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 was 17-28 years. 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. 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. About 95-99% of the adult population carry the parasite with less than 30% of this number coming down with illness. 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. Socioeconomic factors such as education, income, housing patterns, social groups, water storage and treatment seeking behavior play an important role in malaria transmission. Subclinical Plasmodium appears to be common comprising up to 30% of parasitaemic individuals studied by active surveillance. Asymptomatic parasitaemia provides reservoir for transmission and may be a precursor to symptomatic diseases. 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. Available evidence indicates that urbanization is having a significant impact on malaria epidemiology. 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-Saharan Africa create conditions favourable to anopheline vector breeding. During the initial stages of their development, this suburban slum areas are frequently nothing more than expanded rural areas with mosquito breeding sites essentially unchanged. The control of falciparium malaria is becoming increasingly challenging in many endemic area of the world including Nigerian not only because P. falciparium has developed resistance to commonly used antimalaria drugs but due to individual and household drug use patterns. The commonest complaint of students for
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absenteeism has always been malaria as high as 28%\textsuperscript{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\textsuperscript{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\textsuperscript{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\textsuperscript{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 ages 17-28 years. 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 100× 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\textsuperscript{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 ± 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 enrolled Subjects

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Total enrolment (n=500)</th>
<th>Public Hostel enrolment (n=400)</th>
<th>Private host enrolment(n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-19</td>
<td>100</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>20-22</td>
<td>260</td>
<td>230</td>
<td>30</td>
</tr>
<tr>
<td>23-25</td>
<td>100</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>26-28</td>
<td>40</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2. Prevalence of malaria parasitaemia

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

Table 3: Parasite density

<table>
<thead>
<tr>
<th>Parasitaemia (parasites/µl)</th>
<th>Public (%)</th>
<th>Private (%)</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>42 (62.7)</td>
<td>15 (75.0)</td>
<td>57</td>
<td>0.067</td>
</tr>
<tr>
<td>1000-5000</td>
<td>21 (31.3)</td>
<td>4 (20.0)</td>
<td>25</td>
<td>0.074</td>
</tr>
<tr>
<td>&gt;5000</td>
<td>4 (5.8)</td>
<td>1 (5.0)</td>
<td>5</td>
<td>0.756</td>
</tr>
</tbody>
</table>

DISCUSSION

Subclinical malaria parasitaemia is the presence of malaria parasites in blood in the absence of symptoms\(^6\). 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\(^8\). Although, Ntoumi, et al\(^9\) found that asymptomatic 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\textsuperscript{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,\textsuperscript{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.\textsuperscript{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 mosquito net as preventive measure is cumbersome; an observation also made by Onwujekwe and others about malaria even among students\textsuperscript{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\textsuperscript{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,\textsuperscript{12} poor spacing, poor drainage system,\textsuperscript{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\textsuperscript{19}, in their findings reported an association of age with parasite load; they further argued that, asymptomatic 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.

\section*{ACKNOWLEDGEMENT}

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\section*{REFERENCES}

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