Prevalence of Yellow Fever Vectors in the Forested area of Bekwarra, Southern Nigeria

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Abstract

The prevalence of yellow fever vectors in the forested area of Bekwarra, Southern Nigeria was carried out from Sep 2013 to Nov 2013. A total of 372 larval species were collected from temporary water habitat in Ukparibu village, Bekwarra, Southern Nigeria. Out of the 372 larval species collected, 332(88.70%) were Aedes sp. and 42(11.29%) were Culex sp. while the adult mosquito species collected from various locations, in Ukparibu village of Bekwarra, 233(54.95%) were Aedes sp., 10(2.36%) were Culex sp. and 172(40.33%) were Anopheles sp. These mosquitoes are vectors of different parasites responsible for diseases in humans and animals. Species of Anopheles observed are important vectors of malaria parasite Plasmodium sp. Species of Aedes observed are important vector of yellow fever virus. Other side of the Africa, species of Aedes is responsible for dengue fever. Other species observed was Culex which is also a disease vector of encephalitis, except Culex titrips which is not important in disease transmission. The distribution of these mosquitoes and the species is affected by temperature fluctuation and availability of breeding site and host.

Keywords: Prevalence, yellow fever, Bekwarra, Anopheles, Aedes, Culex, disease transmission.

Introduction

Malaria remains an important public health parasitic disease in both tropical and subtropical countries in Africa where, it is mostly seasonal with its major incidence occurring in the rainy season (Oesterholt et al., 2006). Despite decades of control efforts, malaria continues to be a major public health concern throughout the world. It is estimated that there are 300-500 million new cases every year, with 1.5 to 2.7 million deaths worldwide particularly in Africa (WHO, 1992) where about 90% of the global cases are recorded (Breman et al., 2004). Children under five years and pregnant women are affected most (WHO, 2008). In Nigeria, the risk of malaria infection exists throughout the country. Malaria is endemic and stable, being a major cause of morbidity and mortality, resulting in 25% infant and 30% childhood mortality (FMH, 2005a). More than 90% of the total population is at risk of malaria and at least 50% of the population suffers from at least one episode of malaria each year. Beyond the impact on children and pregnant women, it affects the general population (RBM, 2005; FHM, 2005b). The disease is the commonest cause of outpatient attendance across all age groups with about 66% of clinic attendance due to malaria (FMH, 2000) and thus, constituting a great burden on the already depressed economy. The enormous loss of life, days of labour, absenteeism in schools and cost of treatment of patients brought on by malaria make it a major social and economic burden in Nigeria.

Malaria parasites, Plasmodium sp. are generally transmitted by female Anopheles mosquitoes. The prevalence, intensity and regularity of malaria differ from location to location depending on factors such as rainfall patterns and proximity of human dwelling places to vector breeding sites among others (Onyido et al., 2009a). Anopheles gambiae, the principal transmitter of malaria in Nigeria is closely associated with sunlit water collections close to human dwellings while A. funestus, another important malaria vector tends to breed more in cool, clear, shaded, permanent water bodies in rural areas relatively undisturbed by man (Onyido et al., 2009b). Yellow fever occurs only in Africa and South America, sporadic infection occurs almost exclusively in forestry and agricultural workers due to occupational exposure in or near forest (Okon and Asor, 2003). Several studies on the pattern of yellow fever in Nigeria have been carried out but these were mostly concentrated in urban and sub-urban communities than in rural communities (Aribodor et al., 2003). This study is intended to extend and intensify research on yellow fever among rural dwellers that are mostly at risk. Specifically the study is carried out in the rural community of Ukparibu village in Bekwarra Local Government Area of Cross River State. The objective of this study is to determine prevalence of yellow fever vectors in the forested area Ukparibu village, Bekwarra local Government Area.
Table 1. Summary of larval species collected from temporal water habitat in various locations of Ukparibu village, Bekwarra during the study period (Sep 2013 to Nov 2013).

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Locations</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Tree holes around forest edge</td>
</tr>
<tr>
<td>Months</td>
<td>Sep 2013</td>
</tr>
<tr>
<td>Period of sampling of larval species</td>
<td>1st week</td>
</tr>
<tr>
<td>Aedes aegypti</td>
<td>60</td>
</tr>
<tr>
<td>Culex sp.</td>
<td>20</td>
</tr>
<tr>
<td>Aedes simpsoni</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
</tr>
</tbody>
</table>

Table 2. Prevalence of adult mosquito species in various locations of Ukparibu village, Bekwarra during the study period (Sep 2013 to Nov 2013).

<table>
<thead>
<tr>
<th>Habitat</th>
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<tr>
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<td>Period of sampling of larval species</td>
<td>1st week</td>
</tr>
<tr>
<td>Aedes aegypti</td>
<td>-</td>
</tr>
<tr>
<td>Culex sp.</td>
<td>-</td>
</tr>
<tr>
<td>Aedes simpsoni</td>
<td>33</td>
</tr>
<tr>
<td>Anopheles sp.</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

Materials and methods

Description of study area: This study was carried out in Ukparibu village of Bekwarra located in the northern Cross River State, Nigeria with the longitude of $6^\circ41^\prime38N$, $8^\circ58^\prime3E$ and latitude $6^\circ69^\prime89N$, $8^\circ96^\prime50E$. It has an area of 306 km² and a population of 105,822 at the 2006 census.

Collection of mosquito larvae: The larval sampling of all accessible breeding sites was carried out in Ukparibu village, Bekwarra, bi-weekly between 7.00 am to 11.00 am for three months (Sep 2013 to Nov 2013). The breeding sites were grouped into five: tree hole around forest edge, abandoned pot around home and rock pool within the forested area. The mosquito larvae were collected with plastic scoopers and sieves of about 0.55 mm mesh-size into labeled containers and transferred to the laboratory for analysis.

Larval identification: All larvae collected were identified with the aid of dissecting microscope using the keys described by Gillett (1972). Some larvae were allowed to emerge into adult inside mosquito cage and identified using the keys described by Gillett (1972).

Experimental procedure: Adult mosquitoes within human home were killed using sheltox insecticides. This was done during the day and repeated at night. All mosquitoes found on the ground were carefully picked with the aid of forceps into specimen bottles containing 70% ethanol for preservation.

All the mosquitoes caught from all the locations were put in their individual specimen bottle and marked by its respective site code.

Data analysis: The data generated from this study were subjected to factorial experiment, using the randomized completely blocked design (RCBD) to evaluate whether or not there were associations between the prevalence of yellow vectors and the subjects’ variables. GenStat computer software (Version 4 Edition) was used for this analysis. Confidence level was set at P<0.05.

Results
Summary of the larval species collected from temporal water habitat and various adult mosquito vectors encountered at the different sampling locations is presented in Table 1 and 2 while the illustration in Fig. 1 shows the prevalence of adult mosquito species in Ukparibu village, Bekwarra, Southern Nigeria. A total of 372 larval species were caught in temporary water habitat in Ukparibu village, Bekwarra, Southern Nigeria. Anopheles sp. accounted for the highest prevalence (88.79%) followed by Culex sp. accounted for the lowest prevalence (11.29%) by number. A total of 424 adult mosquito species was also caught in the various locations in Ukparibu village. Aedes sp. accounted for the highest prevalence (54.95%) followed by Anopheles sp. and Culex sp. accounted for 2.36%. The species of mosquito caught in these areas were the same in larval species, except Anopheles sp., this was identified in adult species but was not found in larval species.
There was a significant difference between the number of larval and adult species (P<0.05) caught during the study.

Discussion
From this study, it was observed that 330(88.70%) and 42(11.29%) larval species were caught from temporary water habitating Ukparibu village in Bekwarra, southern Nigeria. In the temporary water habitat, out of 330(88.71%) larvae caught, 197(52.96%) were found to be Aedes aegypti, while 133(35.75%) were A. simpsoni and 42(11.27%) was Culex sp. The number of Culex larvae species was scanty compared to the numbers of Aedes seen. The larvae species found in temporary water habitat are domestic species, that breed in or near houses. The two species are important vectors of yellow fever and Wuchereria bancrofti, a filarial responsible for lymphatic filariasis. In the second experiment, larval sample were not collected and identified as in experiment one rather adult mosquito species were caught from various locations. In this experiment, it was observed that the adult mosquito species caught were the same species found in larval species of experiment one except Anopheles which was not found in larvae sample. Total of 424 adult species were observed, 110(25.94%) were Aedes aegypti, 133(31.37%) were A. simpsoni, 10(2.36%) were Culex sp. and 171(40.33%) were Anopheles sp. This study confirms the presence of Culex and Anopheles species are capable of transmitting malaria around Ukparibu village, Bekwarra. The predominance of the most efficient vector of malaria in this study is consistent with available data (Alaribe et al., 2003; Okwa et al., 2007). It was also observed that Anopheles sp. which is the main vector of malaria parasite was more populated in living home and its surrounding, where by the female anophelae were gravid and saturated with blood meal in the morning, after night bite. In the aspect temperature fluctuation in Ukparibu village in Bekwarra, the catching increased when the temperature was normal. Ukpariku also have streams and swamps which serve as good breeding sites for mosquitoes.

Studying the effect of temperature on the prevalence of the different species caught, it was observed that at a certain temperature, larval species did not survive at temperature above 44°C and adult species were scanty in their various location, when temperature was below 7°C, this was in accordance with Lardeux and Cheffort (1997) who reported that adult are killed by temperature below freezing point and did not survive well at temperature below 5°C. The relationship between the total number of larvae species and the total number of adult caught was significant during the study period. The high prevalence of Aedes species observed in Ukparibu village, suggest possible transmission of yellow fever and a high prevalence of Anopheles sp. was also observed.

Conclusion
High number of Aedes and Anopheles mosquitoes caught indicate the prevalence of this important vector of yellow fever, lymphatic filariasis and malaria in these areas. Presently, there are surveys on prevalence of yellow fever, lymphatic filariasis and malaria in Cross River State Southern Nigeria, this research can be accepted as a rapid assessment of these diseases in this area for determining its public health importance and subsequent planning of control programme.

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References


