A PREVALENCE STUDY OF MOSQUITOES IN LAGOS METROPOLIS

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A PREVALENCE STUDY OF MOSQUITOES IN LAGOS METROPOLIS

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2016

CERTIFICATION

I certify that this project was conducted by AJALA, ABIGAIL AYODELE (BMSP13/14/H/1951) under my supervision and approved by me in partial fulfillment of the requirements for the award of Master of Science (M.Sc.) degree in Medical Parasitology, Department of Medical Microbiology and Parasitology, Faculty of Basic Medical Sciences, ObafemiAwolowo University, Ile-Ife, Osun State, Nigeria.

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POSTGRADUATE THESIS

AUTHOR: AJALA, ABIGAIL AYODELE

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DEDICATION

This project is dedicated to the Almighty God for his help, provision, direction, strength and for sparing my life so as to witness the completion of the study. It is also dedicated to the Ajala andAfolabi families plus the Love of my life, Orofin ZechariahOluwabunmi .

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ABSTRACT

The study investigated the prevalent genera of mosquitoes in Lagos metropolis based on the characteristic morphology of their larvae. It also determined the likely possible variations in prevalence of mosquito larvae in different localities of the study area, and likely seasonal variation in prevalence.

Mosquito larvae were collected partly during the rainy season (August and September,2015) and partly in the dry season, (November and December, 2015) from seventeen (17) Local Government Areas (LGAs) of Lagos within the metropolis (core Lagos). These areOjo,AmuwoOdofin, Apapa, Ajeromi/Ifelodun, Mainland, Surulere, Lagos Island, Mushin, Oshodi, Isolo, Shomolu, Kosofe, Alimosho, Ikeja, Agege, Eti-osa and IfakiIjaye. Five potential breeding sites in the LGAs, namely gutters, discarded tyres, discarded containers, household containers, and abandoned concrete electric poles were identified in both seasons.The collection of mosquito larvae was done using dipper and Pasteur pipette.Mosquito larvae were identified at the Department of Medical Microbiology and Parasitology,Lagos State University Teaching Hospital (LASUTH). Mosquito larvacollected werepoured into Petri dish for counting. The larvae were then poured into glass bottle and heated for five minutes to kill them. The larvae were further dehydrated in increasing concentration of ethanol (20%, 40%, 60%, 80% and absolute) for twenty minutes per concentration. They were cleared in xylene, and mounted in DistrenePlasticer Xylene (D.P.X.) on a dry microscope slide, covered with cover slip. Thereafter, the slides were viewed under microscope with ×4 objective lens. Data collected were analyzed using One way analysis of variance (ANOVA),Repeated analysis of variance and Student t-test. Alpha level was set at $P< 0.05$ of significance.

Out of a total of 340 breeding sites investigated, only 125 of them contained mosquito larvae. A total of 2380 mosquito larvae belonging to three genera were collected and identified. These were *Aedes* 1502(63.1%), *Culex* 869(36.5%) and *Anopheles* 9(0.4%).In both raining and dry seasons,*Aedes* were predominant in discarded tyres. *Culex*werepredominant in both seasons in the gutters. In discarded containers, *Aedes* were predominant in both seasons. In abandoned concrete electric poles, *Aedes* were predominant in the rainy season while no mosquito larvawas observed in the poles in the dry season. In household containers in the rainy season, *Culex* were the most abundant but in the dry season *Aedes* was. Few*Anopheles* were observed in the gutters and discarded tyres. There was no statistically significant difference ($P>0.05$) in the larvae genera collected in different breeding sites in the raining and dry seasons. There was also no statisticallysignificant difference ($P>0.05$) in the larvae distribution in the LGAsin the rainy and dry seasons.

The study concluded that *Aedes* werethe predominant mosquitoes in the study area followed by *Culex*. In view of the fact that a few number of *Anopheles* were encountered, there seems to be no justification for the high cases of malaria that is usually insinuated. Therefore diseases that may be emerging are those caused by the pathogens carried by the predominant two genera of mosquitoes.

CHAPTER ONE

INTRODUCTION

Mosquito belongs to the Phylum Arthropoda; Class Insecta; Order Diptera(True flies), sub order Nematocera, family Culicidae. There are two important subfamilies which are the Anophelinae and Culicinae(White, 2002).The Anophelinaesubfamily consist of three genera which are*Anopheles*, *Bironella* and *Chagasia.*The subfamily Culicinaeis the largest subfamily of mosquitoes.Species belonging to this subfamily are referred to as 'culicines'. The culicinesconsist of 4 tribes:Sabethine having only one genus *Sabethes*,Aedini tribe having 4 genera which are; *Aedes* (980 species), *Haemagogus,Eretmapodite* and *Psorophora*. Culicini tribe with only one genus*Culex* (800 species) and finally Mansoniini tribe having only one genus*Mansonia* (78 known species) (Gordon and Lavoipierre, 1962;Maurice and Robert, 1969).There are more than 4500species of mosquitoes distributed throughout theworld and groupable into 34 genera; but mostly belonging to *Aedes, Anopheles* and *Culex* (Ghosh *et al.,* 2013).

Mosquitoes are found throughout the world except in places that are permanently frozen such as Antarctica (Reiter,2001).However it is only in the tropics that they assume medically important roles.*Anopheles, Aedes* and *Culex* aredistributedworld wide, *Chagasia* is restricted to South America,*Bironella* has a geographical distribution of Australoasia.*Sabethes* is neo-tropical in distribution, found only in South and Central America. *Haemagogus* is neo-tropical in distribution, found in South and North America.*Eretmapodite* is restricted to Africa.*Psorophora* is found in Southern part of U.S.A and Central and South America.*Mansonia*

is found in several parts of the world but assume important role in health in South East Asia (Maurice and Robert 1969).

Mosquitoes require water bodies for breeding (WHO,1982)and undergo holometabolous (complete)type of metamorphosis, which has four stages of development which are the egg, larva, pupa, and adult (Cranston *et al*.,1987).Mosquito breeding sites are often created by human or animal activities wherein larvae are found in small depressions including foot or hoof prints, edges of boreholes and burrow pits, road side puddles formed by tyre tracks, irrigation ditches and other artificial bodies of water (Gimnig*et al*., 2001). The increase in environmental modification as a result of urbanization is usually being accompanied by creation of more breeding sites for mosquitoes which, most often, lead to an increase in the incidence of mosquito borne diseases (Amusan*et al*.,2003).

According to the World Health Organization (W.H.O), mosquitoes are 'Public Enemy No.1' (WHO, 1996). Mosquitoes are,however,the most important single group of insects which cause millions of death every year by transmitting pathogens which are agents of various diseases such as dengue fever, Chikungunya virus, Yellow Fever, Lymphatic Filariasis, Japanese B-encephalitis, Malaria (Becker *et al.,*2010; Barik *et.al.,* 2012), Zika virus (WHO, 2016).

Malaria is a major global public health problem but has been considered predominantly a rural disease in Africa, primarily because suitable *Anopheles* mosquito breeding sites are few in highly populated urban areas (Keating *et al.,*2004).Malaria still kills more people than HIV/AIDS or any other killer disease and it is endemic throughout Nigeria, accounting for 25% of infant mortality and 30% of childhood mortality (FMOH, 2005).Malaria is caused by the protozoan *Plasmodium*, which is transferred to humans through bites ofinfected female

Anopheles mosquitoes (Choumet, 2012). Nigeria has achieved so much in its malaria control efforts in the past few years and has moved down from hyper endemic i.e a situation where about 50% of the population at any time will test positive, when they have fever, to a meso endemic nature, which is the level that you test about 100 people and less that 25 are positive especially in most urban areas (Ntadom,2015).

In urban areas,water pollution is believed to be a major factor that generally reduces the development of anopheline larvae. There is evidence to the fact that *Anopheles* mosquito breeding sites decrease from rural to urban areas and transmission intensity is on the average eight times greater in African rural areas than urban centres (Hay*et al*., 2000;Robert*et al*.,2003). Even so, malaria transmission is reported to still occur in most urban cities and pregnant women and children under 5 years are said to be at risk (Awolola *et al.,*2007).

Mosquitoes can thrive in a variety of habitats with fresh water, brackish water, or any water (clear, turbid or polluted) except in marine habitats with high-salt concentration (Rueda,2008). Mosquito breeding places in and around houses can be divided into two main types;breeding sites with clean water mainly rain-filled receptacles in humid tropical areas which are suitable breeding sites for some *Aedes* species. These habitats are favored by *Aedes aegypti*, *Aedes albopictus*and *Aedes vittatus*which can act as a vector of dengue virus and also a dengue vector referred to as the Asian tiger mosquito by Americans.These species also breed in containers that are used to store water for drinking or washing. The second breeding siteis polluted water mainly gutters and discarded tyres which are suitable breeding sites for *Culex* and *Aedes* species respectively (Rajesh*et al.,*2014).

Urbanization is one of the factors that increase the number of habitats suitable for *Aedes* mosquitoes, especially *Ae. aegypti*(*W*HO,2008).While *Ae.aegypti*is commonly found inside

houses, *Ae.albopictus*is more common in outside areas, in open spaces with shaded vegetation and suitable breeding sites such as car tyres and garbage dumps (WHO, 1986). Breeding places in the city arise from neglected features of the construction sites, stagnant drain water collections, tanks, coolers and receptacles of rain water collections.

1.1 Justification for research work