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Assessing the Prevalence of Wuchereria bancrofti infection and abundance of its mosquitoe vectors in Ifedayo Local Government areas, Osun State, Southwestern Nigeria.

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ABSTRACT:
Filarial worms that cause human lymphatic filariasis (LF) are transmitted by many species of mosquitoes. Globally, 120 million people are affected, and 40 million are disfigured and disabled by complications such as severe swelling of the legs (elephantiasis). The Global Programme to Eliminate LF (GPELF) aims to interrupt disease transmission through mass drug administration (MDA), and to control illness and suffering in affected persons. The disease is targeted for elimination by 2020 through the treatment of the entire population at risk in endemic areas using a mass drug administration (MDA) strategy. After several years of MDA, there is now growing interest in including vector control as a supplement to MDA to achieve elimination goal. This study is to determine mosquito abundance, transmission, and prevalence of bancroftian filariasis in Ifedayo local government of osun state, Nigeria to determine the existence of bancroftian filarial worm in the mosquitoe vectors as a prerequisite for a search for appropriate vector control methods to complement the ongoing MDA campaign. Mosquitoes like *Mansonia, Culex, Aedes* were collected indoor and outdoor using Centre for Disease Control (CDC) light trap and examined for infection with *filarial worm* by microscopy. This xenomonitoring as a proxy to human infection reveals zero *W. bancrofti* transmission in four towns of Ifedayo Local government of osun state.

Keyword: *Abundance, Bancroftian filariasis,, CDC light trap, mosquitoe vectors, Prevalence.*

INTRODUCTION:
Lymphatic filariasis (LF) is a chronic infection with serious physical, mental and socio- economic consequences to the affected individuals, and ranked as one the leading causes of long-term disability in the world [23]. In Sub-Saharan Africa, LF is caused by the filarial nematode *Wuchereria bancrofti* and transmitted mainly by Anopheles and Culex mosquitoes [2]. Globally, it has been estimated that more than one billion people live in endemic areas and are at risk of infection, and more than one third of these are in Sub-Saharan Africa [12]. Filariasis are neglected tropical diseases (NTDs) known to be caused by parasitic worms that inhabit the tissue, lymphatic system and blood of humans [15]. The disease is manifested by lymphedema of the extremities or hydrocoele. Although human LF does not increase mortality in endemic areas, morbidity causes major economic losses and often leads to psychosis and psychosexual conditions in infected individuals [18].

Rural–urban migration is an important risk factor of LF transmission in endemic countries [3, 7]. Population movements may help spread LF infection from endemic to non-endemic areas where potential LF vectors are present, or may also lead to the resurgence of infection in areas under control [17]. Interpretation of the importance of infection rates in humans is also confounded by large movements of infected individuals from endemic to non-endemic areas, especially in conflict areas in West Africa, where some transient populations or internally displaced persons or refugees from the neighbouring countries settle in large cities not directly affected by conflict [6].

For mosquito surveys, both Centre for Disease Control (CDC) light and gravid traps have been found to be useful tools for collection of filarial mosquito vectors [4]. Dissections of the vectors and molecular tests based on polymerase chain reaction (PCR) have proved useful in detection of *Wucherieria. bancrofti* in mosquitoes [8, 4, 10].

Treatment is by the application of Ivermectin or Diethylcarbamazine (DEC) which rapidly kills microfilariae and will kill adult worms if given in full dosage over 3 weeks [11]. Release of antigens from dying microfilariae cause allergic-type reactions. Prevention and control is by rapid diagnosis and treatment of infected individuals through mass drug administration to risk communities and vector control by elimination of mosquito breeding sites through improved sanitation and environmental management [1].

This study is to determine mosquito vector abundance, transmission, and prevalence of bancroftian filariasis in four towns of Ifedayo Local government of osun state as a prerequisite for a search for appropriate vector control method to complement the ongoing mass drug administration (MDA) campaign.

The aim of the Global Programme to Eliminate Lymphatic Filariasis (GPELF), launched by the World Health Organization (WHO) in 2000, is to interrupt the transmission of lymphatic filariasis caused by *Wuchereria bancrofti* and *Brugia* species, and to manage morbidity and disability in affected individuals [21, 22]

2.0 Materials and Method

Study site

The study was conducted in Oke-ila Orangun, (N'07.94971°, 004.98859°'E), Ora Igbomina (N 08.03526°, 005.05137°'E) Alagbede (N'08.03073°, 004.99189°'E) and Idi-Awewe (N'07.97993°, 004.99976°) in Ifedayo local government, Osun state, Nigeria. Ifedayo is a rural area having villages and hamlets. All these villages (Oke-ila orangun, Ora igbomina, Alagbede and Idi-awewe) are inhabited. The inhabitants of Ifedayo local government are subsistence farmers of cocoa, plantain, yams and cassava. The islets receive one rainy season, long rains in March to October. LF is an important mosquito borne diseases in Ifedayo local government.

Mosquito collection

Four villages, Oke-ila orangun, Ora-Igbomina, Alagbede and Idi-awewe (from Ifedayo local government). These villages were purposely selected for the study to check the post prevalence of lymphatic filariasis after the early intervention by

WHO [20]. Other islets were excluded due to transport-related challenges and very low filarial vectors collected during preliminary surveys. All households in the selected villages were mapped using hand held Global Positioning System (GPS) device (Garmin etrex Legend H, Garmin ltd, USA). Two households in each village were randomly selected for indoor mosquito collections using Centers for Disease Control (CDC) light traps (John W Hock Co, Gainesville, FL, USA). Light trapping was conducted as previously described [4] and mosquitoes were collected in each of the selected households every other day from 22nd June to 5th July 2019, resulting in a total of 14 light trap catch nights. Light traps were set in the evening from 18.00 hours and retrieved by 06.00 hours the following morning. Caught mosquitoes were transferred from the traps to labeled paper cups covered with netting material and transported to the f laboratory for identification and processing. Moreover, two households were selected from each of the 4 study villages for outdoor mosquito collection using CDC light traps (John W. Hock Co., Gainesville FL). Light traps were set in peri-domestic areas and trapping was conducted as described previously [14]. Traps were set in the evening 18:00 hours, and retrieved the following morning 06:00 hours during same period from 22th June to 5th July 2019. At each household the traps were ran for 14 nights. Collected mosquitoes were treated as described for light trap catch. Upon arrival in the field laboratory live mosquitoes were knocked down with chloroform were identified using morphological criteria [9]. In the field laboratory, freshly killed *Cx. quinquefasciatus, Anopheles gambiae* complex and *An. funestus* group were processed for W. bancrofti detection by microscopy. The rest were stored in Eppendorf tubes containing silica gel desiccants for later identification of sibling species of *An. gambiae* complex, *An. funestus* group and detection of *W. bancrofti* by microscopy.

Species identification

Members of each mosquito species were identified by microscopy examination to identify *Aedes spp, Anopheles spp, culex spp and the Mansoni spp.*

Detection of *Wuchereria bancrofti*

Freshly killed *An. gambiae , An. funestus group and Cx. quinquefasciatus* from light traps were dissected and examined under dissecting microscope for the first, second and human infective third stage larvae of *W. bancrofti* as previously described [19]. 6 *Anopheles spp, 15 Mansonia spp., 10 Aedes spp. and 254 Culex spp. (mainly Culex. quinquefasciatus)* were examined by microscopy and estimated based on thresholds criteria outlined by the World Health Organization [20].

Data analysis

Data was entered in Microsoft Excel. The "abundance" of mosquitoes was determined by counting and prevalence of gravid mosquitoes determined by the number of gravid mosquitoes divide by total number of mosquitoes caught.

Ethical considerations

The study received ethical approval from the Ministry of health, Osun state, Nigeria. Before data collection, meetings were held with the district and respective village leaders to inform them about the study and to obtain their cooperation. Written informed consent was obtained from the heads of households before commencing mosquito collection in their respective houses or peri-domestic areas.

3.0 RESULT

3.1 Table 1:- Abundanmce of mosquitoe vector across four towns in Ifedayo local government area

Mosquitoe collected	Oke-ila Orangun light trap	Ora-Igbomina light trap	Idi awewe (less city) light trap	Alagbede (less city) light trap	Total
Culex quinquefasciatus	76	80	52	46	254
Aedes aegpti	6	1	3	0	10
Mansonia	0	7	5	3	15
Anopheles	3	0	0	3	6
Total by trap / village	85	88	60	52	285

Table 2;- Prevalence of *Wuchereria bancrofti* in the dissected mosquito spp.

Village	Method analysis	Trap type	Number analysed	Number of gravid	Number of non-gravid	Number of mosquitoes infected with filarial worm
Ora-igbomina	Microscopy	Light trap	80	53	27	-
Oke-Ila Orangun	Microscopy	Light trap	76	56	20	-

Idi-awewe (less city)	Microscopy	Light trap	52	45	7	-
Alagbede (less city)	Microscopy	Light trap	46	45	1	-
Total			254	199 (78.35%)	55	-

DISCUSSION

In this study, mosquitoes of species *Anopheles gambiae* s.l., *Anopheles funestus* and *Culex quinquefasciatus* were the vectors of *Wuchereria bancrofti* recovered. This agrees with the work of Bockarie *et al*., 2009 who also found *Anopheles gambiae* s.l., *Anopheles funestus* and *Culex quinquefasciatus* as the vectors of *Wuchereria bancrofti* in Nigeria as well as in many other parts of Sub-Saharan Africa. Studies have also documented an increased potential of Cx. quinquefasciatus as vector due to its expanding population and its inherent efficiency in LF transmission as the prevalence of the disease falls [2].

It was recorded in this work that Ora-Igbomina has the highest number of mosquitoes 88 (30.88%) out of the 285 mosquitoes captured; this is so because there are a lot of factors that promotes the breeding of mosquitoes in this area. Of all the 254 mosquitoes dissected from 285 captured from the local government, 199 (78.35%) were found to be gravid while 54 (21.65%) were not gravid, filarial worm can only be seen or present in gravid mosquito.

All the 80 mosquitoes dissected from the catch in Ora-igbomina were with no filarial worm. This is followed by Oke-ila Orangun with 76 mosquitoes with no filarial worm; followed by Idi-awewe (less city) with 52 mosquitoes of which none had filarial worm while Alagbede had the lowest number of mosquitoes, 46 with no filarial worm present.

There is no on-going trasmission of *Wuchereria bancrofti* in all these areas in Ifedayo local government of Osun State, Nigeria, this may be due to the intervention of WHO in the area [20].

In the current study, *Cx. quinquefasciatus* accounted for 98.2% of the filarial mosquito vectors caught. Previously, *Cx. quinquefasciatus* was considered an urban vector but it has become successful in establishing itself in the rural areas possibly due to adoption of urban life in rural areas, this is in agreement with the work of Schorkopf *et al.*, 2016. The current study searched for prevalence of *Wuchereria bancrofti* in potential LF vectors in Ifedayo local government as an attempt to validate the presence of the infections and establish its prevalence rate to accelerate LF elimination efforts.

The detection of non-infected mosquitoes in this study is an indication of the non-existence of a reservoir of microfilaraemia in the human population.

CONCLUSION AND RECOMMENDATION

The findings of this study provide an indication that there is no on-going transmission of *W. bancrofti* on Ifedayo local government, Osun State. Nigeria. Prevention of reservoir of microfilaraemia in human population in the studied areas and eliminating all the factors that can promote the abundance of mosquitoe will sustain *W. bancrofti* no – transmission status of these communities.

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