

Research article

Malaria Parasitaemia in Children Aged 1-5 years in Aba, South Eastern Nigeria

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Abstract

Malaria has become a threat to health in the tropical and other developing countries. No wonder this has become one of the components of the Millennium Development Goals (MDGs). Malaria accounts for one in five of all childhood deaths in Africa. Yet much of the impact of this disease on the world's children could be prevented with currently available interventions. This study was carried out in Aba, Abia State, Nigeria between the months of July and October, 2012. Three hundred patients were tested using thick and thin film methods for the presence of malaria parasites. A pre-tested structural questionnaire was used to obtain the demographic data and home management practices from parents of the children. Out of 300 children sampled, 195 (65.0%) were infected with malaria parasites. Ninety seven (62.2%) of the males were infected, while 98 (68.1%) of the females were infected. However, the prevalence rate of infection among the males and females were statistically insignificant (P -value > 0.05). Children of age five had the highest prevalence of 73.8%, followed by the children of age two with prevalence rate of 68.0%. Children living in homes where preventive measures were adopted recorded lower rate of infection. Those using insecticide treated nets (ITNs) had the lowest rate of infection (23.1%). This is followed by those using combined window/door net plus insecticide sprays (45.0%), while the homes where no control measures were adopted recorded 92.8% rate of infection. The difference in prevalence rates among homes using different control measures were statistically significant (P -value < 0.05) and therefore malaria infection is dependent on the control measures adopted. In spite of all prevention and control efforts, malaria has remained a leading cause of morbidity

and mortality in Nigeria especially among children. This study revealed a high level of malaria infection among this vulnerable group. There is a need for parents to adhere strictly to the use of the available preventive measures like the insecticide-treated nets (ITNs) to reduce the burden of malaria on these children.

Key words: Malaria parasitaemia, prevalence, children, home management practices.

Introduction

Malaria has become a threat to health in the tropical and other developing countries. No wonder this has become one of the components of the Millennium Development Goals (MDGs). Malaria remains a major public health problem particularly in sub-Saharan Africa [1, 2]. Malaria threatens the lives of 3.2 billion people globally and exacts a great toll on vulnerable pregnant women and children, killing an estimated 1 to 2 million yearly and causing illness in about 300 to 500 million among the two groups due to their high vulnerability [3, 4,5]. Malaria is Africa's leading cause of under five mortality, and constitutes 10% of the continent's overall disease burden. It accounts for 40% of public health expenditure, 30 to 50% of in-patient admissions, and up to 50% of out-patient visits in areas with high malaria transmission like Nigeria [6]. There are at least 300 million acute cases of malaria each year globally, resulting in more than a million deaths, of which about 90% occur in Africa mostly in children [6,7].

Nigeria is one of the hardest hit of the countries in malaria-endemic countries of sub-Saharan Africa, where the disease accounts for 11% of maternal mortality and 12 to 30% of mortality among the under-five; but its severity and complicated effects are most common among infants and pregnant women [3, 8, 9]. It is estimated that 50% of the people have at least one episode of malaria each year [10, 11]. With a total population of 120 million, this translates to 60 million people suffering from attacks of malaria yearly. It is estimated that children under the age of five, have 2 to 4 attacks every year [10]. This makes malaria the most important cause of death and disability in children under the age of five in the country. To date, there is no effective vaccine or drug for mass chemoprophylaxis against malaria, thus proper know-how and use of preventive measures is crucial. The recommended preventive interventions are the use of insecticide-treated bed nets (ITNs), and indoor residual house spraying and other preventive interventions where appropriate and effective [12]. The coverage and proper utilization of these malaria preventive measures, like the ITNs in the country is also limited due to lack of sustainable distribution and issues related to replacement of nets, seasonality of malaria, and poor knowledge of the community with regards to the link between mosquito and malaria [13]. The use of ITNs is a cost-effective intervention to reduce child mortality and maternal anaemia where malaria imposes an important disease burden. This study was undertaken to assess the level of malaria parasitaemia and the adherence to the use of the available preventive measures among children between ages 1 to 5 in Aba.

Methodology

Study Area: The study was conducted in Aba, Abia State, Nigeria. Aba lies between latitude 5° 07' N and longitude 7° 22' E and 205m (673ft) above sea level. Aba is a commercial town located 64 km from the State capital of Abia State. The people are predominantly traders, artisans, farmers and public/civil servants. The area is prone to malaria because of flooding during the rainy seasons and the associated poor drainage system, resulting in the formation of temporary water bodies that promotes the breeding of mosquitoes, the vector for malaria parasites.

Study Population: The study was conducted in four hospitals that were randomly selected, from July to October, 2012. The hospitals were Ezianya Health Center, Living Word Hospital, Teaching hospital and World Bank Hospital. A total of 300 children between ages 1 to 5 years were randomly selected for the investigation.

Research Ethics: Ethical review and clearance of the research protocol were obtained from the Ethical Review Committee of the Department of Biology/Microbiology, Abia State Polytechnic Aba. Permission was obtained from the Hospital authorities and the parents of the children who filled the Patient Consent Form as evidence of their consent. All subjects who were interviewed accepted to present the identification data (name, age and sex).

Data Collection: Two procedures were used in the data collection. First, a structured questionnaire was administered to the parents of the children to obtain information on the home management methods (HMMs) used as preventive measures against malaria. Then about 1ml of venous blood was collected from each subject into an EDTA bottle (labeled with code numbers, age and sex) using 5ml syringe. The samples were collected with care with adequate safety precautions and taken immediately to Microbiology Laboratory, Abia State Polytechnic, Aba for screening. The screening was done using Giemsa- stained thick and thin blood films as recommended by WHO [14]. The films were examined using the 100x oil immersion objective.

Statistical Analysis: The statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 20.0. Statistical significance tests include the use of *P-value* to assess the role of chance and χ^2 (Chi-square) test to account for the association between different variables. In this study, *P-value* < 0.05 was used to disapprove the null hypothesis.

Results

Table 1 shows the sex-related distribution of children between ages 1-5 years who were screened for malaria parasites. Out of 300 children screened, comprising of 156 (52.0%) males and 144 (48.0%) females, 195 (65.0%) were positive for malaria parasites. A total number of 97 (62.2%) and 98 (68.1) of the screened males and females respectively were infected. The prevalence rate of malaria infection according to gender is insignificant ($\chi^2_{cal}=1.136$, $P > 0.05$).

Table 1: Sex-related Distribution of malaria infection among screened children between ages 1-5

| Sex | Number Sampled (%) | Number Infected (%) | Number Uninfected (%) | χ^2 | <i>P-value</i> |
|---------|--------------------|---------------------|-----------------------|----------|----------------|
| Male | 156 (52.0) | 97 (62.2) | 59 (37.8) | 1.136 | 0.286 |
| Females | 144 (48.0) | 98 (68.1) | 46 (31.9) | | |
| Total | 300 | 195 (65.0) | 105 (35.0) | | |

The age-related prevalence is shown on Table 2. The result revealed that children of age 5 were infected the most, with prevalence rate of 73.8%. This is followed by age 2 (68.0%) while the least was children of age 4 with infection rate of 42.9%. The prevalence rate of malaria infection according to age distribution is significant ($\chi^2 = 11.665$, $P = 0.02$).

Table 2: Age-related Distribution of malaria infection among screened children between ages 1-5

| Age | Number Sampled (%) | Number Infected (%) | Number Uninfected (%) | χ^2 | <i>P-value</i> |
|-------|--------------------|---------------------|-----------------------|----------|----------------|
| 1 | 61 (20.3) | 39 (63.9) | 22 (36.1) | 11.665 | 0.02 |
| 2 | 50 (16.7) | 34 (68.0) | 16 (32.0) | | |
| 3 | 51 (17.0) | 31(60.8) | 20 (39.2) | | |
| 4 | 35 (11.7) | 15 (42.9) | 20 (57.1) | | |
| 5 | 103 (34.3) | 76(73.8) | 27(26.2) | | |
| Total | 300 (100) | 195(65.0) | 105 (35.0) | | |

Table 3 shows the prevalence of malaria parasites among children using different preventive measures. Seventy eight (26.0%) of the total population sampled use insecticide-treated bed nets (ITNs), 44 (14.7%) use indoor insecticide spraying, 60 (20.0%) use window/door net plus indoor insecticide spraying while 97 (32.3%) use none. Out of the 78 that use ITNs only 23.1% were infected. Infection rate among those that use indoor spraying 90.9%, window/door net had 92.6% infection rate while window/door net plus indoor insecticide spraying had 45.0% infection rate. However, the highest infection rate of 92.8% was obtained among those that do not use any preventive measures. The prevalence of malaria infection among children using different control measures is significant ($\chi^2 = 125.038, P < 0.05$).

Table 3: Prevalence of Malaria Parasitaemia among the sampled Children using Different Control Measures

| Types of Preventive Measures used | Number Sampled (%) | Number Infected (%) | Number Uninfected (%) | χ^2 | <i>P value</i> |
|---|--------------------|---------------------|-----------------------|----------|----------------|
| ITNs | 78(26.0) | 18 (23.1) | 60 (76.9) | 125.038 | 0.000 |
| Indoor spraying | 11 (3.7) | 10 (90.9) | 1 (9.1) | | |
| Window/door Nets | 54 (18.0) | 50 (92.6) | 4 (7.4) | | |
| Window/Door Nets Plus indoor insecticide spraying | 60 (20.0) | 27 (45.0) | 33 (55.0) | | |
| None | 97 (32.3) | 90 (92.8) | 7 (7.2) | | |
| Total | 300 (100) | 195 (65.0) | 105 (35.0) | | |

Discussion

This study assesses the level of malaria parasitaemia among children between ages 1-5 in Aba, South eastern Nigeria. The study revealed a high level of malaria infection among this vulnerable group. The prevalence of malaria parasitaemia in this group is 65.0%, indicating a frightening malaria situation in the studied area, despite several malaria interventions. Several studies have also shown high parasite infection rate among children in Nigeria. Adeyemo *et al* [15] recorded an infection rate of 80.0% among primary school children in malaria endemic village of Erunmu in south-west Nigeria while Obi *et al* [16] reported 100% infection among children between ages 0-5 years in Ihitte Uboma LGA of Imo State. The study also revealed that more females are infected (68.1%) than males (62.2%). This difference is statistically independent ($P > 0.05$). However, this contradicts the reports of Obi *et al* [16] and Etusim *et al* [17] where the prevalence rate was higher in males than females.

Based on age-related prevalence, children of age 5 were most infected with infection rate of 73.8%. This is followed by children of age 1 and 2 with infection rates of 63.9% and 68.0% respectively. The reasons for higher infection rate among children of age 5 might be that children of this age are more active and exposed more to mosquito bites than those of lower ages. Other reason may include environmental factors and parents' habit in adhering to preventive measures. However, the statistical analysis revealed there is significant difference among the different age groups ($P < 0.05$).

The preventive methods used include insecticide treated bed nets (ITNs), insecticide spray, window/door nets and window/door nets plus indoor spraying. The results revealed that more children were inclined to the use of ITNs compared to other preventive methods. It is important to note that the non-users of the preventive methods recorded the highest infection rate of 92.8%. The infection rate of the users of the preventive methods were lower with the lowest rates of infection obtained from users of ITNs (23.1%) and window/door net plus insecticide spraying (45.0%). The apparent failure of some control measures could be as a result of poor adherence culture on the parts of the parents.

Conclusion

Malaria indeed constitutes a serious public health problem in Nigeria as this study has shown. An infection rate of 65% among these children in spite of the malaria interventions should be worrisome. Despite all the health education programmes available in the hospitals, radio and TV, a worrisome number still neglected the control measures. Cases of malaria infection among this vulnerable group would decrease the more if parents adhere to these preventive measures, particularly; the use of insecticide-treated bed nets (ITNs).

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References

- [1] Greenwood, B.M., Bojang, K., Whitty, C.J., Targett, G.A. Malaria. *Lancet*, vol.365(9469), 2005, pp1487–1498.
- [2] Roll Back Malaria, “The Africa malaria,” 2006, <http://www.rbm.who.int/>.
- [3] Okwa, O.O. The status of malaria among women: a study in Lagos, Nigeria. *Afr J Reprod Health*, vol.7(3), 2003, pp 77-83.
- [4] Natalie, C., Crookston, B., Dearden, K., Gray, B., Ivins, N., Alder, S., Davis R. Who sleep under bednets in Ghana? A doer/non-doer analysis of malaria prevention behaviours. *Malaria Journal*, vol.5, 2006, pp 6. Available at: <http://www.malariajournal.com/content/5/1/66>.
- [5] Yartey J.E. Malaria in pregnancy: access to effective interventions in Africa. *Intl J of Gynae Obs*, vol. 94, 2006, pp364-373.
- [6] WHO. Nigeria Malaria status. *World Malaria Report*, 2008, p99-101.
- [7] Akande, T.M., Musa, I.O. (2005). Epidemiology of Malaria in Africa. *Afri J Clin Experiment*, vol. 9, 2005, pp 107-11.
- [8] Jimoh, A., Sofola, O., Petu, A. and Okorosobo T. Quantifying the economic burden of malaria in Nigeria using the willingness to pay approach. *Cost effectiveness Resour Allocation*, vol. 5(6), 2007, pp 1428-1754.
- [9] WHO. Scaling up Insecticide-treated netting programmes in Africa. *WHO Roll Back Malaria*, 2007, pp 6-18.
- [10] WHO / UNICEF; The Africa Malaria Report for year 2003, 2003; p9-29.
- [11] Federal Ministry of Health (2006). National Health Financing Policy. Federal Ministry of Health, Abuja.
- [12] African Union. Special Summit of African Union on HIV/AIDS, Tuberculosis and Malaria (ATM) Abuja, Nigeria: 2006. May 2–4, Update on Malaria Control in Africa.
- [13] MOH (2006). Proceedings of the National Workshops on the Review of the first five year (2001-2005) and Preparation of the second five year(2006- 2010) National strategic plan for malaria prevention and control in Ethiopia, Federal Demographic Republic of Ethiopia Ministry of Health, Addis Ababa, Ethiopia.

- [14] WHO. Basic Laboratory Methods in Medical Parasitology. Geneva: WHO, 1991.
- [15] Adeyemo, A.A., Olumese, P.E., Amodu, O.K. and Gbadesin, R.A. (1999). Correlates of Hepatomegaly and Splenomegaly among healthy school children in malaria-endemic village. *Nigeria Journal of Paediatrics*, 26 (1): 1-3.
- [16] Obi, R.K., Nwanebu, F.C., Okangba, C.C. and Nwanebu, C.K. Malaria Prevalence in Children under 5 years and Pregnant women attending selected Hospitals in Ihitte Uboma LGA, Imo State, Nigeria. *Nigerian Journal of Parasitology*, vol. 33 (1), 2012, pp 73-76.
- [17] Etusim, P.E., Kalu, C., Nduka, F.O., Kalu, E.C., Melariri, P.E., Nwoke, M. and Aduaka, A.C. Studies on the Prevalence of Malaria Parasite among children with splenomegaly in Aba Metropolis, Abia State, Nigeria. *Journal of Medical and Applied Biosciences*, vol. 5(1), 2003, pp56 - 65