



Distribution and Abundance of Mosquito Species in Some Selected Study Locations in Gwagwalada Area Council, FCT

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ABSTRACT

A study on the distribution and abundance of mosquitoes as vectors of diseases were investigated in some study locations in Gwagwalada, FCT Abuja, Nigeria between March and December 2018. A total of 1,820 mosquitoes were collected. The mosquitoes comprised of three genera *Anopheles*, *Aedes* and *Culex*. Anopheline mosquitoes collected, were the most abundant followed by *Aedes* and *Culex* respectively. There were significant difference in the relative abundance of mosquitoes with respect to seasons ($P < 0.05$). A number of factors (culture, awareness, proximity to water bodies) appear to be responsible for the abundance of the mosquitoes. The result suggests that concerted efforts should be made by stakeholders at reducing the abundance of mosquitoes as vectors of diseases in these rural locations in order to prevent their occurrence of the diseases they carry.

Keywords: Distribution Abundance, Mosquitoes, Anophelines, *Culex*, Gwagwalada

INTRODUCTION

Mosquitoes posed as nuisance and one the prominent public health menace, because they transmit extremely harmful diseases to humans, such as Mosquito borne diseases, yellow fever and filariasis *Aedes* transmit arboviral infections while *Culex* transmitting bancroftian filariasis (Wikipedia, 2014). They are estimated to transmit diseases to more than 700 million people annually.

Effective transmission of mosquito-borne disease requires successful contact between female mosquitoes and their hosts (Xu *et al.*, 2014). Among Anophelinae, the members of the genus *Anopheles* are best known for their role in transmitting Mosquito borne diseases and filariasis worldwide (WHO, 2013). Of these diseases, Mosquito borne diseases caused by *Plasmodium* parasite is one of the greatest killer diseases in the world (WHO, 2013). WHO (2013) reported an estimated 207 million cases of Mosquito borne diseases in 2012 out of which 200 million cases (80.0 %) were in African continent. The distribution pattern, transmission and intensity of the disease are dependent on the degree of urbanization and the distance from vector breeding sites (CDC, 2015). The endemicity of mosquitoes borne diseases in any region is determined by indigenous mosquitoes, abundance, feeding, resting behavior and their

Plasmodial infectivity, among other factors (Chukwuocha, 2012).

Federal Ministry of Health, Abuja reported that at least 50.0 % of Nigerians suffered from one form of mosquitoes borne diseases or the other making it the most significant health problem in Nigeria (Chukwuocha, 2012). The high transmission rate and prevalence of mosquitoes borne diseases is as a result of the diverse mosquitoes breeding sites, which include practically receptacles that holds water, such as tins, cans, old tyres, tree holes, cisterns, open pools, drainage, stream and pond (Ingstad *et al.*, 2012). Part of the efforts being made is the official commemoration of April 25 every year, starting from 2008 as World Mosquito borne diseases Day (CDC, 2017).

People living in poor rural locations are confronted with a multitude of barriers when assessing mosquitoes borne diseases prevention strategies especially on the knowledge of the biology and ecology of the vectors, among others (Ingstad *et al.*, 2012). The mapping of

Received 3 May, 2020

Accepted 1 July, 2020

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mosquitoes borne diseases is important in the control of Mosquito borne diseases. This is because the species abundance and distribution and other biological parameters of the mosquitoes are poorly known in different ecological zones of Nigeria and in most of the Mosquito borne diseases endemic locations due to the difficulties in the morphological identification of certain complex species, the knowledge of which is required in the design of vector control programmes and in tackling the prevalence of the disease in endemic locations (Awolola *et al.*, 2002).

According to the World Health Organization, Mosquito borne diseases is still the major cause of death in children in sub-Saharan Africa. The disease in this region takes the life of a child every 2 minutes (WHO, 2015).

Therefore, the aim of this study was to determine the distribution and abundance of different mosquitoes in major marshy communities of selected locations within Gwagwalada Area Council, Abuja covering all the seasons of the year.

METHODOLOGY

Study Area

This study was carried out at the Biology laboratory of the Department of Biological Sciences at the University of Abuja, Gwagwalada FCT-Abuja- Nigeria. Gwagwalada is one of the Six municipal Councils of the Federal Capital Territory of Nigeria, together with Abaji, Kuje, Bwari, and Abuja Municipal Area Council (AMAC)

The FCT also includes the City of Abuja. Gwagwalada is the name of the main town within the Area council, which has an area of 1,043 km² and a population of 157,770 as at the 2016 census and is located between latitude 8° 55' and 8° 60' North and 7° 05' and 7° 11' East (Awowole-Browne and Francis, 2017). The major Communities in Gwagwalada Area Council includes Agwandodo, Gwako, Dukpa, Giri and New kutunku, beside one of the tributary stream of river Usuma, which drains through the Town.

Mosquito Sample Collections

Studies in various habitats have demonstrated the distribution and abundance of various mosquito species. They include mosquitoes of

the genera *Anopheles*, *Culex* and *Aedes* (Nwoke *et al.*, 1993). Various mosquito species from these genera are possible vectors of human diseases, including yellow fever, arboviruses in general, Mosquito borne diseases and bancroftian filariasis (Johnson, 1979). Knowledge of the species abundance and disease relationship is of paramount importance in disease forecasting and surveillance. This study is aimed at providing information on the distribution and abundances of the adult female genera of mosquitoes which will serve as an important tool in management.

Laboratory Examination of Mosquitoes

Collected and preserved mosquitoes were brought to the laboratory to be sorted, morphologically identified to species level (Gillies and Coetzee, 1987) before further processing.

Morphological Identification and Sorting of Mosquitoes

The Mosquitoes were identified according to the morphological characteristics of their maxillary palps and identified mosquito genera were sexed based on the presence or absence of plumose (feathery) antennae. The morphological identification of different species of female mosquitoes were done by studying the scales and colour of the palps at the head region, the patterns of spots on the wings, thorax, terminal abdominal segments, scales of the legs using dissecting microscope following the taxonomic keys of (Gillies and Coetzee 1987).

Data Analysis

The data obtained were subjected to descriptive statistics; percentages were calculated and presented in tables. Analysis of variance (ANOVA) was used to determine the significant difference ($p < 0.05$) between mosquito compositions in relation to Study locations using SPSS.

RESULTS

A total of 1820 adult mosquitoes were collected. They were represented by three genera- *Anopheles*, *Aedes* and *Culex*. *Anopheles* was the most abundant of the three genera,

anopheline mosquitoes was 970(47.76%) followed by *Aedes* and *Culex* both having abundances of 640 (37.92%) and 210 (14.32%)

respectively. Result showed that anopheline mosquitoes were more abundant. Of the 2,276 mosquitoes, 1,440 (78.12%) were females while the rest were males. Furthermore, more females than male were recorded in each of the three mosquitoes genera. The mosquito composition and the relative abundance are represented in Table 1.

Table 1 shows the abundance of adult mosquitoes. Result shows that the anopheline mosquitoes were least abundant during the dry seasons and more abundant during the rains. There was a significant difference in the seasonal relative abundance of mosquitoes during the study period that is, ($P < 0.05$).

Table 1: Composition and relative abundance of adult mosquitoes in some study Locations within Gwagwalada Area Council

Species composition of mosquitoes	Relative abundance	Prevalence (%)
<i>Anopheles</i> spp	970	53.3
<i>Aedes</i> spp	640	35.16
<i>Culex</i> Spp	210	11.54
Total	1,820	100

DISCUSSION

The distribution and abundance of *mosquito* species in Gwagwalada Area Council could be attributed to a number of factors, one of which is that some communities in Gwagwalada Area are located along the bank of River Usuma and experiences seasonal flooding which usually provides favourable temporary and permanent breeding sites for Mosquitoes and the area being also located with ambient temperature that favours larval development (Ishaya, 2007).

The predominance of mosquitoes is in line with the findings of Aju-Ameh *et al.* (2016) in Benue state and that of Oduola *et al.* (2016) in Kwara State and the occurrence of *Anophel*as Mosquitoes as a major mosquitoes *spp* in this study is similar to findings of Anosike *et al.* (2007) in Imo state. The abundance of these species of mosquitoes is attributed to the fact that these mosquito species are associated with human dwellings with indoor resting habits and the species are mainly anthropophilic (Oyewole *et al.*, 2005). *Culex* was the least abundant;

perhaps it is more common in humid zone of the study area (Gimba and Idris H.S 2014).

The distribution of mosquito *spp* in relation to the seasons of the year showed variations, although, it did not appear to follow a particular pattern, it was observed to be generally low in dry season in all the study locations when most of the temporary habitats dried out which is in line with findings of (Bagoro *et al.*, 2014).

In New kutunku, the mosquitoes species peaked at the end of dry season and at the onset of mosquito wet season and the least was at the end of wet season and in dry months. In Anguwan dodo, the *mosquito* species population was highest in the middle of wet season but lowest in the end of wet season and dry months. The highest peaks of the female mosquitoes species in February and the smallest peaks during September, as observed in New kutunku study area was in line with findings of (Bagoro *et al.*, 2014). Combination of trends of mosquitoes abundance in both New Kutunku and Anguwan dodo was observed in Dukpa in which *Anopheles* species, had the highest population observed in some dry months and in the middle of wet months and the lowest at the end of wet months.

The fact that the mosquito abundance coincides to a great extent with period of rainfall is an indication that rainfall plays significant role in mosquito population dynamics. This implies that in all the study locations, abundant rainfall and duration, temperature and relative humidity are factors that determine abundance of mosquitoes due to availability of breeding sites which may be (permanent or temporary or both) throughout the year. Increase in human development, activities like construction and agricultural activities generate diverse larval habitats which account for mosquito abundance in the study locations. This is similar to findings by Lamidi (2009) in Sahel region of Nigeria. Ototo *et al.* (2015) had earlier reported that human activities and behaviours of mosquito of different species affected the population of indoor-resting mosquitoes, among which are exposures of mosquitoes to insecticides, use of insecticide treated bed net and exophilic/endophilic behaviours of mosquitoes. However in some cases it was observed generally that the distribution and abundance of mosquito was not strongly dependent on rainfall as in Kwara State Oduola *et al.*, (2016) where

the mosquito peaked in April and as was generally observed in this study.

Relative Abundance of sympatric relationships occurrence in this study which is in line with findings of Ebenezer *et al.* (2014) and Oduola *et al.* (2016).

This finding is a foremost showing species composition and abundance of Mosquitoes and their genetic variants is based on seasons and locations not only in Gwagwalada, but generally in Nigeria. In the three study locations, only *Anopheles genera* were common to all study locations.

The abundant occurrence of in the study locations suggests restricted gene flow and therefore very high degree of reproductive isolation between the species as also found in Ibadan by Okorie *et al.* (2015) with 0.5% occurrence among other Mosquitoes species.

Conclusion

Three genera of mosquito species were identified in this study, (*Anopheles Spp, Aedes and Culex*) of which are very important vectors of mosquito borne diseases in Nigeria. This information calls for all stakeholders involved in the concerted effort of Mosquito borne diseases vector control to pay special attention to the rural locations in order to come up with measures that will ensure little risk of exposure to mosquito borne related diseases.

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