4. Villalpando S, Shamah-Levy T, Ram'irez-Silva CI, Mej'ia-Rodriguez F, Rivera JA. Prevalence of anemia in children 1 to 12 years of age: Results from a nationwide probabilistic survey in Mexico. *Int J Epidemiol* 2003, 45:490-498.
5. Memendez C, Kahigwa E, Hirt R et al. Randomized placebo controlled trial of iron supplementation and malaria chemoprophylaxis for prevention of severe anaemia and malaria in Tanzanian infants. *Lancet* 1977; 350:844-850
6. Sanou D, Ngnie-Teta I. Risk Factors for Anemia in Preschool Children in Sub-Saharan Africa. In: Silverberg DS (ed.). *Anaemia*. In Tech; 2012: 171-190
7. Greenberg AE, Nguyen-Dinh P, Mann JM, et al. The association between malaria, blood transfusions, and HIV seropositivity in a Paediatric population in Kinshasha, Zaire. *JAMA* 1988;259:545-549
8. Marsh K, Forster D, Waruiru C, et al. Indicators of life threatening malaria in African children. *N Engl J Med*; 1995;332:1399-404
9. Federal Ministry of Health (FMOH). National Antimalarial Treatment Policy. FMOH, National Malaria and Vector Control Division Abuja, Nigeria 2005;8-10
10. National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International:201-219
11. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1) <http://www.who.int/vmnis/indicators/haemoglobin.pdf> (accessed 12/4/2015).
12. Ekwochi U, Osuorah DIC, Odetunde OI, Egbonu I, Ezechukwu CC. Prevalence of iron deficiency anaemia in anaemic under five children in Enugu, south East Nigeria. *Nigerian Journal of Pediatrics* 2014;41:129-132
13. Cranston HA. Plasmodium falciparum maturation abolishes physiologic red cell deformity. *Science* 1994; 223: 400-402
14. Kiguli S, Maitland K, George EC, et al. Anaemia and blood transfusion in African children presenting to hospital with severe febrile illness. *BMC Medicine*. 2015; 13:21. doi: 10.1186/s12916-014-0246-7.
15. Muoneke V, Ibekwe R, Nebe-Agumadu H, Ibe B. Severe anaemia in under five years children in Ebonyi State University Teaching Hospital Abakiliki. *Arch Dis Child* 2010;95: A100-A101; doi:10.1136/adc.2010.186338.218