Malaria: Prevalence and related factors in children at Aba, Southeast Nigeria

Chukwuemeka Ngozi Onyearugha[1], Nneka Chioma Okoronkwo[1], Prince Ezenwa Onyemachi[2]

From [1]Consultant Paediatrician/Senior Lecturer, Department of Paediatrics, [2]Consultant Community Physician/Senior Lecturer, Department of Community Medicine, Abia State University Teaching Hospital, Aba, Abia, Nigeria

Correspondence to: Dr. Nneka Chioma Okoronkwo, Department of Paediatrics, Abia State University Teaching Hospital, Aba. P O Box 21953, Aba, Abia State, Nigeria. E-mail: nnekaceo@rocketmail.com

ABSTRACT

Background: Childhood malaria has remained a major public health burden. It severely affects children aged under-5 years, particularly in Sub-Saharan Africa. Curbing the prevalence of malaria begins with determining the prevalence and related factors of the disease in the community. **Objective:** The objective of the study was to determine the prevalence and related factors of malaria in children at Aba, Southeast Nigeria. **Materials and Methods:** In this retrospective study, 275 case files of children admitted with malaria in the Department of Paediatrics of the Abia State University Teaching Hospital from January 1, 2016, to December 31, 2016, were analyzed. **Results:** During the study period, among the 440 overall admission, 275 children were diagnosed with malaria. The prevalence of malaria in our study was 62.5%. The male:female ratio was 1:1.2. We found, 234 (85.1%) children were <5 years of age, 23 (8.2%) belonged to the age group of 5–11 years, and 18 (6.7%) were aged between >11 and 16 years. The highest prevalence of malaria 40 (14.4%) occurred in September while the least 10 (3.6%) occurred in April. Around 247 (89.8%) patients were discharged home, 18 (6.5%) patients succumbed to death, and 6 (2.1%) patients were discharged against medical advice. **Conclusion:** The prevalence and mortality rates of malaria are high. To curb the trend of this disease, good environmental sanitation, prevention of the anophelene mosquito blood meal on humans, and early diagnosis and treatment of malaria should all be enhanced.

Key words: Aba, Malaria, Prevalence, Related factors

Malaria is one of the most severe global public health problems worldwide, with highest prevalence in the tropical countries of Africa and Asian subcontinent. Each year, more than 650 million people ate affected by malaria, with mortality rates between 1 and 3 million, most of whom are young children in Sub-Saharan Africa [1,2]. Nigeria has the highest prevalence rates of malaria both in Africa and in fact tops the global malarial prevalence charts [3]. Malaria remains a leading cause of morbidity and mortality, with children aged below 5 years constituting up to 70% of the mortality globally [3]. About 50% of the population of Nigeria suffer from at least one episode of malaria each year with over 45% presenting to the outpatient clinics. Among the, about 30% of admissions are of children aged under-5 years [3,4].

Malaria is holoendemic and stable in Nigeria, is deemed not only as a public health problem but also a deterrent to the socioeconomic growth of a country [5,6]. It has been documented that about 50% of the Nigerian population suffers from at least one episode of malaria every year, while under-5 children have an average of 2–6 attacks of malaria annually [7]. Malaria, therefore, constitutes a heavy burden on Nigerian families, communities, health system, and workforce [6]. Curbing the morbidity and mortality from malaria will help immensely in achieving Goal 3.2 of the Sustainable Development Goal which aims at stemming down the prevalence of neonatal mortality to 12.5% and under-5 mortality to 25% by the year 2030. Achieving a reasonable reduction in the morbidity and mortality from malaria can only be attained by first determining its prevalence, morbidity, mortality, and associated factors in the society. The result obtained will provide a background data for future reference and also serve as a veritable tool for the formulation of policy for malaria control in the community.

Hence, the present study was conducted with an objective to determine the prevalence and related factors of malaria in children at the Abia State University Teaching Hospital (ABSUTH), Aba, Southeast Nigeria.

MATERIALS AND METHODS

The present retrospective study was conducted in the Department of Paediatrics of the ABSUTH, Aba. The hospital serves as a tertiary health-care institution and referral center for peripheral hospitals in Aba and neighboring states of Rivers, Akwa Ibom, and Imo, respectively. The admission records of children aged 1 month–16 years, from January 2016 to December 2016, were retrospectively reviewed. The department of pediatrics is manned by 6 consultants, 12 registrars, and 10 house officers (who do 3 monthly rotation before proceeding to other departments). Ethical

clearance was obtained from the ABSUTH Ethics Committee before the commencement of the study.

All cases of admission were reviewed by at least the registrar on call before commencement of further management. Diagnosis was made on the patients based on clinical features and laboratory results. All the case records of children admitted into the children emergency ward and children medical wards, with the diagnosis of malaria, over the study period, were retrieved from the medical records department. The records of neonates, those aged more than 16 years and those with inadequate data, were excluded. There were a total of 440 admissions out of which 295 children were diagnosed with malaria. However, since 20 cases had inadequate data, they were excluded and only 275 were used for subsequent analysis. Relevant information including age, gender, diagnosis, duration, and outcome of admission were extracted.

RESULTS

The prevalence of malaria in our study was 62.5%. Among the total 275 cases, 150 were male children and 125 were female children, giving a male:female ratio of 1.2:1. Majority of the patients (234, 85.1%) were <5 years of age, while older age groups constituted 14.9% of the population. Table 1 shows the distribution of patients by age group. Seasonal occurrence of malaria was analyzed. Admissions due to malaria were highest (40, 14.4%) in the month of September and least (10, 3.6%) in the month of April (Table 2). Among the study group, majority (247, 89.8%) of the patients were discharged without any complications, 18 (6.5%) suffered mortality, whereas 2.1% were discharged against medical advice (Table 3). The mortality rates of patients <5 years were compared with the patients >5 years. We found, 15 out of 247 (6.1%) patients aged <5 years and only 4 of the 41 (7.3%) above the age of 5 years suffered mortality, with no statistical significance difference between them (Table 4).

DISCUSSION

In our study, 62.5% malaria prevalence rate was observed, which although is much higher compared to the rates observed in Sokoto, Northwest Nigeria (27.2%) [8] and Douala in Cameroon region (23.5%) [9], however, is lower than reported rates in Kano, northwest (72.2%) [10] and Ota, Ogun State, Southwest Nigeria (80%) regions [11]. Higher prevalence in our study could be because of its location, the southern part of Nigeria, with much humid weather, wetter climatic conditions, and a temperature more supportive of widespread breeding of the malaria. On the contrary, Sokoto is located in a drier, hotter part of the country with climatic conditions less conducive for the breeding of malaria parasite vector, the anopheles mosquito. Thus, we believe location affects the prevalence rates. In a study conducted at Cameroon by Eleonore *et al.* [9], the lower prevalence rate of malaria was documented among children with sickle cell disease (SCD). The sickle cell trait (HbAS) has shown high levels of protection against all forms of malaria across Africa [12,13]. Again, among

Table 1: Age distribution of the patients

Age (years)	Number of patients (n=275) (%)
<5	23 (85.1)
5–11	23 (8.2)
12–16	18 (6.7)

Table 2: Monthly distribution of the patients

Month	No. of patients
January	20 (7.2)
February	30 (10.8)
March	17 (6.1)
April	10 (3.6)
May	15 (5.6)
June	32 (11.8)
July	17 (6.1)
August	23 (8.2)
September	40 (14.4)
October	21 (7.7)
November	18 (6.7)
December	32 (11.8)

Table 3: Outcome of admissions

Outcome	No. of patients
Discharged home	247 (89.8)
Dead	18 (6.5)
DAMA	6 (2.1)
Absconded	4 (1.4)

DAMA: Discharged against medical advice

Table 4: Relative mortality in the <5 and >5 years age groups

Age group	Total number of patients	Number of mortality	Percentage
<5	247	15	6.1
>5	41	3	7.3

p=0.396

children with SCD (HbSS), the prevalence of malaria is found to be lower compared to children without SCD [9,13,14]. The previous studies have also shown that glucose-6-phosphate dehydrogenase deficiency protects from severe forms of malaria in children [15,16]. Since our study was conducted among a general population of children admitted into the pediatric wards, these parameters were not analyzed.

Compared to the study by Nyakeriga *et al.* at Ota, Ogun State [11], we observed lower prevalence rates. This may be due to the possibility that their study was conducted on children attending the clinic and then sent for investigation on clinical suspicion of malaria. Similarly, a study by Umma *et al.* in Kano studies the prevalence of malaria in severely malnourished children. Several previous reports have documented that malaria is more prevalent in severely malnourished children than otherwise [17,18]. However, the index study was conducted on children admitted generally for various conditions, thereby making the prevalence of malaria less in such a situation.

Several previous reports have also documented that overwhelming majority of childhood malaria occur in children <5 years [19,20]. Results of our study are in accordance with the previous reports, wherein we found 85.1% prevalence rates in children aged <5 years. Although transplacental maternal immunity protects the newborn from malaria during the early months of life, this immunity is passive and wanes subsequently. The infant develops its own active immunity gradually and progressively from the later part of the 1st year. However, the infant is prone to increasing attacks of malaria until about the age of 5 when the immunity develops adequately to curb significantly the prevalence and severity of malaria attacks [20]. At a young age, without the adult supervision, the child is unable to exercise self-protective measures such as moving to more secured places, away from a place of exposure to mosquito bite, despite the discomfort of the experience, wearing protective clothing, mosquito repellant creams, shut access of mosquitoes to living room, and apply insecticide treated bed nets, thereby making the child more predisposed to malaria attacks.

Our study also revealed that the highest prevalence of malaria was in the month of September. Similarly, the previous reports have indicated highest prevalence of malaria in the months of July–December [21,22]. These are rainy season months with high humidity, adequate rainfall, optimal temperature, and periods of water collection support the breeding of female anopheles mosquito – the vector of malaria parasite. These result in growth of vegetation, collections of pools of water in containers/ environmental objects, and poorer sanitary environment which encourage breeding of mosquitoes abound. All these factors result in higher prevalence of malaria during these months [21,22].

Majority (89.8%) of the patients in this study were discharged without any complication, which is in accordance with the previous reports [22,23]. Discharge rates have improved in recent years probably as a result of improved knowledge and application of the first-line antimalarial treatment using the artemisinin-based combination therapies (ACTs) by caregivers. Again, the universal availability of ACTs, which are often administered before presentation to health-care facilities mitigates the effect of the disease and improves recovery rates from the illness. Our study observed 6.5% mortality rate. This is higher than the 1.96% reported by Edelu *et al.* at Enugu [23] but <9.6% reported in Ibadan. Measures of prevention and home management of malaria (e.g., use of insecticide treated bed nets and artemisinin-based combination therapy) improved mortality rates in our study. However, since ours was a hospital-based retrospective study with a small sample size, results may not be a true reflection of the prevalence of malaria among children in the community of Aba. The authors further recommend a multicentric prospective hospital-based study on malaria among neonates, malnourished and immunocompromised children at Aba and throughout Nigeria.

CONCLUSION

This study revealed a high prevalence of malaria among children in Aba, Nigeria. Those aged under-5 years were mostly affected.

The disease had a peak in the month of September and is associated with a high fatality rate. We believe that there is a need for enhanced education of the populace, especially child caregivers, on the endemicity, symptoms, prevention, and treatment of malaria. Environmental health officers should ensure citizens' compliance with environmental sanitation, before the onset of and during rainy season. The "Roll Back Malaria" program and other malaria control measures should be reactivated and implemented at all levels of governance and health care. Caregivers should be taught on the need for early presentation of a febrile child to a health facility, for prompt evaluation and treatment for malaria. The government at all levels should make effective health-care facilities available and affordable to all the populace.

REFERENCES

1. Campbell CC. Malaria: An emerging and remerging global plague. FEMS Immunol Med Microbiol 1997;18:325-31.
2. Hay S, Guerra C, Tatem A, *et al*. The global distribution and population at risk of malaria: Past, present and future. Lancet 2004;4:327-36.
3. Oguonu T, Edelu BO. Challenges of managing childhood malaria in a developing country: The case of Nigeria. In: Rodriguez-Morales AJ, editor. Current Topics in Malaria. Croatia: Intech Open; 2016. p. 73-84.
4. Olasehinde GI, Ajayi AA, Taiwo SO, *et al*. Prevalence and management of falciparium malaria among infants and children in Ota, Ogun State, Southwestern Nigeria. Afr J Clin Exp Microbiol 2010;11:159-63.
5. Sam WS, Adekunle NO, Adeleke MA, *et al*. Epidemiological factors in prevalence of malaria parasites in primary health facilities attendees, Ogun State, Nigeria. Malar Chemother Control Elimin 2014;3:1-6.
6. Onwujekwe O, Chikezie I, Uzochukwu B, *et al*. The economic burden of malaria on households and health system in Enugu, Southeast Nigeria. PLoS One 2013;8:e78362.
7. Federal Ministry of Health, National Malaria and Vector Control Division. National Guidelines for Diagnosis and Treatment of Malaria. Abuja, Nigeria: Federal Ministry of Health, National Malaria and Vector Control Division; 2011. Available from: http://www.nmcpnigeria.org. [Last accessed on 2020 Jun 20].
8. Abdullahi K, Abubakar U, Adamu T, *et al*. Malaria in Sokoto, North Western Nigeria. Afr J Biotech 2009;8:7101-5.
9. Eleonore NL, Cumber SN, Charlotte EE, *et al*. Malaria in patients with sickle cell anaemia: Burden, risk factors and outcome at the Laquintinie hospital, Cameroon. BMC Infect Dis 2020;20:40.
10. Umma IA, Robinson WD, Jamilu FA, *et al*. Prevalence of malaria parasitaemia among febrile Nigerian children with severe malnutrition in Northwestern Nigeria. Niger J Basic Clin Sci 2017;14:113-6.
11. Nyakeriga AM, Troye-Blomberg M, Chemtai AK, *et al*. Malaria and nutritional status in children living on the coast of Kenya. Am J Clin Nutr 2004;80:1604-10.
12. Taylor SM, Parobek CM, Fairhurst RM. Haemoglobinopathies and the clinical epidemiology of malaria: A systematic review and meta-analysis. Lancet Infect Dis 2012;12:457-68.
13. Uyoga S, Macharia AW, Ndila CM, *et al*. The indirect health effects of malaria estimated from health advantages of the sickle cell trait. Nat Commun 2019;10:856.
14. Komba AN, Makani JJ, Sadarangani M, *et al*. Malaria as a cause of morbidity and mortality in children with homozygous sickle cell disease on the coast of Kenya. Clin Infect Dis 2009;49:216-22.
15. Manjurano A, Clark TG, Nadjm B, *et al*. Candidate human genetic polymorphisms and severe malaria in a Tanzanian population. PLoS One. 2012;7:e47463.
16. Amoah LE, Opong A, Ayanful-Torgby R, *et al*. Prevalence of G6PD deficiency and *Plasmodium falciparum* parasites in asymptomatic school children living in southern Ghana. Malar J 2016;15:388.
17. Prudence MN, D'Alessandro U, Donnen P, *et al*. Clinical malaria and nutritional status in children admitted in Lwiro hospital, democratic republic of Congo. J Clin Exp Pathol 2012;S3:4.

18. Schumacher RF, Spinelli E. Malaria in children. Mediterr J Hematol Infect Dis 2012;4:e2012073.
19. Reynaldi A, Dent AE, Schlub TE, *et al*. Interaction between maternally derived antibodies and heterogeneity in exposure combined to determine time-to-first *Plasmodium falciparum* infection in Kenyan infants. Malar J 2019;18:19.
20. Addisu A, Tegegne Y, Mihiret Y, *et al*. 7-Year trend of malaria at primary health facilities in Northwest Ethiopia. J Parasitol Res 2020;2020:4204987.
21. Natama HM, Rovira-Vallbona E, Somé MA, *et al*. Malaria incidence and prevalence during the first year of life in Nanoro, Burkina Faso: A birth-cohort study. Malar J 2018;17:163.
22. Olanrewaju WI, Johnson AW. Malaria in children in Ilorin, Nigeria. East Afr Med J 2001;78:131-4.
23. Edelu BO, Ndu IK, Igbokwe OO, *et al*. Severe falciparum malaria in children in Enugu, South East Nigeria. Niger J Clin Pract 2018;21:1349-55.