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Mosquito Genera in Prince Abubakar Audu University, Anyigba, Kogi State, North Central Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors GUA and JCO designed the study, carried out the field and the laboratory analyses of the study. Authors JCO performed the statistical analysis, wrote and proof-read the manuscript. Authors JI, CAI, JUK, OPO, CUU and JTH managed the literature searches and wrote the protocols. All authors thoroughly proof read and approved the final manuscript.

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ABSTRACT

This study was focused on the determination of mosquito genera at Prince Abubakar Audu University, Anyigba, Kogi State, North Central Nigeria. Mosquitoes were collected for four weeks (4) on a weekly basis indoors at dawn from the female hostel of Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria. Samples were collected from three different blocks (A, B, and C) of the study area. The samples were identified clearly based on their visible morphological features up to genus levels using routine methods. The data obtained from the study was analyzed using an SPSS version 21.0 for windows. Analysis of variance was used to test for significant difference in the abundance of mosquitoes' genera between weeks and blocks. The resulting outputs were presented in tables. The weekly mosquito genera and relative abundance in block A of the study

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area showed that the total mosquito genera recorded were *Anopheles* 72 (40%), *Culex* 73 (40.6%), and *Aedes* 35 (19.4%). Mosquitoes were most abundant in week 4 (31.1%) and least abundant in week 1 (18.9%) in block A of the study area, which were statistically significant at $P < 0.05$. The weekly mosquito genera and relative abundance in block B of the study area showed that the total mosquito genera recorded were *Anopheles* 71 (39.7%), *Culex* 73 (40.8%), and *Aedes* 35 (19.6%). Mosquitoes were most abundant in week 4 (30.2%) and least abundant in week 1 (21.2%) in block B of the study area ($P < 0.05$). The weekly mosquito genera and relative abundance in block C of the study area showed that the total mosquito genera recorded were *Anopheles* 47 (37.6%), *Culex* 45 (36%), and *Aedes* 33 (26.4%). Mosquitoes were most abundant in week 1 (25.6%) and least abundant in week 2 (21.6%) in block C of the study area ($P < 0.05$). The total number of *Anopheles* in the study area was 190 (40.9%), followed by *Culex* at 181 (39%) and *Aedes* at 93 (20%). The most abundant mosquito genera were *Anopheles* and the least were *Aedes ($P < 0.05$)*. The number of *Anopheles*, *Culex*, and *Aedes* species observed in this study is of grave epidemiological apprehension for the university community. Consequently, public health education on mosquito control is urgently needed.

Keywords: Mosquito; genera; Anopheles; Culex; Aedes.

1. INTRODUCTION

Mosquitoes are slender and fairly small insects, typically about 3–6 mm in length. Nevertheless, a lot of species can be as small as 2 mm, while many might be as long as 19 mm [1]. The lengthy antennae have several whorls of hair, short in the females but long and bushy in the males. In a lot of mosquito species, the mouthparts of the female are long and modified for piercing and sucking blood, whereas the males feed on nectar as they have basic mouthparts. Females feed on the blood of warm-blooded animals. Once they bite, they introduce some of their salivary fluid into the wound, producing swelling and irritation. Many mosquitos transmit infectious microorganisms and parasites that cause diseases like yellow fever, malaria, dengue, and filariasis [2]. There are about 3300 species of mosquitoes belonging to 41 genera, all confined to the family Culicidae [1]. This family is divided into three sub-families: Toxorhynchitinae, Anophelinae, and Culicinae. Mosquitoes have a global spread; they are seen all over the tropics, temperate zones, and extend northward to the Arctic Circle. The single areas where they are absent are Antarctica and some islands; they are seen at altitudes of 5500m and at depths of 1250m beneath sea level [1]. The major vector genera are *Anopheles, Culex, Aedes, Ochlerotatus, Psorophora, Haemagogus* and *Sabethes*. *Anopheles* species transmit malaria and filariasis and a few arbo-viruses, whereas many *Culex* species transfer *Wuchereria bancrofti* and different arbo-viruses. *Aedes* species are vital vectors of yellow fever, dengue, encephalitis viruses and some other arbo-viruses. Species in the very closely related genus *Ochlerotatus* likewise transmit filariasis and some encephalitis viruses [3]. *Mansonia* species spread *Brugia malayi*, and occasionally *Wuchereria bancrofti*, and a few arbo-viruses. *Haemagogus* and *Sabethes* mosquitoes are vectors of yellow fever and a few other arbo-viruses in America, while *Psorophora* contains some difficult pest species in America and transmits a few arbo-viruses [1]. Most species, though not carriers of some diseases, can nonetheless be troublesome due to the severe biting irritations they cause. Mosquitoes have come to be recognized by humans, predominantly in homes, because of their bites, which provoke the production of antibodies. They are able to cause sharp-pains with certain allergic tendencies, though they also cause nuisance by causing uneasiness to their hosts as a result of the irritating sounds they make, especially at night [4]. Mosquitoes are extensively spread because of their high adaptability, higher reproductive rate, and wings that enable them to travel long distances. Mosquitoes lay their eggs in locations where there is stagnant water [2]. Mosquitoes are malicious biters, and their bites create biting nuisance, allergies, skin reactions, scratching, restiveness, and wakeful nights [3]. Mosquitoes have continued to be the main vector of killer diseases globally, and Nigeria is not an exclusion. Nevertheless, they play a major ecological role as their larvae, pupae, and adults are vital food supplies for insects, fishes, bats, birds, bats, and frogs [5]. Given the epidemiological importance of mosquito species as vectors of a lot of diseases, this study was designed to determine the mosquito genera at Prince Abubakar Audu University, Anyigba, Kogi State.

2. MATERIALS AND METHODS

2.1 Study Area

Anyigba is a town in the Dekina Local Government Area in Kogi State, Nigeria (Fig. 1). It is situated between latitudes 7o15N and 7o29N and longitudes 7o11E and 735E, with an average elevation of 385 meters above sea level (Fig. 1). Anyigba has a total land mass area of 420 sq. km with an estimated population of 189,976 [6]. Anyigba town is characterized by the wet and dry seasons. The wet season begins in April and ends in October, while the dry season starts in November and ends in March. Agriculture is the main occupation of the people in this town because they are blessed with vast arable land [7]. Their main agricultural activities include peanuts, millet, rice, cowpeas, cotton, and palm oil farming, plus livestock such as domestic birds, fowls, cattle, and goats.

2.2 Mosquito Collection

Mosquitoes were collected for four weeks (4) on a weekly basis indoors at dawn from the female hostel of Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria. The spray catch involved the use of insecticide (Mortein), sprayed in the room, and after 10–15 minutes, adult mosquitoes were collected on a white cloth spread on the floor. Samples were collected from three different blocks (A, B, and C) of the study area. They were later placed on a petri dish which was labelled according to the blocks they were collected. The samples were later taken to the laboratory, examined with the aid of a microscope, and identified. The samples were identified clearly based on their visible features of morphology up to genus levels [8].

2.3 Statistical Analysis

The data obtained from the study was analyzed using an SPSS version 21.0 for windows. Analysis of variance (ANOVA) was used to test for significant difference in the abundance of mosquitoes' genera between weeks and blocks. The resulting output was presented in tables.

3. RESULT

Table 1 below shows the weekly mosquito genera and relative abundance in block A of the study area. In week 1, mosquito abundance was recorded in this study at 34 (18.9%). The mosquito genera recorded were *Anopheles* 34, *Culex* 6, and *Aedes* 8. Similarly, in week 2, mosquito abundance was recorded at 41 (22.8%). The mosquito genera recorded were *Anopheles* 15, *Culex* 15, and *Aedes* 11. Also, for week 3, the mosquito abundance recorded was 49 (27.2%). The mosquito genera recorded were *Anopheles* 19, *Culex* 24, and *Aedes* 6 (Table 1). Finally, for week 4, the mosquito abundance recorded was 56 (31.1%). The mosquito genera recorded were *Anopheles* 18, *Culex* 28, and *Aedes* 10. Mosquitoes were most abundant in week 4 (31.1%) and least abundant in week 1 (18.9%) in block A of the study area which were statistically significant at $P < 0.05$. Overall, in block A, the mosquito genera recorded were *Anopheles* 72 (40%), *Culex* 73 (40.6%), and *Aedes* 35 (19.4%) and were statistically significant at $P < 0.05$.

Table 2 below shows the weekly mosquito genera and relative abundance in block B of the study area. In week 1, mosquito abundance was recorded in this study at 38 (21.2%). The mosquito genera recorded were *Anopheles* 16, *Culex* 20, and *Aedes* 2. Similarly, in week 2, mosquito abundance was recorded at 45 (25.1%). The mosquito genera recorded were *Anopheles* 20, *Culex* 18, and *Aedes* 7. Also, for week 3, the mosquito abundance recorded was 42 (23.5%). The mosquito genera recorded were *Anopheles* 20, *Culex* 15, and *Aedes* 7. Finally, for week 4, mosquito abundance recorded in this study was 54 (30.2%). The mosquito genera recorded were *Anopheles* 15, *Culex* 20, and *Aedes* 19 (Table 2). Mosquitoes were most abundant in week 4 (30.2%) and least abundant in week 1 (21.2%) in block B of the study area which were statistically significant at $P < 0.05$. Overall, in block B, the mosquito genera recorded were *Anopheles* 71 (39.7%), *Culex* 73 (40.8%), and *Aedes* 35 (19.6%) and were statistically significant at $P < 0.05$.

Table 3 below shows the weekly mosquito genera and relative abundance in block C of the study area. In week 1, mosquito abundance was recorded in this block at 32 (25.6%). The mosquito genera recorded were *Anopheles* 10, *Culex* 16, and *Aedes* 6. Similarly, in week 2, mosquito abundance was recorded at 27 (21.6%). The mosquito genera recorded were *Anopheles* 12, *Culex* 10, and *Aedes* 5. Also, for week 3, the mosquito abundance recorded in this study was 35 (28.0%). The mosquito genera recorded were *Anopheles* 15, *Culex* 10, and *Aedes* 10. Finally, for week 4, the mosquito abundance recorded was 31 (24.8%). The

mosquito genera recorded were *Anopheles* 10, *Culex* 9 and *Aedes* 12 (Table 3). Mosquitoes were most abundant in week 1 (25.6%) and least abundant in week 2 (21.6%) in block C of the study area which were statistically significant at $P < 0.05$. Overall, in block C, the mosquito genera recorded were *Anopheles* 47 (37.6%), *Culex* 45 (36%), and *Aedes* 33 (26.4%) and were statistically significant at $P < 0.05$.

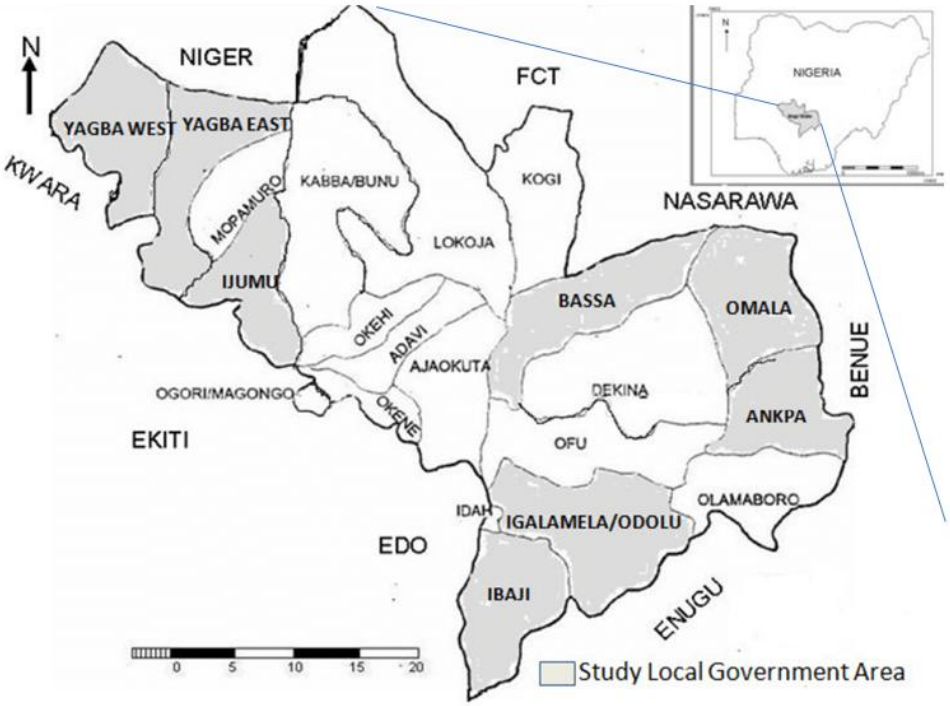

Fig. 1. Map of Kogi State, Nigeria

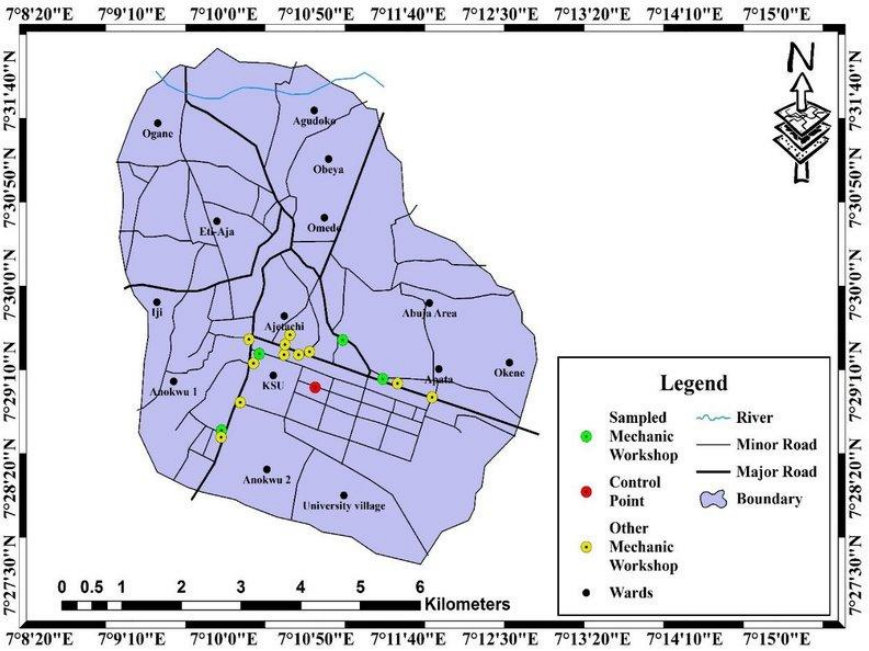

Fig. 2. Map of Anyigba, Kogi State

Table 1. Weekly mosquito genera and relative abundance in block A

Weeks	*Anopheles*	*Culex*	*Aedes*	Abundance	% Abundance
Week 1	20	6	8	34	18.9
Week 2	15	15	11	41	22.8
Week 3	19	24	6	49	27.2
Week 4	18	28	10	56	31.1
Total	72	73	35	180	100
% species	**40%**	**40.6%**	**19.4%**	**-**	**-**

Table 2. Weekly mosquito genera and relative abundance in block B

Weeks	*Anopheles*	*Culex*	*Aedes*	Abundance	% Abundance
Week 1	16	20	2	38	21.2
Week 2	20	18	7	45	25.1
Week 3	20	15	7	42	23.5
Week 4	15	20	19	54	30.2
Total	71	73	35	179	100
% species	**39.7%**	**40.8%**	**19.6%**	**-**	**-**

Table 3. Weekly mosquito genera and relative abundance in block C

Weeks	*Anopheles*	*Culex*	*Aedes*	Abundance	% Abundance
Week 1	10	16	6	32	25.6
Week 2	12	10	5	27	21.6
Week 3	15	10	10	35	28
Week 4	10	9	12	31	24.8
Total	47	45	33	125	100
% species	**37.6%**	**36%**	**26.4%**	**-**	**-**

Table 4. Abundance and Distribution of Mosquito genera in the different blocks of study area

Mosquito Genera	Mosquito abundance				Percentage Abundance
	Block A	Block B	Block C	Total Abundance	
Anopheles	72	71	47	190	40.9%
Culex	73	63	45	181	39.0%
Aedes	35	25	33	93	20.0%
Total Distribution	180	159	125	464	100.0%
Percentage Distribution	38.8%	34.3%	26.9%	-	-

Table 4 below shows the abundance and distribution of mosquito genera in the study area. From the study, 73 *Culex*, 72 *Anopheles* and 35 *Aedes* were recorded in block A. This implies that *Culex* species are the most common in block A of the study area. The table also revealed that 71 *Anopheles*, 63 *Culex* and 25 *Aedes* were found in block B. This indicates that the *Anopheles* genus is the most common in the study area's Site B. Finally, in block C, *Anopheles* was 47, closely followed by *Culex* at 45 and *Aedes* at 33. The total number of *Anopheles* in the study area was 190 (40.9%), followed by *Culex* at 181 (39%) and *Aedes* at 93 (20%) which were statistically significant at $P < 0.05$. The most abundant mosquito genus was *Anopheles*, and the least was *Aedes* and which were statistically significant at $P < 0.05$.

4. DISCUSSION

This study discovered three genera of mosquito in the study area. In general, it was observed that for block A of the study area, the mosquito genera recorded were *Anopheles* 72 (40%), *Culex* 73 (40.6%), and *Aedes* 35 (19.4%). Mosquitoes were most abundant in week 4 (31.1%) and least abundant in week 1 (18.9%) in

block A of the study area. *Anopheles* was the most abundant genus, whereas *Aedes* was the least. Overall, in block B, the mosquito genera recorded were *Anopheles* 71 (39.7%), *Culex* 73 (40.8%), and *Aedes* 35 (19.6%). Mosquitoes were most abundant in week 4 (30.2%) and least abundant in week 1 (21.2%) in block B of the study area. Overall, in block C, the mosquito genera recorded were *Anopheles* 47 (37.6%), *Culex* 45 (36%), and *Aedes* 33 (26.4%). Mosquitoes were most abundant in week 1 (25.6%) and least abundant in week 2 (21.6%) in block C of the study area. The total number of *Anopheles* in the study area was 190 (40.9%), followed by *Culex* at 181 (39%) and *Aedes* at 93 (20%). The most abundant mosquito genera were *Anopheles* and the least were *Aedes.* These findings are comparable to those reported by a lot of investigators from many areas in Nigeria [9, 10, 11]. The high abundance of different mosquito genera could be due to the high anthropogenic actions associated with schools where there are many peridomestic things like cans and plastics [12, 13]. These may serve as habitats for breeding mosquitoes, particularly in the rainy season, which favored *Anopheles* most in this study. Blocks with relatively lower abundance may be due to proper sanitation and drainage systems. These reasons may have contributed to the lower abundance of mosquitoes seen in some blocks of the study area [14, 15]. The differences in social events within the blocks of the study areas may have boosted or reduced the breeding of mosquitoes [16, 12]. Therefore, blocks with elevated anthropogenic events might have greater mosquito abundance, whereas blocks with reduced anthropogenic events might have a reduced mosquito abundance [16].

5. CONCLUSION

Three mosquito genera (*Anopheles, Culex, and Aedes*) were observed in abundance at Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria. These are recognized vectors of parasites which aid the transmission of diseases like malaria, filariasis, and yellow fever, which have a high mortality rate when unchecked. Therefore, a workable community health education program on vector control should be used in the university to control these vectors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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