ORIGINAL ARTICLE

SUBCLINICAL MALARIA INFECTION AMONG UNIVERSITY OF MAIDUGURI STUDENTS: PREVALENCE AND PARASITE DENSITY

Adesina O.O

ABSTRACT

Background: Despite several interventions, malaria continues to cause significant morbidity and mortality worldwide. **Objectives:** To determine malaria parasitaemia among apparently healthy university students. **Methodology:** The study was conducted from September 2009 to March 2010 in University of Maiduguri, Borno State. A total of 500 students randomly selected from the residential hostel (public and private hostel) at the university campus were included into the study. The students were both in private and public hostel within the campus. All selected students were undergraduates. Subjects included in the study were those who had not taken malaria medication for at least 3 weeks. Each subject volunteered and gave informed consent through the use of structured questionnaire. **Results:** The age range was17-28years.The overall prevalence of malaria parasitaemia was 17.4% (87/500) and was similar among students resident in both public (16.8%, 67/400) and private hostel (20.0%, 20/100) (p = 0.58). However, the prevalence was significantly higher in age group 17 – 19 years resident in public hostels (43.3%, 26/60) than those resident in private hostels (25.0%, 10/40) (p = 0.007). **Conclusion:** Prophylaxis for malaria in such settings would be an efficient means of preventing symptomatic malaria.

Key words: *Subclinical, Malaria, parasite density, prevalence, students.*

INTRODUCTION

Malaria is the most common parasitic infection in Africa and is the disease of tropics[1]. Over 40% of the world lives in malaria endemic area and it is estimated that 300-500 million cases and 1.5-2.7 million deaths occur each year[2].About 95-99% of the adult population carry the parasite with less than 30% of this number coming down with illness[1].Malaria transmission is not homogeneous through an endemic area but spotty, and depends on two primary factors: location of mosquito breeding sites and clustering of human habitations [3]. Socioeconomic factors such as education, income, housing patterns, social groups ,water storage and treatment seeking behavior play an important role in malaria transmission[4,5].Subclinical Plasmodium appears to be common comprising up to 30% of parasitaemic individuals studied by active surveillance[6].Asymptomatic parasitaemia provides reservoir for transmission and may be a precursor to symptomatic diseases[7]. Asymptomatic parasitaemia, the presence of malaria parasites in the blood in the absence of symptoms is prevalent in highly endemic areas of Africa, reaching over 90% in children with only a small percentage of individuals ever exhibiting clinical symptoms[6]. Available evidence indicates that urbanization is having a significant impact on malaria epidemiology[8]. Formal urban development can typically reduce anopheles mosquito vector densities, but the informal peri-urban settlement found at the edge of many urban centers in sub-Sahara Africa create conditions favourable to anopheline vector breeding[9,10].During the initial stages of their development, this sub-urban slum areas are frequently nothing more than expanded rural areas with mosquito breeding sites essentially unchanged[9,10,]. The control of falciparium malaria is becoming increasingly challenging in many endemic area of the world including Nigeria not only because P. falciparium has developed resistance to commonly used antimalaria drugs but due to individual and household drug use patterns[11,12]. The commonest complaint of students for

Department of Medical Laboratory Science, College of Medical Sciences, University of Maiduguri, Borno State, Nigeria.

Correspondence to:
ADESINA OO
Department of Medical Laboratory Science
College of Medical Sciences, University of Maiduguri
P.O BOX 1079, GPO, Maiduguri
Tel: +2347030543843
Email:yemmyadesina09@yahoo.com

absenteeism has always been malaria as high as 28%[13].It was also reported that Nigeria School children miss an estimated 3-12 school days per year which is 2-6% of school year[14]. Although government has extended their good gestures as regards campaign, eradication and using malaria control programme for pregnant women and children of pre-school age[15] this has not extended to our higher institution of learning. The use of both free chemotherapy and insecticide treated nets have not been extended to this community which represents a considerable size of the Nigeria youths. Despite several work done in Maiduguri on malaria, few published reports are available from our tertiary institution.

MATERIAL AND METHODS

The study was conducted from September 2009 to March 2010 in University of Maiduguri, Borno State. The University is the first Federal University representing the North- Eastern part of Nigeria[16]. A total of 500 students randomly selected from the residential hostel (public and private hostel) at the university campus were included into the study. The students were both in private and public hostel within the campus. All selected students belong to different ethnic groups and were all undergraduates. The subjects recruited into the study include ages17-28years. Subjects included in the study were those who had not taken malaria medication for at least 3 weeks. Each subject volunteered and gave informed consent through the use of structured questionnaire.

Thin and thick films were prepared by pricking the finger aseptically with lancet. Two drops of blood were placed on the 76mm x 25mm microscope slide and thick smear made. The smears were air dried and stained with 10% Giemsa stain solution. It was washed and viewed under the microscope using oil immersion magnification. Thin smears were made, fixed in methanol before staining in the same concentration of Giemsa stain. A positive and negative smear was included with each new batch of working Giemsa stain. The stained smears were first examined at low magnification (10× and 40×) objectives lens to detect large parasites such as microfilaria and also examined using 100x oil immersion. The parasite densities obtained were reported as a ratio of parasite against WBCs from thick smears assuming the leukocyte count of 8000 cells/µl. For positive smears, parasites were counted against 500 WBCs according to Greenwood and Armstrong[17].

The parasite densities were calculated as follows:

$$\frac{\text{Number of parasite}}{\text{Number of WBC}} \times 8000$$

RESULTS

Of the 500 subjects enrolled in the study, 400 (80.0%) were from public hostel while 100 (20.0%) were from private hostel (Table 1). The mean age was 20.5 $\pm$ 4.1 years with age group 20 – 22 years contributing the highest proportion of 52.0% (260/500). Table 2 presents the prevalence of malaria parasitaemia among the enrolled students. The overall prevalence of malaria parasitaemia was 17.4% (87/500) and was similar among students resident in both public (16.8%, 67/400) and private hostel (20.0%, 20/100) ($p = 0.58$). However, the prevalence was significantly higher in age group 17 – 19 years resident in public hostels (43.3%, 26/60) than those resident in private hostels (25.0%, 10/40) ($p = 0.007$). Of the 87 students with peripheral malaria parasitaemia, 57 (65.5%) had parasite density below 1000 asexual parasites (Table 3) indicating relatively low parasite density among the enrolled students. All the 87 subjects with malaria parasitaemia showed no obvious symptoms indicative of malaria.

Table 1. Age distribution of the enrolledSubjects

Age group (years)	Total enrolment (n=500)	Public Hostel enrolment (n=400)	Private hostel enrolment(n=100)
17-19	100	60	40
20-22	260	230	30
23-25	100	80	20
26-28	40	30	10

Table 2. Prevalence of malaria parasitaemia

Age group (years)	Public hostel (%)	Private hostel (%)	P values
17-19	26/60 (43.3)	10/40 (25.0)	0.007
20-22	20/230 (8.7)	5/30 (16.7)	0.09
23-25	16/80 (20.0)	3/20 (15.0)	0.35
26-28	5/30 (16.7)	2/10 (20.0)	0.58
Total	67/400 (16.8)	20/100 (20.0)	0.58

Table 3: Parasite density

Parasitaemia (parasites/µl)	**Public (%)**	**Private (%)**	**Total**	**p-value**
1000	42 (62.7)	15 (75.0)	57	0.067
1000-5000	21 (31.3)	4 (20.0)	25	0.074
>5000	4 (5.8)	1 (5.0)	5	0.756

DISCUSSION

Subclinical malaria parasitaemia is the presence of malaria parasites in blood in the absence of symptoms[16]. Morbidity and mortality due to malaria have been increasing due to deterioration in health system, insecticide resistance, periodic changes in weather pattern, human migration and population displacement.

From this study, the prevalence rate of subclinical malaria is 17.4%. The overall prevalence of 17.4% is similar to 17% previously reported in children[18].Although, Ntoumi,et al[19], found that asymptomatism was age dependent and that age increase was associated with decrease parasite load and complexity of infection.

The prevalence rate obtained from this study during rainy season is lower when compared with similar work done during rainy season by Fernando et al in Senegal[20] with prevalence rate of 77% and 83.3% in a similar work conducted by Omolade et al[21] and Annon, 2003 [22] in southern part of Nigeria. The result obtained reflected longer rainy season in their region as compared to our study center. The study was carried out in the rainy season [May-June] when there are more breeding sites of mosquitoes and these could lead to high peak transmission. This no doubt had contributed to the high prevalence of malaria (83.3%) among asymptomatic students in their study. In Nigeria, the epidemiology of malaria is relatively uniform throughout the year, but sometimes high at the rainy season as reported

earlier[22,23]. The transmission of this parasite in our study center could be influenced by socio-economic and cultural factors when considering hostel location and its structure with mixed joint family system which play a vital role in influencing susceptibility to infection carrier. From our study as supported by Carter et al,[24] that malaria transmission is not homogenous through an endemic area but spotty and depends on two primary factors: location of the breeding sites and clustering of human habitations where people serving as reservoirs of parasites for mosquitoes live.[3]. From our study sites ,there is poor or inadequate drainage system, no kitchen, overpopulation in both hostel with ratio 6 to 8 student per public and private hostel respectively thus making use of mosquitoe net as preventive measure is cumbersome; an observation also made by Onwujekwe and others about malaria even among students[25] .Thus vector control is an intervention measure that can be used to limit the spread of malaria in a community and should therefore be considered as an adjunct to chemotherapy[24]. Also, mixed joint family system in the community studied representing six North Eastern geopolitical states can influence susceptibility to infection due to variation in adaptability to socio economic factors like low economic status.[12],poor spacing, poor drainage system [6,7]which encourage breeding of the various stages of mosquitoes. There was no significant difference in the overall subclinical malaria parasitaemia in both hostels. This finding is attributed to similar socioeconomic conditions. Similarly there is no significant difference in age distribution except in subject enrolled within age 17-19 which shows that age prevalence rate is higher in public hostel compared to private hostel among students of that age limit. Although,Ntoumi et al[19], in their findings reported an association of age with parasite load; they further argued that ,asymptomatism was age dependent and that age increase was associated with decrease parasite load and complexity of infection. They opined that they could have been exposed to the environment for a longer time and better immuned. There is no significant difference in distribution of parasite density in malaria positive subjects in our study.

In conclusion, there is a high prevalence of subclinical malaria in this locality as reflected by the high malaria parasitaemia among university students. This could impact negatively on the health of this population.

Improving hygienic conditions and periodic insecticides spray in both hostels can go a long way in reducing the prevalence of subclinical malaria and indirectly symptomatic malaria.

ACKNOWLEDGEMENT

We acknowledged the staff and students who participated during the study period. We commend their cooperation.

REFERENCES

1.World Health Organisation. World Malaria situation in 1994.Parts 1-111.Weekly Epidemiol Rec 1997:72:269-90

2. Odutola ,A.Report on Roll back Malaria Summit Held in Abuja , Nigeria April 24-25,2000. 2005.Available from URL; http://www.afronets.org/achieve/200006/msg00023.php.accessed 20th August 2011

3. Carter R,Mendis KN, Roberts D. Spatial targeting of interventions against malaria. Bulletin of the WHO 2000: 78:140-1411.

4. Okeyere A,Kwando N.Socioeconomic factors in Malaria control ,World Health Forum 1994:15:265-267

5. Coker HAB, Chukwani CM,I fudu ND, Aina BA .The malaria Scourge: Concepts in disease management .Nigeria Journal of Pharmacology 2001; 32: 19-46.

6.Bottius E, Guanzirolli A ,Trape J-F, Rogier C, Konate L, Druilhe P. Malaria: even more chronic in nature than previously thought : evidence for subpatent parasitaemia detectable by Polymerase chain reaction. Trans R soc Trop Med Hyg 1996:90: 15-19.

7. Farnert A, Arez AP, Correia AT, Bjorkman A, Snounou G and Do Rosario V. Sampling and storage of blood and the detection of malaria parasites by PCR. Transactions of the royal Society of Tropical Medicine and Hygiene 1999:93,50-53.

8.Community and household assessment of malaria prevention in Eastern province Zambia:Summary of findings on knowledge, attitudes , behaviours,practices.Environmental Health project Bulletin 1999.

9.McMichael AJ, Haines A,Sloof R,Kovats S (eds). Climates Change and human health .WHO, Geneva 1996.

10.Centre for health policy and strategic studies Bulletin, Lagos 2002.

11.Ademowo OG, Falusi AG, Mewoyeka O.O. Prevalence of asymptomatic parasitaemia in an urban and rural community in West Africa. Cent Afri J Med 1995:41(12):411-2.11.

12.Camargo LMA, Norrlia E, Villalobos Sakedo JM,Dutra AP, Krieger H, da Silva LHP, et al. The epidemiology of malaria in Rondonia(Western Amazon region ,Brazil): Study of a riverine population. Acta Tropica 1999:72:1-11.

13.Najera J.A,Hempel J: The burden of malaria CTD/Mal 2006:196.10.pp35.

14.Leighton C,Foster R. Economic impact of malaria in Kenya and Nigeria .Applied Reasearch paper No 6.Abt Associates inc. In collaboration with vector Biology Control project.J Medical Services Coorporation International. 1993.

15. Murmur, M.A., Hafeez,R.S, Solongi,SM and Dil.A.S. Insecticides impregnated bed nets provide protection against malaria.Pak.J.Med. Res. 1995;34(3): 34-35

16. Willhelm S. Malaria. Annals of Borno 1983:l(1) pp5-15.

17. Greenwood BM, Armstrong JRM. Comparison of two simple methods for determining malaria parasite density. Trans R Soc Trop Med Hyg 1991; 85:186-188.

18. DeniseN.M, Moses R, K,Grant D. Asymptomatic parasitaemia as a risk factor for symptomatic malaria in a cohort of Uganda children.J .Trop Med and Intern.Health 2004; 9(8): 862-864.

19.Ntoumi F, Contamin H,Rogier C,Bonnefoy S,Trape J and Odile M.P: Age dependent carriage of multiple plasmodium falciparium merozoite surface antigen-2 alleles in asymptomatic malaria infections.Am.J.Trop. Med. 1995;52(1) 81-88.

20. Fernado SD, Gunawardena DM, Bandara D,Desilva R,Carter KN,Mendis KN, et al. The impact of repeated malaria attacks on the school performance of children. Am.J.Trop. Med.Hyg. 2003;69(6):582-588

21.Omolade O,Okwa, Adejoke CI.The malaria situation, perception of cause and treatment in a Nigeria University 2010;

22. Annon.Africa Malaria Report. Executive Survey on Malaria http:/www.rsm .who. int.2003

23. Elzubier AG,Ansari EHH,Nur EIMH. Knowledge and misconception of Malaria among secondary school students in Kassala, Eastern Sudan J.Roy.Soc.Prom.Health 1997;117(6) 381-385

24.Carter R ,Mendis KN,Roberts D.Spatial targeting of interventions against malaria. Bulletin of the WHO. 2000;78:1401-1411.

25.Onwujekwu O, Hanson K, Fox-Rushby J. Inequalities in purchase of mosquito nets and willingness to pay for insecticides treated nets in Nigeria: Challenges for malaria control interventions.Malaria J 2004;.3:6

Cite this article as: Adesina O.O. Subclinical Malaria Infection among University of Maiduguri Students: Prevalence and Parasite Density. Bo Med J 2013;10(1):6-11