

Assessment Of Mosquito Larvae Density In Eziobodo Community, Owerri-West L.G.A, Imo State

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ABSTRACT

Larval control is of paramount importance in the reduction of malaria vector abundance and subsequent disease transmission reduction. This study is aimed at assessing mosquito larvae density and profile in Eziobodo community, Owerri West L.G.A. Imo State. Standard dipping techniques was used to determine larval density, morphological characteristic was used to determine the larvae genera, aquatic quality condition and habitat preferences were observed at the oviposition sites. A plastic dipper of 50mls was used to collect water samples from ground puddles, plastic containers, earthen pots, gutters, tin cans and old car tires. The result showed the presence of *Anopheles* larvae 63 (42.0%), and *Culicine* larvae 88(58.0%). *Anopheles* larvae were found mostly in surface and shallow water with semi shaded light whereas *Culicine* larvae were found in equal density in both shallow and deep water preferably with semi shaded and shaded light. Residents used sanitation measures mainly for mosquito control closely followed by Insecticide treated bed nets (ITNs). Some (30%) reported the use of a combination of sanitation, ITNs, insecticide sprays/coils. Understanding larval habitat and its ecology in different environments can give an insight for control of mosquito borne diseases. Community participation to improve their sanitation will help to close ground puddles, clean gutters, removal of old car tires that can serve as breeding sites of mosquitoes.

Key Words: Mosquito Larvae, Density, Imo State

INTRODUCTION

Mosquitoes are responsible for the transmission of many medically important pathogens and parasites such as viruses, bacteria, protozoans, and nematodes which cause serious diseases like malaria, dengue, yellow fever, encephalitis or filariasis (Kettle, 1995; Beauty and Marquardt, 1996; Lehane, 1991). It is those which utilize humans as their primary host and are also willing to enter houses in their pursuit of a blood meal which are the most important. Some species do not feed on humans at all but utilize other mammals, birds or even reptiles as their hosts (Okorie, 2003). Mosquitoes are the most widely spread of the medically important insect (Service, 2008). They cause much ill health and loss of human lives. Some mosquito genera responsible for such diseases include *Aedes*, *Anopheles*, *Culex*, *Mansonia* etc. These mosquitoes are mostly found within human dwellings (Patricia *et al*, 2014).

Statistics show that 270 million people are infected with malaria alone and of those up to two million will die annually. It is this that makes the mosquito the most dangerous creature in the world (WHO, 2003). Malaria is a major infectious disease that still affects nearly half of the world's population (WHO, 2015). Information on spatial distribution of malaria vector species is needed to improve malaria control efforts. *Anopheles* species have plagued the world with malaria for decades and centuries now. Africa region was home to 90% of malaria cases and 91% of malaria deaths, globally (WHO, 2015). Nigeria accounted for the highest proportion of cases globally (27%), followed by the Democratic Republic of the Congo (10%), India (6%) and Mozambique (4%) (WHO, 2017). *Anopheles gambiae sensu stricto* and *Anopheles arabiensis* are the major vectors of malaria in Nigeria. *An. gambiae* is usually the predominant species in environment with high humidity and rainfall and *An. arabiensis* is common in zones with less rainfall (Sinka, 2001; Bangs, 2001).

Environmental alterations due to deforestation, swamp reclamation mainly for agriculture, excavation of sand and building stones, bricks making and vegetation clearance may lead to an increase in larval habitats of malaria vectors, such as *An. Gambiae* (Amadi, 2015; Udo, 2015). Local environmental characteristics, such as altitude, climate and land use can be significantly impact on phenology and population dynamics of mosquito larvae, and indirectly affect the dynamics of mosquito-borne diseases.

This study therefore can help health planners and policy makers in identifying the necessary areas of intervention in a bid to help urban communities in controlling *anopheline* larvae, resulting in decrease of malaria transmission.

MATERIALS AND METHODS

Study area

The study was carried out in Eziobodo, Owerri-West, Imo State. Eziobodo is an ancient kingdom located in today's Owerri-West Local Government, Owerri - Imo State Nigeria. Eziobodo is an igbo-speaking community with a population of over 15,000 locals; also known as Alueze or Alueze as this was the ancient name of the community before the colonial arrival of the former British Empire and Warrant Chiefs that followed much later around the 1930's. The town hosts the Federal University of Technology Owerri – FUTO and accounts for over 70% of the landmass of Federal University of Technology, Owerri. The town is also known for agricultural produce such as cassava, pumpkin leaf, cocoyam, maize, and palm oil.

Population of Study

The Population for questionnaire survey consists of inhabitants of selected households in Eziobodo community, Owerri-West, L. G. A. Imo State. One hundred (100) questionnaires were administered through interview to elucidate the community's best practice in the control of mosquitoes.

Method of Data Collection

The mosquito larvae were collected by a standard dipping method with a dipper (a 50ml universal container attached to a handle). While dipping, care was taken so that shadow was cast away from the habitat as larvae are very sensitive and will dive to the bottom once shadow is cast on the water. The dipper was gently lowered in an angle of 45° just below the surface. Proper care was taken not to disturb the water too much as this will make larvae dive downwards. When lifting the water, care was taken not to spill the water containing the larvae. Dipper was held steadily until larvae were raised to the water surface in the dipper. At least 5 dips were taken per habitat in different locations where mosquito larvae can be expected. Larval numbers was counted and calculated on a numerical basis as per dip. An average larval number was determined by adding the number of mosquito larvae and dividing by the number of dips. Larvae were collected by pipette, transferred to a petridish filed with water for morphological identification under a magnifying lens. They were returned to the water after identification. Average number of each class of mosquito was obtained. Larvae were identified using the keys of Knight and Stone (1977).

Results were represented in simple percentages and chi square (manually calculated) was used to test for statistical significance ($P < 0.05$).

RESULTS

A total of 35 larvae habitats where encountered. Two classes of mosquitoes were encountered: *Culicines* and *Anopheles*. The density of *Anopheles* mosquito was 63 (41.72%) while that of *Culicines* was 88 (58.28%) making a total of 151 larvae. (Figure 1).

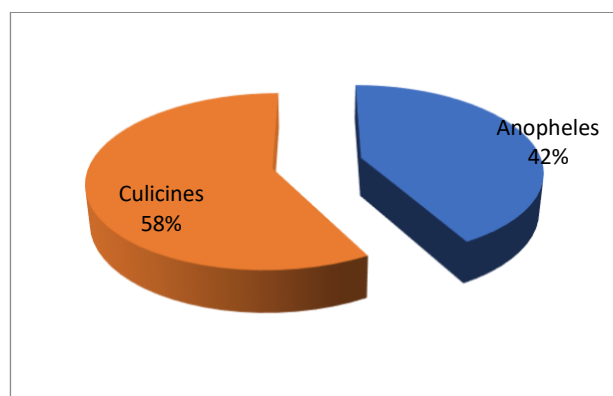


Fig.1. Average Larvae Abundance Encountered in the Area

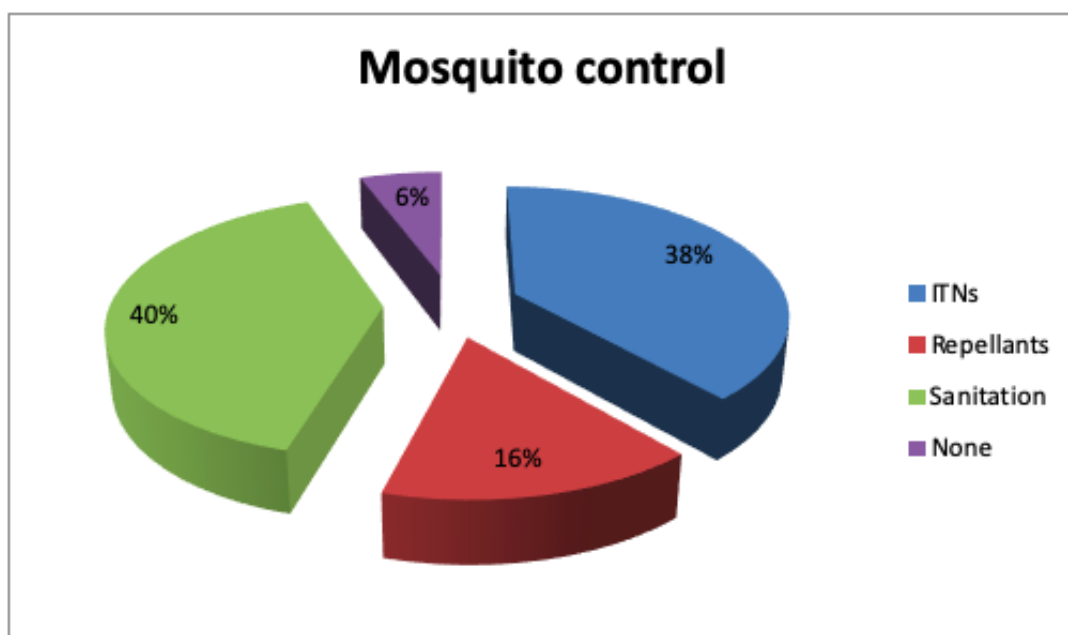
Six habitats were encountered in the study, which includes ground puddles, plastic containers, earthen pots, old car tires, gutters, and tin cans. *Anopheles* larvae were found both in shallow and deep water, semi shaded or shaded light. There was presence of either algae or emergent plant. *Anopheles* was found mostly in clear water 119(78.81%), and also in two out of six

habitats, ground puddles/ponds 33(52.38%) and gutters 30(47.62%). *Culicine* larvae were found equally (50.00%) in deep and shallow water, either with sunlight 12(13.64%), semi shaded 53(39.77%) and shaded 23(26.14%) light intensity; where there were no vegetation 60(68.18%) and mostly in clear water 66(75.00%) found in old car tires 39(44.32%), plastic containers 21(23.86%), and least in earthen pots 11(12.51%) and ground puddles 11(12.51%).

Table 1: Aquatic Quality Conditions And Habitat Preferences Of Mosquito Species

Variables	Habitat Condition	No of Sites	No of mosquitoes (%)	<i>Anopheline</i> Larvae (%)	<i>Culicines</i> (%)
Depth					
	Shallow (<20cm)	21	97(64.24%)	53(84.13%)	44(50.00%)
	Deep (>20cm)	14	54(35.76%)	10(15.87%)	44(50.00%)
Light					
	Sun Light	9	32(21.19%)	20(31.75%)	12(13.64%)
	Semi-shaded	15	96(63.58%)	43(68.25%)	53(39.77%)
	Shaded	11	23(15.23%)	0 (0.00%)	23(26.14%)
Vegetation					
	None	18	60(39.74%)	0 (0.00%)	60(68.18%)
	Algae	6	31(20.53%)	16(25.40%)	15(17.05%)
	Emergent Plant	7	34(22.52%)	28(44.44%)	6(6.82%)
	Floating Plant	4	26(17.22%)	19(30.16%)	7(7.95%)
Water Clarity					
	Clear	21	119(78.81%)	53(84.13%)	66(75.00%)
	Turbid	14	32(21.19%)	10(15.87%)	22(25.00%)
Type of Habitat					
	Ground Puddles /ponds	10	44(29.14%)	33(52.38%)	11(12.51%)
	Plastic Container	6	21(13.91%)	0 (0.00%)	21(23.86%)
	Earthen pots	3	11(7.28%)	0 (0.00%)	11(12.51%)
	Old car tires	8	39(25.83%)	0 (0.00%)	39(44.32%)
	Gutters	8	36(23.84%)	30(47.62%)	6(6.82%)
	Tin Can	0	0(0.00%)	0 (0.00%)	0(0.00%)

Out of 100 respondents interviewed on mosquito control practices, multiple responses were given by 30 respondents. Out of the remaining 70, respondents who used Insecticide Treated nets (ITNs) for mosquito control were 27 (38.57%), 11. (15.7%) of the respondents make use of repellants, 28 (40%) of the respondents make use of sanitation measures in the control of mosquitoes. The respondents, who used no measure to control mosquitoes, were 4 (5.7%).



DISCUSSION

This study has revealed that ground puddles, plastic containers, earthen pots, old car tires, gutters and tin cans are important breeding mosquito habitats. The result also indicates that mosquito larvae abundance varied depending on the habitat condition.. These results are similar to reports by Fillinger *et al* (2004) who found that semi permanent and permanent water were suitable for proliferation of both *anophelines* and *culicine*.

The density or abundance of mosquito larva in a community is directly proportional to the prevalence of mosquito borne infections in that community. An average of 151 mosquitoes was encountered of which anopheles accounted for 63(41.72%) while culicines were 88(58.28%). The results show that a high abundance of *Anopheles* larvae in the community which may account for malaria endemicity. The high number of culicines may be indicative for gradual urbanization of the community.

In this study, *Anopheles* species seemed to have adapted breeding in area rich in organic materials particularly plants which was also noted by Sattler *et al.*, (2005) contrary to the findings of Robert *et al* (2003). Culicine larvae were found most abundant in old can tires and plastic containers. Madewa, Macharell and Carvalho (2002), reported that *Aedes* was found in wide range of artificial containers such as plastic containers, earthen jars, used cans, metals boxes etc and natural containers such as tree holes, coconut shells, fruit peels and plant axial. Curtis *et al* (2015) studied container breeding sites of mosquito larvae and indicated that *Aedes* was capable of breeding in a wide range of container types.

Water depth played a significant role in habitat preference of the mosquito breeding habitats. In this study *Anopheles* preferred shallow (<20cm) water depth for oviposition. *Culicines* were found in equal density where water depth was deep and shallow. Awolola *et al* (2002) found that *Anopheles* preferred to breed in habitats like shallow pools.

Generally, *Anopheles* larvae prefer open sunlit waters (Awolola *et al*, 2007). The warm water in sunlit habitats maybe an important factor for larval development because warm water accelerates their development. In addition, warm temperatures may allow more microbes to develop which provide food sources for the mosquito larvae. In this study, *Anopheles* larvae preferred semi-shaded and sunlit habitat. *Culicines* preferred semi-shaded habitat and shaded habitats.

Vegetation was known to have direct effects on some mosquito species by obstructing gravid females from ovipositing and supporting a greater diversity of aquatic predators (Chambers *et al*, 2001). Emergent vegetation may reduce the amount of sunlight reaching the water surface, resulting in lower temperatures. Reduced temperatures cause a decline in microbial growth upon which mosquito larvae depend on and increases the larval development time exposing them to greater risks of contact with potential predators and competitors. In this study, *Anopheles* preferred ovipositing in habitats with vegetation. *Culicines* preferred habitats without vegetation. Similar type of results was obtained by Tirone and Jonathan, (2016) where *Culex* larvae were negatively associated with emergent vegetation. *Aedes* mosquitoes are container breeders, vegetation cannot affect their ovipositing behaviour due to the fact that vegetation cannot grow without muddy substrates. These findings contradict with Pates and Curtis, (2015) as they reported that vegetation is important while explaining the presence and abundance of *Culex* and *Anopheles* larvae in their study.

Mosquito control can be divided into two areas of responsibility: individual and public (Castro *et al*, 2004). An integrated larval source management approach such as water and environmental management, biological control options, in addition to the use of microbial larvicides especially in temporal habitats and area where water cannot be drained away. The community in this study mainly used Sanitation measures 28 (40.0%) to control mosquitoes, followed by the practice of the use of Insecticide Treated Nets (ITNs), 27 (38.570%), followed by the use of repellants, 11 (15.70%), then who did not apply any measure in the control of mosquitoes totaled 4 (5.70%). It was observed in this study that more women make use of insecticide treated nets than men this may be because they share the nets with their young children and are more vulnerable to malaria when pregnant.

An efficient way to control mosquitoes is to find and eliminate their larval habitat. Eliminating large larval development sites (source reduction) such as swamps or sluggishly moving streams or ditches may require community-wide effort (Blaustein and Eitam, 2004). This is usually a task for your organized mosquito control program. The second method used by organized mosquito control agencies is larviciding which utilizes the application of insecticides targeted at the immature mosquitoes.

CONCLUSIONS

The findings of this study revealed that Anopheline larvae breed more in Eziobodo community than other mosquito genera. Implementation of effective larval control should be targeted when the habitats are fewer and manageable with high larvae abundance during dry and end of rainy seasons as the use of mosquito nets will not be effective in controlling the population of mosquitoes which mosquito nets is the major means the community apply to control mosquitoes. The mosquito genera encountered in Eziobodo community, Owerri-West, Local Government Area are well known vectors of parasites and help in transmission of diseases such

as yellow fever, malaria, dengue and West Nile encephalitis. All these diseases are associated with high morbidity and mortality, with malaria being predominant. Many of the mosquito problems that trouble homeowners and the general population cannot be eliminated through individual efforts, but instead, must be managed through an organized effort. This suggests that a sustainable public health campaign on vector management and control should be intensified in Nigeria.

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