Evaluation of Habitats of Mosquitoes (Culicidae) Larvae in the Gwagwalada Area Council, Federal Capital Territory Abuja

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Abstract: Studies on the evaluation of larval habitats of mosquitoes (culicidae) in selected Communities of Gwagwalada Area Council of Federal Capital Territory, Abuja were carried out from January 2015 to December 2015 using standard entomological procedures at various communities of Dobi, Kutunku, Paiko Kore and Tungamaje. Of the 391 selected potential larval habitats/sites examined 272 breeding were found to contain larvae. The abundance of mosquito larvae in the various breeding habitats were as follows; Gutters (BH1) 528 (30.72%), Ditches/ponds (BH2) 289 (16.81%), Road side pot holes (BH3) 163 (9.48%), Clay pots (BH4) 283 (16.46%), peri-domestic run-off water (BH5) 115 (6.69%), Plastic Containers (BH6) 77 (4.48%), Abandoned tyres (BH7) 207 (12.04%), Metals containers (BH8) 49 (2.85%), Tree holes/leaf axils (BH9) 8 (0.47%) respectively. A total of one thousand seven hundred and nineteen (1719) mosquito larvae were collected and classified into three genera *Aedes* 601 (34.96%), *Anopheles* 309 (17.98%) and *Culex* 809 (47.06%) respectively. The mosquito larval abundance in these study areas were significantly ($P<0.05$) different. The continued presence of *Anopheles* and *Culex* would ensure endemicity of malaria and filariasis in Gwagwalada, while the presence of *Aedes* points towards the potential risks of yellow fever and arbo-virus diseases in the area. The results are discussed and the need for concerted efforts in mosquito control in Gwagwalada is hereby suggested.

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1. Introduction

Mosquito-borne diseases constitute one of the major health problems in Nigeria. Mosquitoes are of great and remarkable importance to the health and economic development of man. They transmit and disseminate both human and animal diseases. Among the public health and veterinary important arthropods, mosquitoes rank first in the spread of such diseases as malaria, yellow fever, filariasis, dengue fever, encephalitis as well as other viral and bacterial diseases (Gillet, 1972; Service, 1980). Apart from disease transmission, mosquitoes are regarded as public enemies because of their biting annoyance, noise nuisance, sleeplessness and allergic reactions due to their bites (Onyido *et al*., 2009).

Mosquito aquatic habitats are often created by human or animal activities where in larvae are found in small depressions including foot or hoof prints, edges of boreholes, burrow pits, road side puddles formed by tyre tracks, irrigation ditches and other artificial bodies of water (Gimnig *et al.*, 2001). Vector control is one of the major elements of the world health Organization (WHO) global mosquito-borne diseases control strategy, that is primarily focused on indoor residual spraying and the use of Insecticide Treated Nets (ITNs), however these control measures have drawbacks including insecticide resistance and difficulties in achieving high coverage (Killeen *et al.,* 2002). Before World War II, source reduction and other anti-larval measures were the main pillars of mosquito borne disease control (Kitron and Spielman, 1989). This control approach has been largely neglected in past decades in Sub-Saharan Africa, partly because of the perceived difficulties in identifying larval habitats especially in rural and difficult to reach areas (Sogoba *et al.,* 2007).

Interest in environmental management of mosquito larval habitats has been rekindled due to the debilitating effects of malaria in tropical Africa (Fillinger *et al.*, 2004). Appropriate management of larval habitats in Sub-Saharan countries, particularly during the dry season may help suppress vector densities and mosquito-borne diseases transmission. Permanent breeding sites during the dry season may serve to seed the additional habitats formed during the rainy season (Lindsay *et al.,* 1991; Killeen *et al.*, 2006). Therefore, dry season larval control might prevent this sharp increase that is in the absence of adult mosquitoes which normally survive the dry season by aestivating and thus play a crucial role in integrated vector control strategy (Fillinger *et al.,* 2004). For instance, source reduction through management of larval habitats had been the key factor in malaria eradication efforts in the United States, Italy and Israel (Kitron and Spielman, 1989).

Suppression and even eradication of malaria in these regions were attributed to effective large scale programmes that targeted the immature vector mosquitoes or reducing the extent of suitable habitats in proximity to vulnerable human populations (Killeen *et al.,* 2002). Therefore, application of larval control approach is considered an effective method of mosquito control and for the campaign to be successful, the types of habitats must be considered. Subsequently the most productive habitat should be given a priority attention.

2. Materials and Methods

The study was carried out in some selected areas of Gwagwalada Area Council, Federal Capital Territory (Abuja) Nigeria. The area is located between latitude $8^0$55'52''N, $9^0$14'34''N and longitude $6^0$51'36''E, $7^0$11'35''E (Balogun, 2001). The whole study area is located within the northern boundary of the Guinea Savannah, the total annual rainfall of approximately 1,650mm per annum. Four settlement areas were randomly selected out of Gwagwalada, these are: Tunganmaje, Poiko Kore, Kutunku and Dobi. Recently, Gwagwalada has witness an influx of people from different parts of Nigeria and beyond due to its proximity to the Abuja the Federal Capital city and the University of Abuja. The influx of people necessitated huge construction activities opening up areas which were hitherto unoccupied. The data were analyzed using the Chi-Square at probability of 0.05. The relative abundance and distribution of the mosquito larvae and species were determined and expressed as percentages of the total. Charts were also used to express some of the observations.

3. Results

The mosquito breeding habitats and abundance in selected areas of Gwagwalada, FCT are presented in figure 1. The number of selected potential larva breeding habitats/sites examined was 391 of which 272 breeding habitats site were found to contain one or more larvae. Within the study areas of Dobi, Kutunku, Poiko Kore and Tunganmaje different types of habitats were identified, the included; Concrete Gutters (BH1) 528 (30.72%), Ditches/ponds (BH2) 289 (16.81%), Road side pot holes (BH3) 163 (9.48%), Clay pots (BH4) 283 (16.46%), Peri-domestic run-off water (BH5) 115 (6.69%), Plastic Containers (BH6) 77 (4.48%), Abandoned types (BH7) 207 (12.04%), Metals containers (BH8) 49 (2.85%), Tree holes/leaf axils (BH9) 8 (0.47%). The result showed that BH1 seems to potentially breed highest proportion of larva among other breeding sites while BH9 had the least numbers of mosquito larvae. There was a significant difference in the diversity of larval habitats of mosquitoes in selected areas P-Value 0.000< 0.05.

The results shown in figure 2 revealed that *Culex* had the highest percentage of occurrence at Dobi 271 (44.21%), Kuntuku 298 (58.32%), Tunganmaje 137 (44.63%) while *Aedes* had the highest percentage of occurrence in Poiko Kore 107 (37.15%). *Culex* was found to be the most abundant species within the four sample locations 809 (47.06%) while *Anopheles* was the least in occurrence 309 (17.98%) there was a significant difference (P-Value 0.000 < 0.05) in the relative abundance and distribution of mosquito larvae within their breading habitats.

The distribution of mosquito species in different breeding habitats Figure 3 shown that *Anopheles* breeds highest numbers of larvae in BH2 (170), *Aedes* had it highest breeding in BH4 (194) and *Culex* in BH1 (410). *Aedes* and *Culex* had their least occurrence in BH9 (0). There was a significant difference (P<0.05) in mosquito breeding and preferred larval habitats in selected areas of Gwagwalada FCT.

The monthly distribution and abundance of mosquito larvae at various study areas is shown in figure 4. The month of July had the highest recorded abundance for the three species of mosquito, *Anopheles* 50 (2.91%), *Culex* 196 (11.60%) and *Aedes* (6.23%) respectively while the least recorded species abundance was noted in the month of January, *Anopheles* 8 (0.47%), *Culex* 20 (1.16%) and *Aedes* 16 (0.93%).

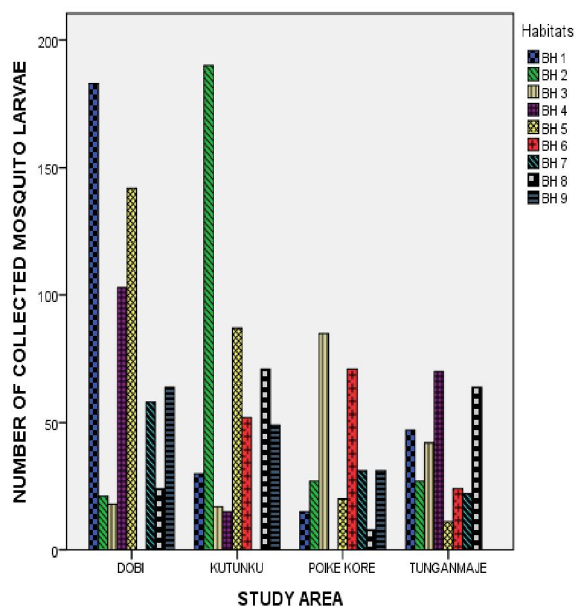

Figure 1: Mosquito breeding habitats and the relative abundance of mosquito larvae in study areas.

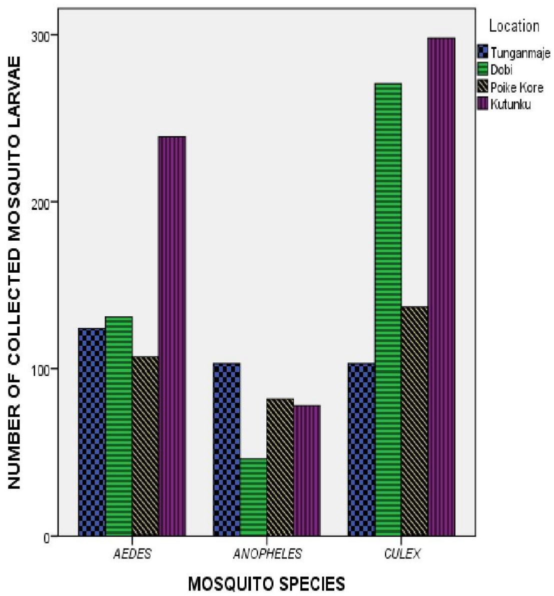

Figure 2: Distribution of mosquito larvae species in selected study areas of Gwagwalada Area Council of FCT.

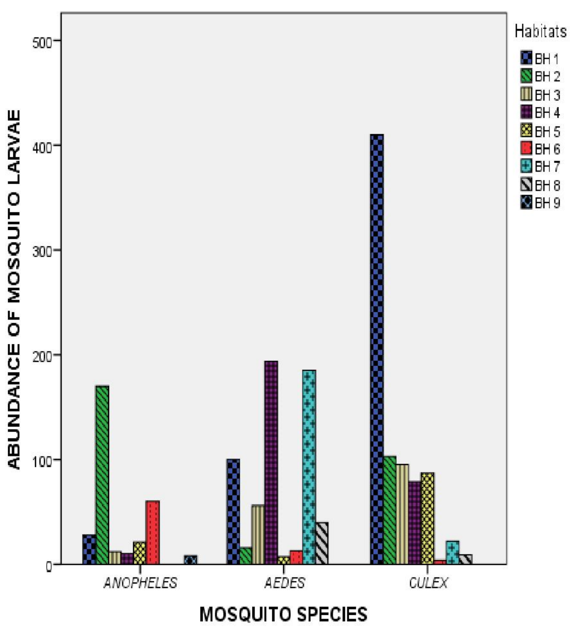

Figure 3: Distribution of mosquito species in different breeding habitats.

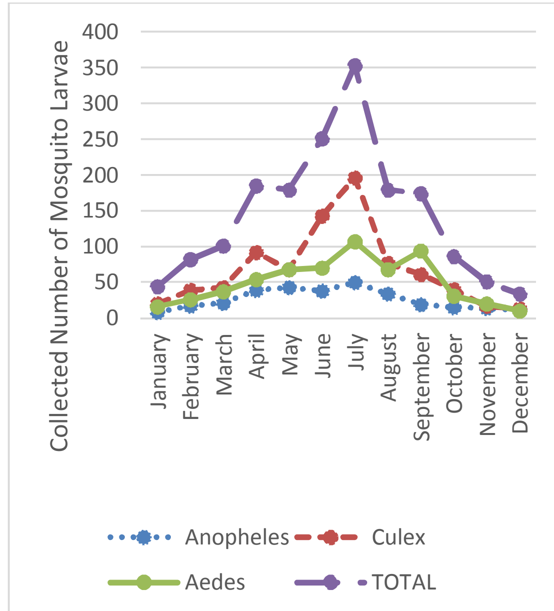

Figure 4: Monthly distribution and abundance of mosquito at various study areas

4.0 Discussion

Mosquitoes use different natural and artificial habitats as sources of water for oviposition and breeding. These breeding sites were numerous in Gwagwalada. This was due to varied human activities, poor economic conditions, abundant numbers of construction sites, poor sanitation level and indiscriminate disposal of discarded household materials. The resultant effect is abundance of ditches/ponds, road side pot holes, clay pots, peri-domestic runoff water, abandoned tyres, water collections in tins, bowls, drums and containers of varying sizes. This observation is in line with the acertions of Mafiana *et al.* (1998). Gwagwalada also lies in the Guinea savanna area of Nigeria, an area that had been described to be conducive for the breeding and survival of mosquitoes of different species (WHO, 1989).

Dobi community had the highest breeding sites with the highest number of larvae collected. This may be as a result of differences in the microhabitat conditions of these study areas. For instance, during the study it was observed that the study areas were low lying, prone to flood waters and had swampy terrain. Dobi and Kutunku study areas also are more of rural settings with inhabitants often keeping water holding vessel around their homes. Due to the swampy terrain of the communities, the grounds were able to retain water for a longer period of time thus serving as breeding sites for mosquitoes. These explain why there were higher numbers of breeding sites recorded in Kutunku. The collection of one thousand seven hundred and nineteen mosquito larvae from different breeding sites in Gwagwalada is an indication of intensive breeding of mosquito in the area as well as preponderance of their breeding sites.

Breeding Habitat type 1 also had the highest larval mean density thereby making it the most preferred breeding habitat in the study areas with about thirty percent of all larvae collected from them, while Breeding Habitat type 9 (tree holes/leaf axils) where least preferred. The breeding habitat choice of mosquitoes was in line with that recorded by Okogun *et al.* (2005), Awolola *et al.* (2005), Oyewole *et al.* (2007), Anosike *et al.* (2007) and Adeleke *et al.* (2008), who observed that domestic containers, gutters and cans were the breeding site of choice by mosquitoes. Mwangangi *et al.* (2007) and Okogun *et al.* (2005) opined that the greater larval density observed in gutters, cans, containers and tyres was due to the absence of or reduced larval predation by mosquito natural enemies in such habitats the result of the present study showed a similar trend.

During the study, three genera of mosquitoes were collected; *Anopheles*, *Aedes* and *Culex* found to breed in a wide variety of habitats. All species of mosquitoes reported in this study had also been reported by different researchers elsewhere in Nigeria (Okorie, 1978; Ezike *et al*., 2001; Aigbodion and Odiachi, 2003; Mbanugo and Okpalaononuju, 2003; Onyido *et al*., 2003, 2009; Ozumba and Nwosu, 2003; Okogun *et al.*, 2005; Anosike *et al*., 2007; Adeleke *et al*., 2008; Adebote *et al*., 2008; Awolola *et al.*, 2005; Oyewole *et al.,* 2007; Abdullahi *et al.*, 2010; Umaru *et al*., 2006 and Oguoma and Ikpeze, 2008).

In conclusion, Increased human development efforts, indiscriminate disposal of tins and cans used for food and procuring cooking ingredients by inhabitants of the town, and a breakdown of public pipe borne water system had caused people to store up water in containers possible responsible accountable for increase in the number of potential breeding sites in the study area. A combination of factors such as abundant rainfall, tropical temperatures and a high relative humidity account for mosquito breeding in both dry and wet periods in the study area. The availability of *Aedes, Culex* and *Anopheles*, which are known vectors of urban yellow fever, lymphatic filariasis and malaria respectively suggest that the residents of Gwagwalada are at risk of mosquito-borne diseases.

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