EPIDEMIOLOGY OF LYMPHATIC FILARIASIS IN ADO-ODO /OTA LOCAL GOVERNMENT AREA OF OGUN STATE, NIGERIA.

BY

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DISSERTATION IN THE DEPARTMENT OF ZOOLOGY SUBMITTED TO THE FACULTY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY (MPhil.) IN ZOOLOGY

JULY, 2013

CERTIFICATION

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Five hundred volunteers (442 adults and 58 children) were recruited according to WHO standard between April, 2008 and November, 2009 from a clinic set up in the local government health centre. Finger-prick blood sampling for parasitological examination was carried out at night between 10pm and 2am. Thick blood films were made for species identification and microfilariaemia. Gross examination of participants for clinical manifestation of the disease was graded using WHO method. Chronic involvements of the male genitalia were graded as hydrocele stage I-IV (increasing sizes of true hydrocele). Affected limbs in males and females were graded as stages I (early pitting oedema), II (non-pitting oedema with thicken skin and loss of elasticity), III (evident elephantiasis with deep skinfolds and/or warty lesions). Pre-tested and structured questionnaire was used to obtain demographic information and assess knowledge, attitude and practice of the participants in the management of the disease. Data were analysed using Chi square and Student's t-test at p= 0.05.

Wuchereria bancrofti microfilaraemia was prevalent among the subjects examined with a total of 105 (21.0%) participants infected. The highest prevalence of infection 35(30.7%) was recorded among those within the stratified age group of 60-69 years in both sexes. Prevalence of infection increased with age and was higher in males 61(27.1%) than in females 44(16.0%). The youngest male and female infected were 9 and 10 years respectively. Intensity of infection was not gender or age dependent. Microfilaria geometric mean intensities ranged from 18.3 - 33.4 mf/mL of blood and were highest in adults in the stratified age group of 70-79 years (33.4mf/mL of blood). True hydrocele occurred in 38(16.9%) males aged 9-70 years old with stage 1V being the most abundant (36.8%). Stages 1-111 limb elephantiasis was found in 7(3.1%) males and 16(5.8%) females while 14(5.1%) females had elephantiasis of the breast.

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There was high prevalence and intensity of lymphatic filariasis in Ado-Odo/Ota local government area of Ogun State. There is a need for appropriate intervention strategies in the area.

Keywords: Lymphatic filariasis, Hydrocele, Elephantiasis, Ado-Odo/Ota.

CHAPTER ONE

INTRODUCTION

Lymphatic filariasis is thought to have affected humans since approximately 1500- 4000 years ago, although an exact date of its origin is unknown. Artifacts from ancient Egypt (2000BC) and the Nok Civilization in West Africa (500BC) showed possible elephantiasis symptoms. The reference to the disease also occurred in Ancient Greek literature where scholars discussed diagnosis of lymphatic filariasis versus diagnosis of leprosy. The first documentation of symptoms occurred in the 16th century, when Jan Huyen Linschoten wrote about the disease during the exploration of Goa. Soon after, exploration of other parts of Asia and Africa turned out other reports of disease symptoms. It was not until centuries later that an understanding of the disease began to develop (Wikipedia, 2005).

In 1866, Timothy Lewis, building on the work of Jean-Nicolas Demarguay and Otto Henry Wucherer, made the connection between microfilariae and elephantiasis, establishing the course of research that would ultimately explain the disease. Not long after that, in 1876 Joseph Bancroft discovered the adult form of the worm, and finally in 1877 the life cycle involving an arthropod vector was theorized by Patrick Manson, who proceeded to demonstrate the presence of the worms in mosquitoes. Manson incorrectly hypothesized that the disease was transmitted through skin contact with water in which the mosquitoes had laid eggs. George Carmichael Low determined the actual transmission method by discovering the presence of the worm in the vector and the often similar symptoms of lymphatic filariasis and those of leprosy (Wikipedia, 2005).

Lymphatic filariasis is caused by tissue dwelling nematode parasites commonly known as filarial worms which utilize mosquito vectors as intermediate hosts (Kagai, 2008).These roundworms of several species are mostly occurring in humid tropical areas and are spread by many different species of mosquitoes. The main species of worms (filariae) that transmit the disease are *Wuchereria bancrofti* and *Brugia malayi*, both belonging to the family Filaridae. The third species with more local distribution is *Brugia timori* (WHO, 1995).

The adult stages of these worms are white and threadlike. Females (80-100mm in length, 0.2-0.3 mm in width) are usually twice the size of male while larval stage

(microfilaria) are only 250-300mm long and 7-9m m in width (CDC, 2008).The mosquito vectors are those from the genera *Anopheles*, *Culex*, *Aedes*, and *Mansonia. Culex quinquefasciatus* is the main vector in urban areas in tropical countries while *Culex pipiens* in temperate countries (Kagai, 2008).

The female worms release large numbers of very small worm larvae (called microfilaria), which circulate in an infected person's bloodstream. When a human is bitten by a mosquito, the mosquito ingests the larvae. The larvae develop in the mosquito into an infective stage and are then spread to other people via mosquito bites. After a bite, the larvae pass through the skin, travel to the lymphatic vessels and develop into adult worms (Fig1). Lymphatic filariasis affects the circulatory system that moves the tissue fluid and immune cells (lymphatic system) and is the most common type (Thomson, 2006).

A larva matures into an adult worm within six months to one year and can live between four and six years. Each female worm can produce millions of larvae and these larvae only appear in the blood stream at night. A single bite is usually not enough to acquire an infection; a series of multiple bites over a period of time is required to establish an infection. Hence individuals capable of infection or at risk are those who are regularly active outdoors at night and those who spend more time in remote jungle areas (Turkington, 2006).

In Bancroftian filariasis the legs and the genitals are most often involved, while the Malayan variety affects the legs below the knees. Repeated episodes of inflammation leads to blockages of the lymphatic system especially in the genitals and the legs. This causes the affected area to become grossly enlarged with thickened coarse skin leading to a condition called elephantiasis (Thomson, 2006).

Nations found to be endemic tend to be tropical or subtropical due to the optimal habitat for the vectors of Lymphatic filariasis. Ambient humidity is also necessary for the survival of the infective larval-stage of the microfilaria (Gregory *et al.*, 2000). Population at high risk for contracting or developing lymphatic filariasis is primarily poor, and majority of the cases are concentrated in rural areas (Wu Y *et al.*, 2004).

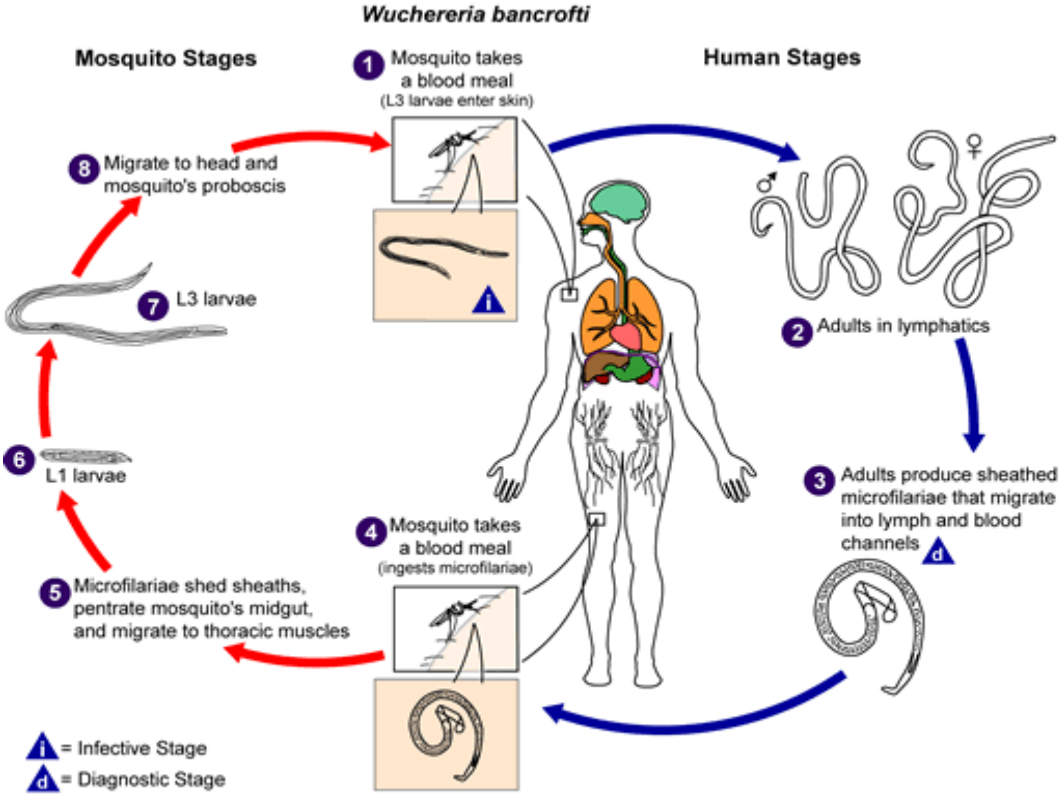

Figure 1: Life cycle of *Wuchereria bancrofti* (CDC, 2008).

Lymphatic filariasis is often associated with areas that have poor sanitation and housing quality. Poorer, rural communities are also typically built around optimal environments for vectors, including mashes or rivers and tend to lack the resources or capabilities to control vectors and hence transmission is high (Smith, 2006).

Monitoring and evaluation are essential for the successful implementation of mass drug administration programs for Lymphatic filariasis elimination. Monitoring transmission when it is low requires both large numbers of mosquito vectors and sensitive methods for detecting *Wuchereria bancrofti* infections in them and the blood of infected man (Smith, 2006).

A Global Program on Elimination of Lymphatic Filariasis (GPELF) was set up in 1988 by the World Health Organization (WHO), and as a result most of the affected countries formed National Lymphatic Filariasis Elimination Program (Kagai, 2008).

The World Health Organization (WHO) has targeted the disease for elimination by the year 2020, and according to GPELF, this has been implemented in affected member countries. The GPELF programme has two major goals: to interrupt transmission of the parasite and to provide care for those who suffer from the devastating, debilitating disease. The latter goal addresses two disease conditions of filariasis: lymphoedema and hydrocele. In filariasis endemic areas the impact of hydrocele is enormous. In younger males it affects their work, study, sports activity and self-esteem. In many adult males, the condition affects professional work capacity and sexual function (Kumari *et al*., 2005).

However, hydrocele is the least priority of the GPELF and only sporadic efforts for hydrocelectomy have been attempted (Harichandrakumari, 2005).

Regarding filarial hydrocele many basic questions like true prevalence, its identification, effectiveness of surgery, postoperative complications, recurrence, treatment seeking behavior of the affected individuals, cost of surgery, need to be researched. It may be possible that in India the estimated hydrocele morbidity data of 13 million cases may not be less than the actual prevalence (Narahari *et al.*, 2007). In filariasis endemic areas, individuals with larger hydrocele report to the health authorities, whereas those with small hydrocele mostly in younger males go unreported. Unlike lymphoedema, small hydrocele is not noticeable and some amount

of shyness, mostly in the younger age group prevents their reporting. In rural and semi-urban settings many hydrocele patients seek help from private practitioners, quacks, and traditional healers, and hence such cases invariably go unreported (Krishnamoorthy *et al.,* 2000).

The recommended treatment for hydrocle is surgery and a variety of surgical techniques are used. The current WHO guidelines recommend complete removal of tunica vaginalis. However, the common deterrents for hydrocelectomy in the endemic population are post-operative infections like haematoma, abscesses, penile oedema. The cost and availability of surgery is also beyond the reach of many rural patients, forcing them to bear the trauma (Brown *et al.*, 2004).

At the local government level, sporadic attempts for mass hydrocelectomy have been initiated recently. Considering the vast population affected by hydrocele, the need of the hour is proper planning with budgetary provisions for surgery and management of post-operative complications. Though the success of the programme will halt transmission of the disease by 2020, the affected individuals will suffer much beyond the deadline. It is time to take up these issues and plan for hydrocelectomy as a mass movement (Brown, 2004).

Available literature on this disease, from the north, north-central, southern parts of Nigeria show the widespread of lymphatic filariasis disease in Nigeria (Anosike *et al*., 2005) Likely examples are reports by Anosike in Ebonyi State, Okon in Cross River State, Mba and Njoku in Anambra State and Targema in Benue State which revealed active transmission of lymphatic filariasis (Elkanah *et al*., 2011). So also the survey by the Nigerian Lymphatic Filariasis Elimination Programme (NLFEP), show prevalence of disease (Smith, 2006). Consequently, epidemiological information is needed on the distribution, clinical signs and intensity in many parts of Nigeria because many areas in the country remain unidentified and unstudied (WHO, 2005).

Nigerian Lymphatic filariasis Elimination Programme (NLFEP) with the assistance of the Carter Centre has set 2015 as the year to eliminate the disease in Nigeria. With this in view, Nigeria and all supporting agencies and organization require comprehensive nationwide epidemiological data to enable the mapping out of

filariasis endemic foci, for mass-community treatment, so as to ensure adequate coverage of all endemic areas (WHO, 2005).

1.1 Rationale for Study

In 1977, the Fiftieth World Assembly resolved that lymphatic filariasis should be eliminated as a public health problem (resolution WHA 50.29). The World Health Organization (WHO) proposed a comprehensive strategy for achieving this goal which included interrupting transmission by drastically reducing the prevalence level of microfilaraemia in communities where it is endemic and implementing interventions for those already infected to prevent and manage the disabilities it causes (WHO 2005).

This study will constitute a baseline data which is a prelude to launching a reliable intervention implementation programme in Ado-Odo Ota LGA of Ogun State. The data from this study will be a reference point in assessing any resultant reduction or otherwise prevalence of microfilaraemia.

1.2 Problem Statement

(1) Information from the State Ministry of Health, indicate that Ogun State is endemic for lymphatic filariasis, however Ado-Odo Ota L.G.A has never been mapped for lymphatic filariasis.

(2) There is need to assess the prevalence and intensity of lymphatic filariasis, as well as the prevalence and types of clinical manifestations of the disease in Ado-Odo Ota L.G.A. in Ogun State.

(3) There is need to assess the Knowledge, Attitude and Practice (KAP) of the people in the management of lymphatic filariasis.

1.3 Aim

The aim of this study is to assess the epidemiology of lymphatic filariasis in Ado- Odo Ota Local Government Area.

1.4 Objectives of the Study

1) To determine prevalence of microfilaraemia of lymphatic filarial worm in Ado-Odo/Ota LGA.
2) To assess the clinical manifestations of lymphatic filariasis in Ado-Odo/Ota LGA.
3) To identify the vector of lymphatic filariasis in the area.
4) To provide information needed for the interruption of transmission using questionnaires. To assess the peoples Knowledge, Attitude and Practice (KAP) in the management and treatment of Lymphatic filariasis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Global Prevalence

Lymphatic filariasis due to infection with *Wuchereria bancrofti* or *Brugia malayi* is estimated to infect at least 128 million persons worldwide (Michael and Bundy, 1997). It is a leading cause of long-term and permanent disability worldwide (WHO, 1999). It is endemic in 83 countries, India, Indonesia, Nigeria and Bangladesh account for nearly 70% of lymphatic filariasis cases. Other regions include Central Africa, the Nile Delta, Pakistan, Sri Lanka, Burma, Thailand, Malaysia, Southern China, the Pacific Islands, Haiti, the Dominican, Guyana, Surinam, French, Guiana and Brazil (Carter Centre, 2008).

It is estimated that the global burden of lymphatic filariasis was only 0.23% of the total burden of parasitic and infectious disease (World Bank, 1993). This has been recognized as a serious underestimate (WHO, 1995). One third of the World's population at risk for lymphatic filariasis lives in India (WHO, 1992). Nineteen million disease cases and about 25 million microfilaria carriers live in Orissa, one of the eastern states of India and they contribute 7.2% of disease cases and 8.8% of microfilaria carriers of the total figure of India (Central Bureau of Health Intelligence, 1993). Currently more than 1 billion are at risk and *Wuchereria bancrofti* is responsible for approximately 90% of infection (WHO, 1999). This contributes to about 40% of cases of Bancroftian filariasis in the global scenario (Ramaiah *et al*., 2000).

The mosquito borne nematode parasite *Wuchereria bancrofti* is a major health problem in many tropical and subtropical regions of the world, including Africa (Michael *et al.*, 1997 and O' Hesen *et al.,* 1997). In Africa alone, it is estimated that 50millon people are affected with lymphatic filariasis and there are 4.6 million cases of hydrocele (Michael *et al.*, 1996). These figures represent about 40% of the global burden of the disease (Michael *et al.,* 1996). These estimates were largely based on extrapolations from only gross chronic clinical manifestations due to lack of data on the acute phase and other stages of the disease. Based on more recent knowledge of the epidemiology of the disease, this figure of the Disability-Adjusted Life Years (DALYS) is seen as a gross underestimate, especially in the light of new findings

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Wuchereria bancrofti microfilaraemia was prevalent among the subjects examined with a total of 105 (21.0%) participants infected. The highest prevalence of infection 35(30.7%) was recorded among those within the stratified age group of 60-69 years in both sexes. Prevalence of infection increased with age and was higher in males 61(27.1%) than in females 44(16.0%). The youngest male and female infected were 9 and 10 years respectively. Intensity of infection was not gender or age dependent. Microfilaria geometric mean intensities ranged from 18.3 - 33.4 mf/mL of blood and were highest in adults in the stratified age group of 70-79 years (33.4mf/mL of blood). True hydrocele occurred in 38(16.9%) males aged 9-70 years old with stage 1V being the most abundant (36.8%). Stages 1-111 limb elephantiasis was found in 7(3.1%) males and 16(5.8%) females while 14(5.1%) females had elephantiasis of the breast.

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relating to incidences, duration and severity of acute adenolymphangitis (Gyapong *et al.*, 1996). The third most endemic country is Nigeria where it is caused by *Wuchereria bancrofti* and 22.1% of the population is thought to be affected (Michael *et al*., 1997and WHO, 2000).

2.2 The Disease

An estimated 14 million people suffer from lymphoedema and elephantiasis of the leg caused by lymphatic filariasis worldwide (Dreyer *et al.*, 2002). The overt clinical manifestations of hydrocele, elephantiasis and the syndrome of acute filarial fevers, cause a lot of morbidity and stigma associated with the grotesquely enlarged limbs and genitals (Evans *et al*., 1993 and WHO, 1999). An annual morbidity is estimated as 2% with resultant annual morbidity estimated as four million DALYS (WHO, 1999). Chronic and acute disease manifestation affects the limbs, breast, genitals and other parts of the body. The acute form of the disease typically involves lymphadermitis and lymphoedenolymphangitis (ADL) (O 'Hesen, 1997).

Over time, filarial lymphoedema have become permanent and associated with repeated painful episodes of bacterial adenolymphangitis (ADL) which cause considerable acute morbidity (Kumaraswami, 2000) and hasten the progression of the lymphoedem (Pani *et al.*, 2002). The disease impairs mobility, day to day domestic and economic activities (Evan *et al*., 1993; Gyapong *et al.*, 1996 and Ramaiah *et al.*, 1997) and sexual and marital life (Dreyer *et al*., 1997).

The disease is estimated to be responsible for the loss of about 0.63% of per capitum GNP in India (Ramaiah *et al.*, 2000). Clinical manifestation of lymphatic filariasis in these areas also include episodes of ADL, hydrocele, lymphoedema and elephantiasis of legs, arms, breasts, vulva, scrotum and penis and more rarely chyluvia and tropical pulmonary eosinophilia (WHO, 1992). Hydrocele may be accompanied by thickening of the spermatic cord and changes in the scrotal skin and subcutaneous tissue including Oedema, fibrosis, and formation of nodules or ulceration and oozing of lymph through skin (Ismal *et al.*, 2001). Scrotal swellings vary in size and severity and may become debilitating, causing morbidity, reduced working capacity and sexual incapacitation.

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2.3 Lymphatic filariasis and young Children

Lymphatic filariasis affects about 120 million people globally and about 22 million of them are children below 15 years of age (Michael *et al.*, 1996). Most socioeconomic studies on filariasis involve adults and the problem of filariasis in children has received poor attention (Ramaiah *et al.*, 2000). Also epidemiological studies on lymphatic filariasis have not focused on school children. However prevalence of microfilaraemia, acute and chronic disease has been recorded in school age children.

Community-based epidemiologic studies and individual case reports attest to both the existence of lymphatic filariasis (LF) infection in children and to the occurrence of clinically evident disease (e.g. lymphoedema/elephantiasis and hydrocele). From these reports it is evident that lymphatic filariasis can be a disease of children as well as adults, but the true extent and nature of childhood lymphatic filariasis has remained very much under-appreciated and incompletely documented. This under-appreciation can be attributed both to the natural history of the disease itself and to the limitations of previously available diagnostic methods in the past. Most published surveys based their diagnosis of infection on detecting microfilaraemia (MF). It is now clear, however, that this diagnostic approach is not sensitive enough to identify many infections especially those of low density, as are often found in very young children, and those where adult worms are present but produce no microfilariae (Weil *et al.*, 1997).

Furthermore the subclinical manifestations of early stage infections are difficult to recognize in children. The more pathognomonic clinical manifestations such as lymphoedema or hydrocele which tend to be associated with long term infection and thus relatively infrequent in children, make many investigators tend to exclude children below the ages of 5 in their prevalence surveys, and some had even excluded children less than 10 years of age (Figuredo- Silva *et al*., 1996).

These factors have led to under-representation of children in epidemiological studies, underestimation of their infection rate, and to inappropriate documentation. However, development of the importance of lymphatic filariasis infection and disease in children had enabled the availability of filarial specific antigen assays which had provided more sensitive diagnosis especially in early or low density infection. Also

the use of ultrasound and other methods to detect filariasis-specific subclinical pathology have permitted recent studies in children and this has also been able to challenge the earlier assumption that lymphatic filariasis in children is not a significant public health problem (More, 1990, Amaral *et al,* 1994,Figuredo -Silva *et al.*, 1996, Faris *et al.*, 1998 and Dreyer *et al* 1997, 2002).

Indeed, this newly available information now demands a full, critical re-evaluation of the nature and extent of lymphatic filariasis in children, in order both to improve our approach to the management of this childhood infection and equally, to identify the full range of benefits that can be attained by the new programmes underway to eliminate lymphatic filariasis as a public health problem globally.

Apart from the infection in children, lymphatic filariasis have associated social stigma it attaches to children in terms of shame, embarrassment and ridicule. Enlarged genitals forced a 15 year old boy studying tenth standard in a local school to give up his education. While in school, he used to conceal his disease condition by wearing loose garments. The convention of going to secondary education classes wearing trousers, which he taught would reveal his disease condition and attract ridicule from his fellow students, forced him to give up his education (Lu *et al*., 1988 and Ramaiah, 2000). Another boy, while studying eighth standard used to suffer frequent ADL episodes coupled with transient lymphoedema of lower limbs. Severe fever and malaise associated with ADL episodes also forced another boy to abstain from school often (Ramaiah *et al.*, 1996). Angry reaction from a teacher to absenteeism from school made yet another boy give up his education. In addition, six more pupils also reported occurrence of ADL episodes and hence absenteeism from school (Ramaiah *et al*., 2000). In a research study, five hundred and six people were detected with chronic manifestations of filariasis in two villages near Pondicherry in South India (Ramaiah *et al.*, 2000). They included 28 individuals (26 boys and two girls) below 20 years of age and clinical examination for chronic disease confirmed the presence of chronic and/or acute disease manifestation in them (Pani *et al*., 2002).

The most common complaint among the pupils with hydrocele was pain in the scrotum, which got worse after walking or cycling, the means by which the pupils go to their local schools. The pain and the inconvenience also forced some of the victims to curtail playing and other extra-curriculum activities. One boy reported precipitation

of acute episodes following exertion caused by playing. The children affected also felt anguish that they could not wear clothing of their choice. Physical discomfort in scrotal area and concealment of the disease condition weighed more in choosing their dress (Ramaiah, 2000). While educational performance of young lymphatic filariasis patients are greatly affected, it was also observed that most young affected patients lack adequate and effective treatment methods (Ottesen, *et al.*, 1999). This may contribute to the progression of the disease in affected individuals. Thus the overall impact of the disease appears to be very complex. Poor educational achievements affect the quality of future life (Bundary and Guyatt 1996) and the progression of disease causes socio-psychological problem (Dreyer *et al.*, 1997). Hence, lymphatic filariases in children need to be given attention globally.

2.4 Lymphatic filariasis in women

A serious impact of the gross swelling of limbs in lymphatic filariasis is the social stigma suffered by patients with the disease. A qualitative study published by Paul, 2009 looked at the experiences of women with lymphatic filariasis in two different parts of the world – the Dominican Republic (Caribbean) and Ghana (West Africa). In-depth interviews were conducted with 56 and 58 women in each country respectively. The women reported being criticized and isolated by the community, health providers and even by friends and relatives. They were often denied access to education and employment. There were some interesting variations between the two countries. Women in Ghana generally suffered more from stigma. Dominican women were more likely to have a job or sense of purpose, greater financial resources, better education, and some form of community support. Many of the women had tragic stories to tell. A Dominican woman said: “My daughter-in-law will not let my son eat at my house, I will cook something for them and she will throw it out. She tells everyone that she is afraid of catching this disease”. Another, describing a visit to a health centre said: “The nurse told me that I had to wait outside until I was called to see the doctor because my legs were so disgusting and offended the other patients with its smell. Everyone heard her and I was so embarrassed”. A woman in Ghana said: “If it has not been for my nasty leg, I could have gone to school and become a teacher. I would have been someone, not just the woman with the leg”. Also in

Ghana, a woman described how she was told to leave a church choir because of her condition. The study authors conclude that stigma is a major problem in the communities they studied and the same may well be true elsewhere. Ways must be found to reduce stigma and to counter negative effects. As the authors say: "Intervening to reduce stigma would likely mean that women would seek care earlier, develop more effective coping strategies for living with this chronic condition, engage in more positive social interactions, have greater access to resources, contribute more to society and have hope for the future" (Paul, 2009).

2.5 Lymphatic fllariasis in men

It has been variously reported that more boys were found with clinical manifestation than girls and most of the boys were affected with hydrocele (Pani *et al.,* 1991) . Prevalence and risk of being affected with hydrocele is significantly higher than that of lympoedema of the limb in the male population (Meyrowtisch *et al.*, 1995 and Chan *et al.,* 1998).

The results of several studies on bancroftian filariasis in Coastal East Africa have shown that the human infection and disease burden vary considerably from one community to the other within the same endemic area (Simonsen *et al.,* 1995).

2.6 Lymphatic Filariasis Diagnosis

Trop Bio ELISA for *Wuchereria bancrofti* antigenenaemia

Several laboratories have described methods for detecting soluble filarial antigens in human blood in the late 1990s and early 1980s (Weil *et al*., 1990). However, no filarial antigen test was sensitive or convenient enough to be practically useful outside the developer's home laboratory until the Weil laboratory developed a monoclonal antibody-based ELISA (using monoclonal antibody AD12) for detecting circulating *Wuchereria bancrofti* antigen in 1984 (Weil *et al*., 1987). Early studies with this test showed that it was more sensitive for active infection than microfilaria tests. It is specific for *Wuchereria bancrofti* infection, and that serum antigen levels decreased following treatment with diethylcarbamazine (DEC) (Weil *et al.,* 1987). Although this ELISA was a useful research tool, it was not practically useful for public health programmes. This is also largely true of the TropBio ELISA for

Wuchereria bancrofti antigenenaemia that was marketed in the early 1990s. The TropBio kit has been widely used in research projects but it has not caught on as a tool for mapping or monitoring ELF programmes (Taylor, 2000).

Antibody test Kit and Antibody Monitoring

Antibody test kits (a dip-stick and a cassette test) based on recombinant antigen BmR1 have recently become commercially available. These tests have been reported to be sensitive for *Brugia (malayi* and *timori)* infections/exposure. They have not yet been validated as tools for mapping the distribution of Brugian filariasis for PELFs (Jamail, 2005 and Fischer *et al.*, 2007). Early antibody diagnostic tests for LF were plagued by poor specificity. Greatly improved specificity has been achieved by testing for IgG4 antibodies to a recombinant filarial antigen, Bm 14 (ORF 459 bp, expressed in pGex as a GST fusion). This antigen is similar to Bm SXP-1 reported by Plessen's group (Dissanayake *et al.*, 1995). Numerous studies have shown that the Bm 14 antibody test is sensitive for infection with (or heavy exposure to) *B. malayi* and *W. bancrofti* (generally positive in over 90% of mf carriers) [Ramzy *et al.*, 1999]. A recent blinded multicentre study confirmed this finding (Lammie *et al.*, 2004). Primates produce antibodies to Bm14 a few weeks after they are infected with Brugia (i.e. during the pre-patent period). Humans with pre-patent infections also have antibodies to Bm14; a prospective study showed that antibody to Bm14 was a significant risk factor for incidence of microfilaraemia over the next year while a positive antibody test does not prove current infection, this test is specific for infection or heavy exposure to filarial parasites (i.e. no false-positive tests are seen with sera from people without other nematode infections who have not been exposed to filarial parasites) (Weil *et al.*, 1999).

Molecular Xenomonitoring Tool

Molecular Xenomonitoring (MX) testing is complementary tool for monitoring changes in LF transmission during and after (ELF) programmes. More research is needed to determine the relative value of antibody and MX testing as monitoring tools. Each has its own advantages, and the two approaches are complementary. Antibody monitoring of sentinel populations provides information on

the cumulative lifetime exposure of the sampled cohort to filarial infection. This method requires collection of finger-prick blood from a representative sample (often primary school children). MX is based on the ability of mosquitoes to collect human blood. MX provides information on the point prevalence of filarial parasites in mosquitoes in the area of interest. In practice, most parasite DNA detected by MX in mosquitoes is from pre-infective stages. Therefore, MX should be thought of as a means of efficiently sampling endemic populations for the presence of microfilariae. It is not a measure of infectivity or current rates of transmission (Weil *et al*., 1990).

The ICT (Immunochromatographic Card Test) filariasis Test

In 1997, the lateral flow, rapid-format card test for detecting filarial antigenenaemia was introduced. It took a few years for this test to gain acceptance. However, by 2000 the ICT test was recommended by International Authorities as the diagnostic method of choice for mapping of bancroftian filariasis, and this test is now widely used around the world for the Elimination of Lymphatic Filariasis (ELF) programmes (Gyapong *et al*., 2007). Its virtues are that it is quick (ten minutes), minimally invasive (100µl blood from a finger prick), easy to perform, and widely available. The last points are particularly important because these features freed filarial antigen testing from the confines of research laboratories so that it could be used in field sites around the world (Chandrashekar *et al*., 1994 and Lammie *et al*., 2004).

Despite the advantage of the microfilaria testing listed above, lack of a sensitive antigen test for *Brugia* infections means that good quality microscopy is still a very useful option for identifying *Brugia*- endemic areas. Parasite DNA detection (either in mosquitoes or in human blood samples) and antibody testing could also be used for this purpose (Chandrashekar *et al*., 1994; Ramaiah *et al*., 2001 and Lammie *et al*., 2004).

ICT Test by Binax (Detection of filarial antigenaemia) Sensitive immunological tests (the original AD 12 ELISA and a commercial test based on monoclonal antibody Og4C3 and marketed as the TropBio Filariasis Antigen (ELISA) and a lateral flow card test based on mAB AD12.1 (now marketed as the Filariasis Now ICT Test by Binax) detect antigens released by living adult *Wuchereria bancrofti* worms in

sera/plasma/whole blood from infected subjects. (Weil *et al.*, 1987, Weil *et al.*, 1996 and Taylor, 2000). These tests do not detect antigenenaemia in sera from subjects infected with other parasites including other filarial species. While positive tests may be seen in subjects with other parasitic infections if they have a history of residence in an area that is endemic for bancroftian filariasis, positive tests should not occur with sera from people with no history of exposure to *Wuchereria. bancrofti*. Antigen tests have sensitivities of 95% or higher in untreated subjects with *Wuchereria bancrofti* microfilaraemia, and they also detect infections in subjects with microfilaraemia infections (Faris *et al.*, 1998).

Several lines of evidence support the notion that amicrofilariaemic subjects with positive antigen tests are truly infected: their sera contain the same 200 kDa parasite antigen (detectable by Western blot) that is present in sera from mf carriers; their very high antifilarial antibody prevalence rates are comparable to those seen in mf carriers; their antigen levels decrease or disappear following treatment; they are at increased risk of developing microfilaraemia relative to antigen-negative subjects in the same community; like mf carriers, mf-negative men with positive filarial antigen tests often have motile adult worms in scrotal lymphatic vessels that are visible by ultrasound (Weil *et al.*, 1999, McCarthy , 1995 and Faris *et al.*, 1998).

In contrast, most amicrofilaraemic subjects with clinical filariasis have negative filarial antigen tests and no motile worms visible by ultrasound; we believe that such subjects are no longer infected with adult filarial worms.The sensitivity of antigen tests in subjects with persistent microfilaraemia following treatment is lower than in untreated subjects (in the range of 85% for the card test relative to membrane filtration with higher sensitivity in persons with mf detected by thick smear) (El Setouhy,2004 and Ramzy *et al.*, 1999).

Prior studies have shown that mf prevalence rates (by thick smear) are much lower than filarial antigen prevalence rates in untreated populations (ratio mf rate/antigen rate approximately 0.5). This ratio tends to decrease to 0.25 or lower following several rounds of MDA (which is more effective against mf than adult worms). More data are needed on the relationship between antigen and mf prevalence rates in treated populations (Faris *et al.*, 1998).

Antigen testing has certain advantages over mf testing for detecting active filarial infections: (1) it is more sensitive than mf detection, and (2) blood collected by finger prick during the day or night can be used. Based on data from filarial infections in animals, filarial antigen levels are believed to be related to the number of adult filarial worms in the human host [Weil *et al*., 1987, Weil *et al.*, 1990].

Unfortunately, antigen testing alone is not very good for monitoring progress in the first few years of ELF efforts based on MDA. This is because many infected subjects remain antigen-positive for years after treatment, even if they achieve sustained clearance of microfilaraemia Thus, major early changes in mf prevalence and density, and decreases in filariasis transmission, are likely to be missed by monitoring programs that are based solely on antigen testing.

2.7 Microscopic detection of microfilariae (mf testing)

This provides data on infection prevalence and parasite density, both of which should fall following effective MDA programmes. However, microfilaria testing is labour-intensive and requires collection of blood at night in many endemic areas. Relatively large population samples are needed to demonstrate that mf prevalence rates are below the very low targets suggested for ELF programmes. Apart from these problems, it is very difficult to obtain large, representative samples in night blood surveys in filariasis-endemic areas (Paul, 2009). Mf testing has certain advantages (it is low tech and inexpensive) and of a long track record. Unfortunately, the availability of high quality microfilaria testing is often taken for granted. Mf detection requires lots of work, training, and attention to details. Also proper sampling of populations, preparation of smears, staining and microscopy is very labor intensive. Despite these challenges, there may well be situations where mf testing could and should be the method of choice for assessment. If programme managers choose this approach, they should not focus on young schoolchildren for sampling, because mf rates are often very low in this group (Paul, 2009).

More information is needed to determine residual mf prevalence rates that correspond to interruption of transmission in different situations (i.e. reduction of incidence rates to well below rates of spontaneous clearance of filarial infections). These may vary in different epidemiological settings.(Gyapong, *et al.,* 1996).

2.7.1 Treatment

The other principal goal of the GPELF is to alleviate hardship in individuals with LF-induced disability. In 1990, LF was estimated to cause the loss of 3046 Disability-Adjusted Life Years (DALYs) for men and 952 DALYs for women. The basic measure of disease burden for any condition is measured as the number of Disability-Adjusted Life Years (DALYs) lost, which is the sum of years of life lost due to premature death and years of life lived with a disability weighed by the severity of the disability (Dreyer *et al* 2002).

The presence of the parasite in the lymphatic system can lead to:

- Lymphoedema- an abnormal accumulation of lymph in the tissues causing swelling of legs, arms, breast, or genitals.
- Elephantiasis-disabling and disfiguring lymphoedema of the limbs, breasts and genitals (up to several times their normal size), accompanied by marked thickening of the skin
- Hydrocele-fluid-filled ballon-like enlargement of the sacs around the testes
- Kidney damage leading to blood and protein loss in urine

The first three conditions can be made worse by acute attacks of bacterial infection. Bacteria and fungi invade the body through skin damaged as a result of the severe swelling. The resultant local and sometimes systemic inflammations include symptoms such as high fever, pain; swelling, nausea and vomiting that occur during periodic attacks. The bacterial infections speed the development of lymphatic destruction, causing a vicious cycle which results in more disfigurement and incapacitation (Dreyer *et al.,* 2002).

Because of the many different presentations of clinical disease, there is no one drug or treatment that is effective for all cases. However, for all patients, these issues should be considered: (1) antiparasitic drug therapy (2) supportive clinical care, and (3) patient education and counseling. All individuals with active infection i.e. microfilaraemia, should be given antiparasitic drug therapy to decrease the amount of microfilariae in the bloodstream. Some research has shown that these drugs also can help relieve symptoms (Dreyer *et al.,* 2002).

To alleviate the pain from an acute attack, a cool cloth compressed (using room temperature or a little bit cooler water) should be applied around the affected limb as soon as the attack starts. The patient also should rest and try to elevate the affected limb. Exercises are often painful and should not be done during an attack. Once the pain has subsided, it is important to clean the limb carefully and look for entry lesions.

During acute attacks, patients should drink lots of water or fruit juices. Medicine can be given to help control fever. If the patient can see a doctor or nurse, systemic antibiotics also can be given to help shorten the attack (Dreyer *et al*. 2002).

Adult worms cause damage to the lymphatic system that is permanent. However, symptoms can be managed by reducing the frequency of acute attacks and stopping the disease from getting worse. Progression of lymphoedema and elephantiasis results from bacterial and fungal 'superinfection' of tissues. Therefore, rigorous hygiene for the swollen limbs, with wound care, exercise and elevation to minimize infection and promote lymph flow, results in a dramatic reduction in the frequency of acute attacks and in great improvement of the lymhoedema and elephantiasis. The simple measures, which need to be undertaken by the patient, include: Washing the affected parts twice daily with soap and clean, cool water and drying carefully, to stop acute bacterial attacks

- Raising the affected limb at night to avoid lymph fluid stagnation
- Exercising the limb regularly to promote lymph flow
- Keeping the nails clean
- Wearing comfortable shoes
- Using medicated creams applied topically-or, in severe cases, systemic antibiotics-to treat small wounds or abrasions, which act as entry lesions for bacteria.

Through these methods, even the worst case of elephantiasis can be improved over time (Dreyer *et al.*, 2002).

For most patients, Hydrocele surgery is the treatment of choice. Men have a good prognosis with early and correct hydrocele surgery under local anesthetic. Quality pre-and post-operative care are important components that help make this surgery successful. For other genital damage, more complicated surgery is often

required. For example, scrotal skin elephantiasis may require complex reconstructive surgery with skin grafts for real improvement. Psychological counseling is also essential to support those patients with LF-induced disability who can suffer from acute shame, isolation, sexual dysfunction or disablement and intense chronic pain and suffering (Dreyer *et al.*, 2002).

2.7.2 Prevention

One of the two principal goals of the Global Programme to Eliminate Lympahtic Filariasis (GPELF) is to interrupt transmission of infection, achieved by treating the entire at risk population through community-wide (‘mass treatment’) programmes. Community-wide treatment entails the co-administration of two safe and effective oral antiparasite drugs to members of endemic communities, once a year, for at least five years. This combination of drugs is either albendazole and Mectizan or albendazole and diethylcarbamazine (DEC). Mectizan (generic name: ivermectin) is given in areas of Africa where onchocerciasis (river blindness) may be endemic. DEC is used in all other locations. DEC can also be administered as DEC-fortified table/cooking salt to endemic communities for two years (Dreyer *et al.*, 2002).

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CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The study was carried out in Ado-Odo Ota Local Government Area (LGA) of Ogun State Nigeria (Fig 3.1). This LGA is located within the tropical zone, lying between $6^0$47'N of the equator and $2^0$53'E and $3^0$18'E of the Greenwich Meridian covering a land area of 1,263 square Kilometers. It has a terrain of 1,010.4 square Kilometers plane land and about 252.6 square kilometers bad terrain comprising of 10% riverine and 4% hilly regions. It is a community with a population of about 526,565 people – according to 2006 Nigerian National Census (algoline.org, 2008)

3.2 Study Population and Recruitment of Participants

Prior to the commencement of the study, a meeting was held in the study area and Ado1, Ado11 and Eri communities out of the seven in the Local Government Area were selected for the study. The three communities comprised those randomly selected out of paper wraps containing the names of the seven localities in the Local Government Area. The towns are well demarcated into sections by a network of streets. Participants were drawn from every 5^{th} house from each section. All the selected subjects from the three communities were advised to gather at the Local Government Health center for the research study between the hours of 10pm -2am.

The study population comprised natives as well as non-natives who had resided in the communities for at least one year.

All individuals aged one or more were eligible to participate in the clinical and parasitological surveys.

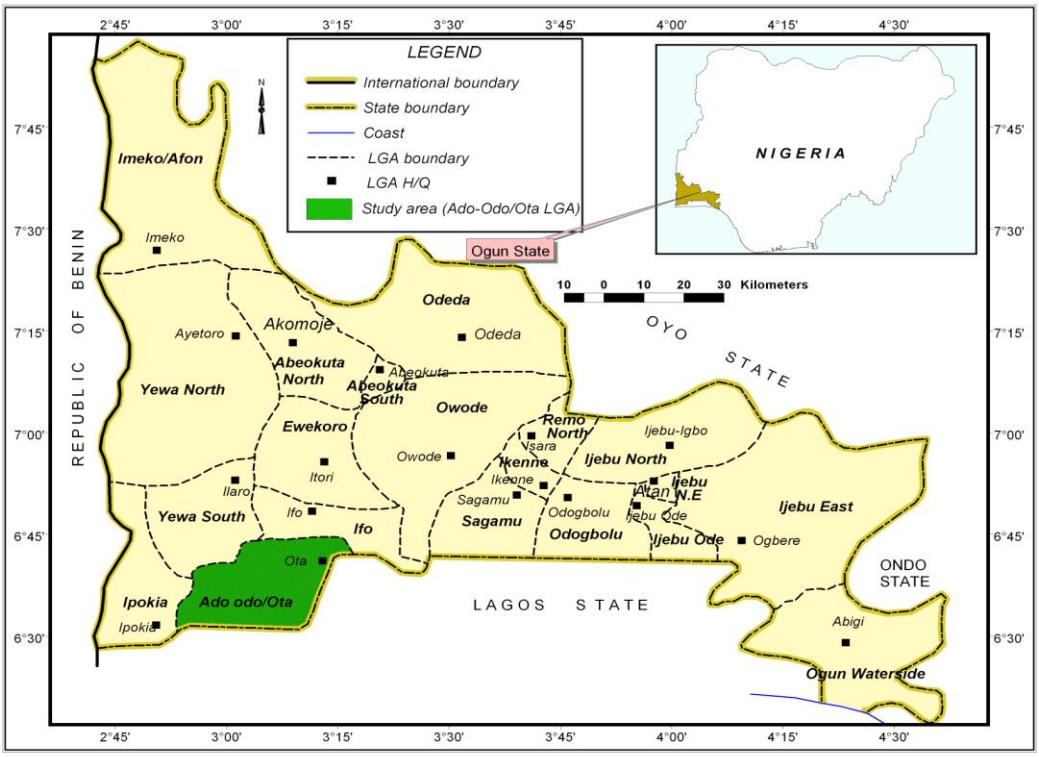

Figure 3.1 Map of Ogun State showing Ado- Odo Ota LGA.

3.3 Parasitological Survey

Blood sampling for parasitological examination took place in the night between 21:00 and 02:00 hours. For each individual participant, cotton wool soaked in 7% isopropanol was used to wipe the left thumb or index finger. A sterilized lancet was used to pierce the left thumb or index finger and a 60µl herparinized capillary tubule was used to collect blood samples. Blood samples collected were used to prepare thick-blood film on well- labeled clean microscopic slides. The slides were allowed to air dry overnight on experimental tables, after which they were carefully packed into slide boxes.

At the laboratory each blood slide was dehaemoglobinized by placing them under clean running tap water for two minutes. The slides were then immersed in a solution of 1 part Giemsa stock (commercial liquid stain) to 30 of Triton-buffered water (PH=7.0) for 30 minutes. Thereafter they were immersed briefly in water and dried. Identification of parasites was done under the microscope using x40 and x100 objective lenses. Microfilariae were identified based on the specific morphological features described by Cheesbrough (2005). The prevalence of microfilaraemia was determined and the intensity of infection was expressed as mf/mL

3.4 Clinical examination

Participants presented themselves immediately at a section of the LGA Health centre after the parasitological survey for clinical examination for evidence of symptoms and signs of lymphatic filariasis. Gross examination of participants for clinical manifestation of the disease was graded using WHO method (WHO, 2000). Chronic involvements of the male genitalia were graded as hydrocele stage I-IV (increasing sizes of true hydrocele). Affected limbs in males and females were graded as stages I (early pitting oedema), II (non-pitting oedema with thickened skin and loss of elasticity) and III (evident elephantiasis with skinfolds and/or warty lesions).

3.5 Entomological Survey

Mosquito vectors were collected using the pyrethrum knockdown method between the hours of 5am and 6am from the fifty (50) randomly selected households (WHO, 2000 and 2005). Clean white sheet of cloth was spread on the floor to cover

the whole room and pyrethrum spray was applied. Mosquitoes collected were kept in cool boxes. Identification was done using the method of Gillies and Coetzee (1987).

3.6 Questionnaire Administration

Knowledge, Attitude and Practice (KAP) survey was carried out by the use of a pretested and structured questionnaire (Krental *et al.*, 2006).The questions were divided into two sections. The first section dealt with the respondent's bio-data, general knowledge of disease, while the second section had questions on cause, symptoms, treatment and control of the disease.

3.7 Ethical Clearance

The ethical clearance for this study was obtained from UI/UCH Ethical Review Board before the commencement of the study. Ado Odo Ota Local Government Area (LGA) health authorities were contacted and their consent obtained before the actual work began. Furthermore the Obas (traditional rulers of the Yorubas), chiefs, and leaders of town development unions were briefed about the project, and their cooperation was sought in the mobilization of their people. With the assistance of the local health workers from the State Ministry of Health, the purpose of the research and why the LGA was chosen for the study was explained to participant in their native language. Informed consent forms were obtained from all participants in the selected communities. During the parasitological and clinical surveys, health personnel from the LGA were always present to monitor safety standards.

3.8 Data Analysis

SPSS 13 for windows (2007 version) was used for data analysis. The geometric mean intensity (GMI) was calculated as antilog [log (x+1)/n], with x being the number of mf/mL of blood in microfilaraemic individuals and n the number of microlilaraemic individuals examined. GMI was used to determine microfilariae load in infected population in different age groups. When analyzing for the effect of age on microfilaraemia, individuals were divided into 5 groups: aged 1-9, l0-19, 20-39, 40-59 and 60-69, 70+ years. Prevalence of infection was determined using percentage

prevalence. Chi-square ($\chi^{2)}$ was used to determine significant differences in microfilaria infection in relation to gender, Contingency chi-square and multivariate logistic analysis were used to test for association between infection and variables and T-test to determine the significant differences in intensity of infection in the different age groups. P –values < 0.05 were considered as statistically significant.

CHAPTER FOUR

RESULTS

Five hundred (500) pooled population samples from three communities Eri 1, Ado1and Ado11 in Ado-Odo Ota LGA of Ogun State participated in the study. Microfilariae identified in the blood samples of infected participants were that of *Wuchereria bancrofti (*Plate 4.1).

Table 4.1 shows that 21% of the sampled population was infected, 27.1% males and 16% females. The highest prevalence of infection in was recorded among those aged 60-69 years in both sexes. The youngest mf positive boy was 9 years old and the youngest mf positive girl was 10 years old. Microfilaria prevalence was significantly higher in males (27.1%) than in females (16%) (χ^2=9.6, df =1, p< 0.05). The overall mf Geometric Mean Intensity (GMI) in positive individuals was 17.48mf/mL blood. Intensity of infection showed no association between sexes, males (17.92mf/mL) and females (18.24mf/mL) at (p>0.05). The lowest intensity of infection (18.32mf/mL) was recorded within the stratified age group of 60-69years (Table 4.2).

4.1 Clinical Manifestations

Three chronic manifestations of bancroftian filariasis: hydrocele, limb elephantiasis and breast elephantiasis were observed (Plates 4.2- 4.8).

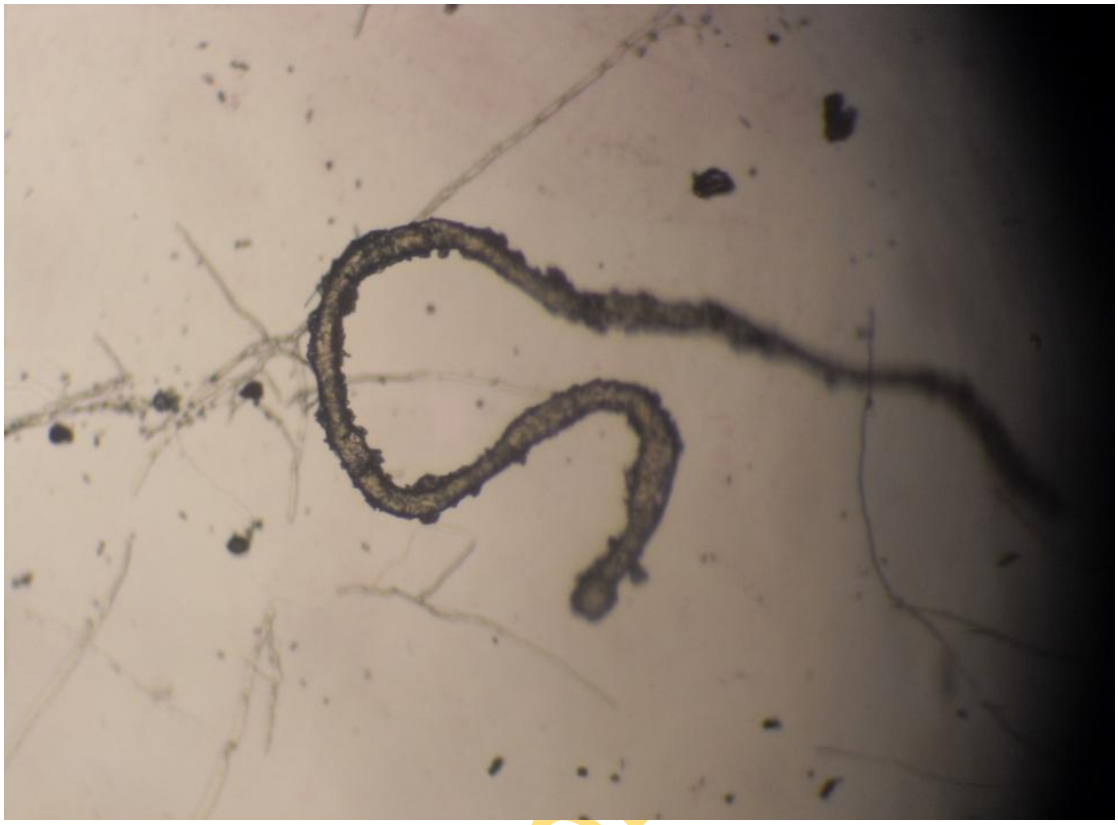

Plate 4.1: Microfilaria of *Wuchereria bancrofti* as indentified in the blood samples of infected participants in Ado Odo/Ota LGA Ogun State (x 1000)

Table 4.1: Prevalence of lymphatic filariasis in relation to age and sex in Ado-Odo/Ota LGA Ogun State

Age groups (years)	Males		Females		Total	
	No examined	No infected (%)	No examined	No infected (%)	No examined	No infected (%)
0-9	8	3(37.5)	12	1(8.3)	20	4(20.0)
10-19	12	9(75.0)	26	3(11.5)	38	12(31.6)
20-29	60	5(8.3)	78	9(11.5)	138	14(10.1)
30-39	48	9(18.8)	33	4(12.1)	81	13(16.1)
40-49	42	11(26.2)	27	5(18.5)	69	16(23.2)
50-59	13	5(38.4)	22	5(22.7)	35	10(28.6)
60-69	41	18(43.9)	73	17(23.3)	114	35(30.7)
70+	1	1(100.0)	4	0(0)	5	1(20.0)
Total	225	61(27.1)	275	44(16)	500	105(21.0)

Table 4.2: Microfilariae mean intensity in relation to age and sex

Age groups (years)	Males		Females		Total	
	No examined	GMI (mf/mL)	No examined	GMI (mf/mL)	No examined	GMI (mf/mL)
0-9	3	26.54	1	33.40	4	24.97
10-19	9	22.01	3	26.54	12	20.26
20-29	5	24.67	9	22.01	14	19.79
30-39	9	22.38	4	24.93	13	19.79
40-49	11	20.93	5	23.91	16	19.94
50-59	5	25.33	5	23.91	10	20.69
60-69	18	19.86	17	19.94	35	18.32
70+	1	33.40	0	0.00	1	33.40
Total	**61**	**17.92**	**44**	**18.24**	**105**	**17.48**

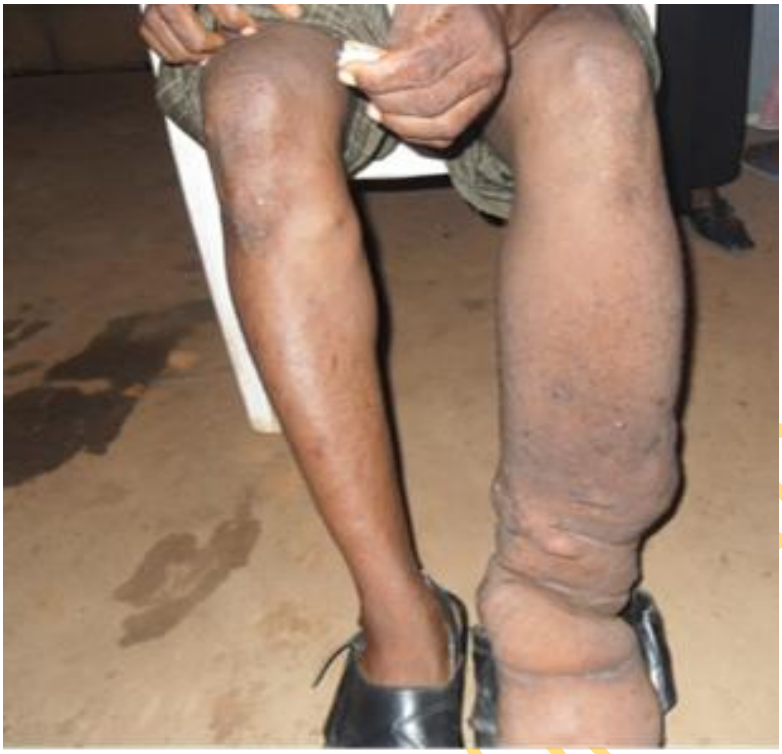

Plate 4.2: Advanced stage of the Elephantiasis of the leg (Stage IV) in an adult male in the sampled population

Plate 4.3: Elephantiasis of the leg (Stage 11) in one of the participants in the sampled population

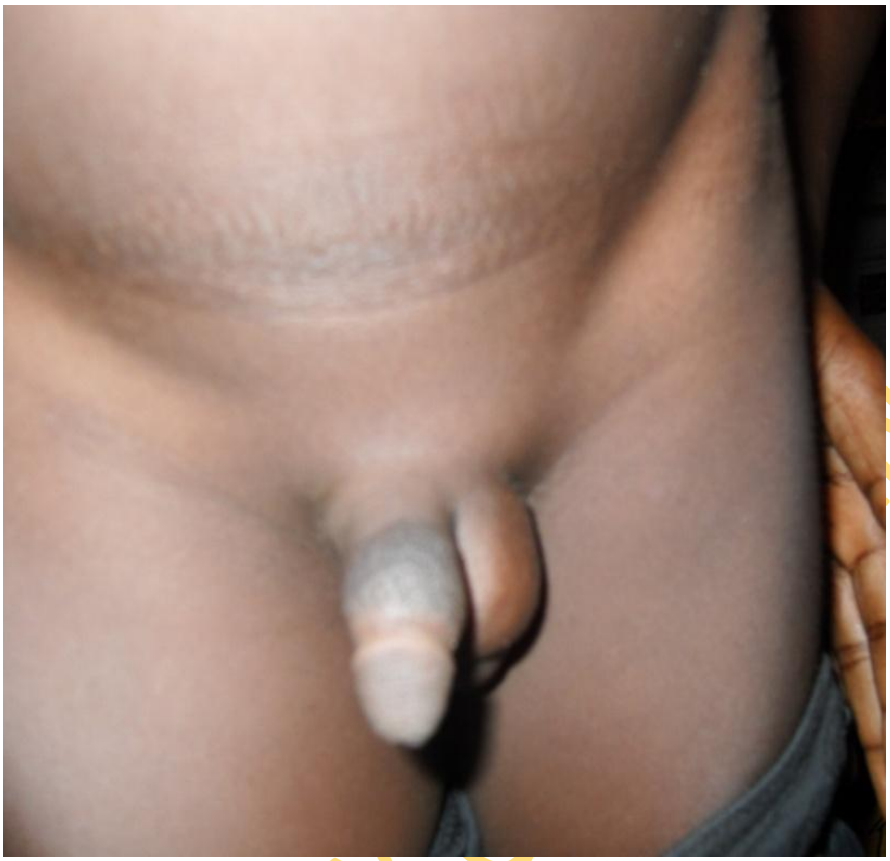

Plate 4.4: Hydrocele in the early stage (Fuculitis) in a young boy in the sampled population

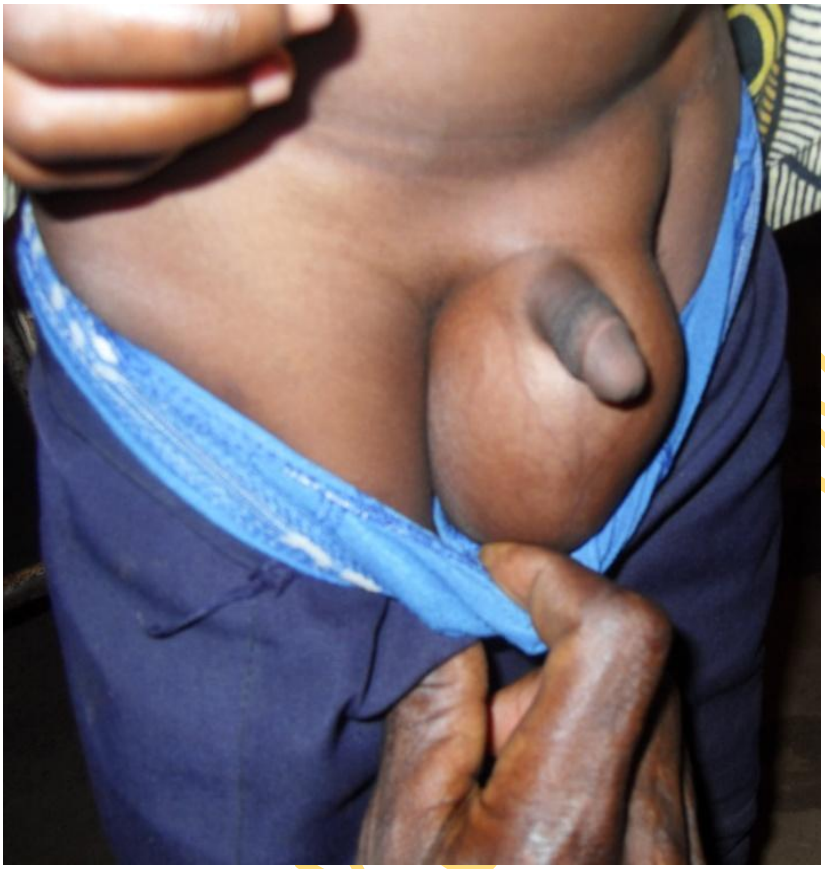

Plate 4.5: Hydrocele in a young adult in the sampled population

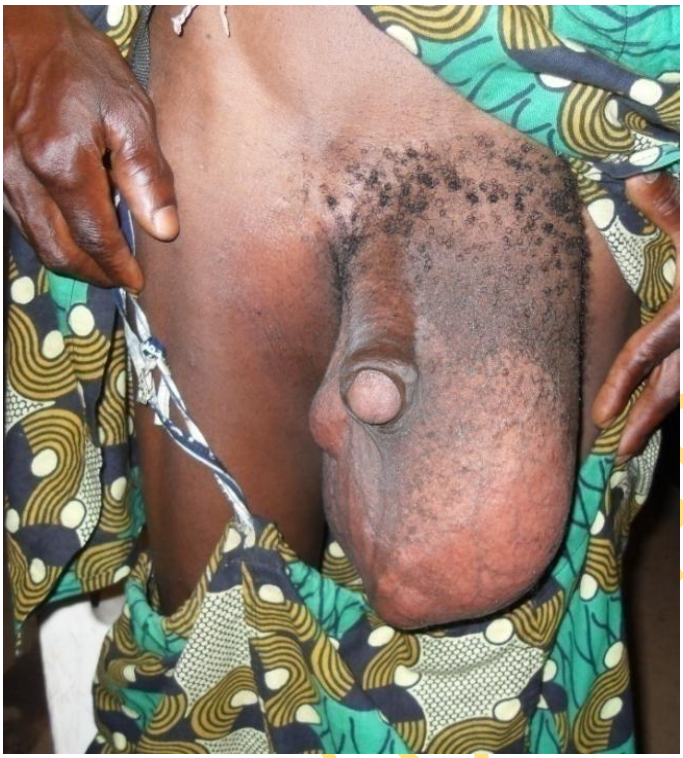

Plate 4.6: Hydrocele in an adult male in the sampled population

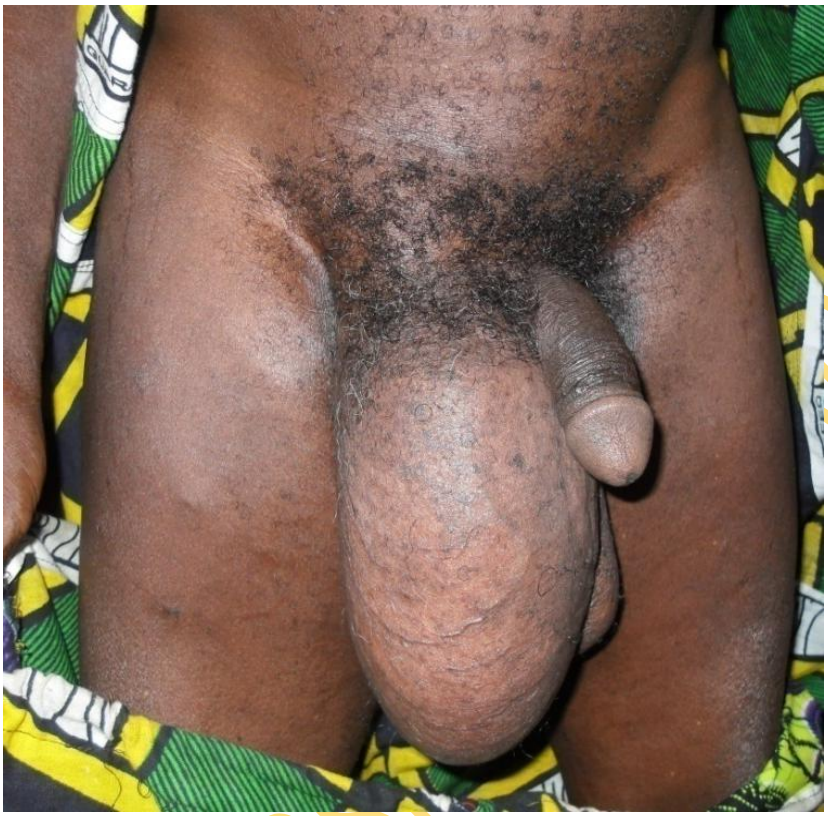

Plate 4. 7: Hydrocele in its advanced stage in an adult male in the sample population

Plate 4. 8: Elephantiasis of the breast in an adult female in the sampled population

Prevalence of limb elephantiasis was higher in females (5.8%) than in males (3.1%) even though there was significant difference (χ^2=1.7, df=1,p<0.05) (Table 4. 3). The early age groups (0-19 years) in both sexes showed no limb elephantiasis. Prevalence of elephantiasis of the limb in males increased from 4.2% to 11.9% within the age groups of 30-39 and 40-49 years respectively, with the peak prevalence 18.2% in 50-59 years old female participants. Prevalence of limb elephantiasis was not observed in males within the age groups of 50-59 years and ≥60 years. The overall prevalence of elephantiasis of the breast was 5.1% with only women in the age groups of 30-39 years (12.1%) and 50-59 years (45.5%) infected (χ^2=90.8, df=7, p< 0.05).

The least and the highest prevalence of the overall clinical manifestation was observed in age groups 20-29 and 50-59 years respectively (Table 4.3). Prevalence of chronic clinical manifestations in males characterized by limb elephantiasis and hydrocele was significantly higher (20%) than in their female counterparts characterized by limb and breast elephantiasis (10.9%) (p<0.05).

Table 4. 3: Clinical manifestations of Lymphatic Filariasis in relation to Age and Sex

Age in years	Males			Females			Total	
	No examined	No with elephantiasis of the legs (%)	No with hydrocele (%)	No examined	No with elephantiasis of the legs (%)	No with elephantiasis of the breast (%)	Examined	Clinical manifestations (%)
0-9	8	0 (0.0)	1(12.5)	12	0(0.0)	0(0.0)	20	1(5.0)
10-19	12	0(0.0)	3(25.0)	26	0(0.0)	0(0.0)	38	3(7.9)
20-29	60	0 (0.0)	3(5.0)	78	3(3.8)	0(0.0)	138	6(4.3)
30-39	48	2 (4.2)	5(10.4)	33	5(15.2)	4(12.1)	81	16(19.8)
40-49	42	5(11.9)	9(21.4)	27	4(14.8)	0(0.0)	69	18(26.7)
50-59	13	0 (0.0)	9(69.2)	22	4(18.2)	10(45.5)	35	23(65.7)
60-69	41	0 (0.0)	7(17.1)	73	0(0.0)	0(0.0)	114	7(6.1)
70+	1	0 (0.0)	1(100.0)	4	0(0.0)	0(0.0)	5	1(20.0)
Total	**225**	**7(3.1)**	**38(16.9)**	**275**	**16(5.8)**	**14(5.1)**	**500**	**75(15.0)**

4.2 Knowledge, Attitude and Practice (KAP) in the Management of Lymphatic filariasis in the sampled population in Ado- Odo Ota LGA, Ogun state

Prevalence of infection varied significantly in the different occupational groups ($\chi 2=42.3$, $p<0.05$) with the unemployed and farmers having the highest prevalence of 41.7% and 25.3% respectively (Table 4.4).

Only a few respondents (4.2%) had tertiary education while quite a number (36.4%) had primary education and 36.0% were illiterates (Table 4.4). However, education was not associated with prevalence of lymphatic filariasis in the study ($\chi 2=5.7$,df=1,$p>0.05$).

The total number of subjects with a history of fever was 102 of which 72.5% were infected with *W. bancrofti.* There was a significant association between prevalence of *W. banrofti* and occurrence of fever in the study population ($\chi 2=5.6$, df=1, $p< 0.05$). The use of bed nets did not significantly reduce infection due to lymphatic filariasis ($\chi 2=1.6$, df=1, $p>0.05$).

The belief by most (79.6%) of the respondents that the disease is fetish (caused by spiritual attack) was associated with infection ($\chi 2=9.7$,df=1.$p<0.05$). Majority (77.4%) believe that the disease was not treatable which was significantly related to disease infection ($\chi 2=9$, df=1,$p<0.05$).The number of participants who believed that the disease is not transmissible (96%) were significantly higher than those who believe that it is transmissible (4.6%). These participants that were ignorant of the transmission of infection were also significantly more infected ($\chi 2=47.1$, df=1, $p<0.05$).

4.3 Mosquito Identification

Mosquitoes collected from the houses were identified as *Anopheles funestus.*

Table 4.4.Responses for some selected survey questions. (n=500)

Variables	Response	No of Respondents	Proportion (%)	No infected %	$\chi 2$	p-value
Education	Primary	182	36.4	32(17.6)	5.7,df=4	p>0.05
	Secondary	116	23.2	23(19.8)		
	Tertiary	21	4.2	7(33.3)		
	Never attended/Too young	180	36.0	43(23.9)		
	No response	1	0.2	0(0.0)		
Occupation	Farming	146	29.2	37(25.3)	42.3.df=5	p<0.05
	Trading	122	24.4	7(5.7)		
	Fishing	21	4.2	3(9.5)		
	Artisan	83	16.6	18(21.7)		
	Civil Servant	44	8.8	5(11.4)		
	Unemployed	84	16.8	35(41.7)		
Is fever a symptoms	Yes	102	20.4	74 (72.5)	5.6,df=1	p<0.05
of Lf?	No	398	79.6	31(7.8)		
5.Causes of Lf	Fetish?					
	Yes	398	79.6	95(23.9)	9.7,df=1	p<0.05
	No	105	20.4	10(9.5)		
6. Is disease	Yes	113	22.6	12(8.7)	9.0,df=1	p<0.05
treatable?	No	387	77.4	93(24.0)		
7. Is disease	Yes	23	4.6	1(4.4%)	47.1,df=1	p<0.05
transmissible?	No	477	95.4	103(21.6)		
8. Are you	Yes	356	71.1	69(20.1)	2.0,df=1	p>0.05
stigmatised	No	144	28.9	40(25.5)		
8. Are you ashamed	Yes	343	68.6	69(20.1)	2.0,df=1	p>0.05
in public?	No	157	31.4	40(25.5)		
Do you use	Yes	79	15.8	13 16.5	1.6,df=1	p> 0.5
bednets?	No	421	84.2	92 21.9		

CHAPTER FIVE

DISCUSSION

This study has revealed the presence of Lymphatic filariasis in the study area. This is in accordance with findings from other parts of Nigeria (Udonsi, 1998 and Onwuliri, 2005) and in Ghana (Dunyo *et al.*, 1996). More than 80% of mf-positive individuals have previously been reported with *Wuchereria bancrofti* from many parts of Uganda using blood smear technique (Simonsen *et .al* ,1995 and Lammie *et .al* ,2004). Information on prevalence of lymphatic filariasis due to *W.bancrofti* and associated burdens is necessary to evaluate its public health implication and subsequently plan for control intervention. People of all ages are susceptible and potentially microfilaremic.

The present survey shows that lymphatic filariasis is highly endemic and a major health challenge in Ado Odo Ota LGA of Ogun State. An overall prevalence of 21% was recorded for lymphatic filariasis in this study. This report is higher than other related studies conducted in Ogun state and other parts of Nigeria (Badaki *et.al.*, 2001, Mbah *et.al,* 2002, Anosike *et.al*., 2005, Ojurongbe *et. al.*,.2010, and Okon *et al*, 2010). The high prevalence of infection could be attributed to poor living conditions of the people. Proximity of the people to various breeding sites of the parasite's vectors is also implicated. Surveyed areas had poor infrastructure, majority of the people lived in mud, thatched roof houses, some with windows and some without windows and none used mosquito nets on their windows and doors. Uncut vegetation around houses serves as hiding places for vectors of disease. Social amenities like pipe borne water, good roads, and toilets were not available. Inhabitants still use rivers and streams for bathing, washing their clothes and passing out feces. Socio-economic factors have been observed to play a major role in the distribution of lymphatic filariasis especially in Western Africa (Thomson, 2006). The rate of poverty in this area is still high; this also makes it difficult for infected participants to seek modern treatment measures. Pani *et al.* (2002) in their work in India emphasized on poverty as one of the causes of lymphatic filariasis as it is majorly found among the poor class in India

The patterns of infection and disease in the 3 endemic communities appeared very similar to those previously observed on the East African coast in studies carried out also using the same night blood sampling techniques (Estambale *et al*., 1994; Meyrowitsch *et al*., 1995). Prevalence of infection cut across the various age groups. Percentage prevalence of infection in the adult population (males and females) in this study increased with age until ≥70 years. There was a higher prevalence of microfilaraemia in males than in females. Age-related infection rates are in accordance with previous studies which showed prevalence rose with age (Akogun , 1992; Anosike *et al*., 1996; Udonsi, 1998). The increase in infection rate from 30-70+ years in the adult population in this study indicates greater exposure of older age groups to the vectors of infection than the lower age groups. Larger proportion of older adults are farmers in the study area; hence the probable higher predisposition to mosquitoes than the younger groups. The difference in microfilaria prevalence between age groups may also be attributed to differences in the level of exposure to the night-biting vector and the sleeping arrangements of the people as observed by Pani *et al.* (2002). It has also been observed that adults present a greater surface area to biting female mosquitoes (Ramaiah *et al*., 2001). The age-related differences may also reveal that the initially very light infections are difficult to detect with available parasitological techniques. When levels of adult circulating antigenemia were measured in an endemic population in Haiti, they seemed to slowly but steadily rise with age, suggesting a slow, but significant acquisition of infection in adults (Lammie *et al*., 2004).

In this study prevalence increased with age till about ≥70. In most Asian communities, it was found that prevalence of microfilaria increased with age up to ≥70years, thereafter remaining steady at almost the same age level (Ramaiah *et al.*, 2001) In Africa, the prevalence increased with age, to reach a maximum level around 15-20 years of age in adolescence. Thereafter it increased with age until it peaked at around ≥40 years, after which it also leveled off. Hence, the age of peak prevalence was strikingly different in the two regions. However no matter the observable difference from region to region, the pattern of increase in infection with age increase has been a remarkable similar pattern in the trend of infection in most studies (Ramaiah *et al.,* 2001). Results from this study however is relatively different from

that observed in Africa in adults, as the peak prevalence of infection was within ≥ 70years age group. Notable similarity however existed between the peak prevalence of infection in adolescence in this study and that observed in Asia (Ramaiah *et al.*, 2001).

In the three endemic communities in this present study, microfilaraemia prevalence was found in young children aged 9-19 years. The prevalence in children increased by age, and reached the highest levels in the stratified age group of 10-19 years. The youngest affected among boys was a 9 year old, while among girls was 10 year old. Proofs from past studies showed that children below age 15 were been infected (Michael *et al*., 1996). Also research studies have shown that detection by antigenaemia shows that children are becoming infected early in life and that the prevalence of positive antigenaemia among children could indicate the degree of transmission in an area (Graham, 1997). Lymphatic filariasis is acquired very early in life even though the clinical manifestations are seen in adults (Smith, 2006). Most epidemiological studies have demonstrated an increase in the prevalence of microfilaraemia with age that plateaus by young adulthood. A similar pattern was observed in 1983 in Bopa (Krishmamoorthy *et al.*, 2000).

Overall in this research study males were observed to show higher prevalence than females. There is a commonly observed and discussed trend of higher microfilaria prevalence in males than in females (Estambale *et al.*, 1994; Meyrowitsch *et al.*, 1995; Simonsen *et al*., 1995; Gyapong *et al*., 1996; Bruschi *et al*., 2004). Both sexes are equally susceptible to infection. However, because of differences in local, cultural and work practice as well as exposure to insect vectors, either sex may be more exposed to infection (Ramaiah *et al.*, 2000). Similar prevalence in both sexes in this study may reflect that both males and females engage equally in activities involving an exposure risk, such as nocturnal outdoor meetings and storytelling. Exposure during sleep is also comparable in males and females with peak vector biting between 22.00 – 02.00 hours (WHO, 2004).

The overall geometric mean intensity recorded in this study did not follow a particular pattern with age and sex. This has also been the trend in previous works (Estambale *et al.*, 1994; Meyrowitsch *et al*., 1995 and Simonsen *et al.*, 1995 Anosike *et al.*, 2005; Udoidung *et al.*, 2008). The high intensity recorded in the younger

individuals (0-9 years) was due to lack of acquired immunity against infection by *W. bancrofti* in the group. There was a noticeable reduction in the microfilariae intensity in women within the active reproductive age of 20-29years. Among females reduction in microfilaraemia level among women of reproductive age of 20-29 years has been reported in Nigeria and elsewhere (Brabin, 1990; Anosike *et al.*, 2005; Kimura, 2005).

All the various clinical manifestations of lymphatic filariasis were observed in this study. Elephantiasis of the limbs in males and females, elephantiasis of the breast in females and hydrocele in males. Chronic and acute disease manifestation affects the limbs, breast, genitals and other parts of the body. The acute form of the disease typically involves lymphadermatitis and lymphanadenolymphangitis (O 'Hesen, 1997). Overall, clinical signs in this research study indicated a higher prevalence in males than females as age increased. The public health importance of limb elephantiasis should, however, not be underemphasized, since this condition often has severe personal and social consequences for the affected individuals. Limb elephantiasis was more common among females than males in this research study which agrees with findings in Ghana (Dunyo *et al.*, 1996). It was observed in this study that prevalence of limb elephantiasis increase with age. Findings from other West African countries and some parts of Northern Ghana also reported higher prevalence of limb elephantiasis in females than males (Dunyo *et al.* 1996 and Gyapong *et al.*, 1996).

Studies in recent times however, have implicated an important role for secondary bacterial and/or fungal infections in the development of lymphoedema and elephantiasis with the presence of filarial worms being a pre-disposing factor (Ottesen, 1994). Hence, although women in this study had a lower prevalence of filariasis, they may be more exposed to the microbiological agents resulting in progression of the lymphatic lesions to elephantiasis. Women in the present study were more engaged in bush trading where they go to buy fruits and vegetables for days for sales to urban women traders, hence females, were therefore more exposed to infections of the lower extremities than males.

Hydrocele was the most predominant clinical sign in men in the studied population than leg elephantiasis. Hydrocele is quite common in Africa with an

estimated number of cases put at 10 million (Michael *et al.*, 1996). It cuts across the age groups. High prevalence of true, and stage I scrotal elephantiasis was recorded in this study and is consistent with findings in some areas in Nigeria (Udonsi, 1998; Akogun, 1992). Chronic clinical manifestations were seen among people in the third or fourth decades of their lives, and non among those in the first decade of life. This could be due to the natural history of the disease, the early stage of which is remarkably silent and progression to latter stages is phenomenally slow (Smith, 2006). Chronic disease has also been found to be higher in males, due to the high number of hydroceles, which is likely to be related solely to anatomical size of the organ being affected (Chan *et al.*, 1998).

Prevalence of hydrocele increased with increase in age in the study population. A similar pattern of increase with age for hydrocele was observed in Ghana (Dunyo *et al*., 1996) and East Africa (Meyrowitsch, 1995). The prevalence of hydrocele was same as reported from studies in East Africa (Meyrowitsch, 1995; Mcpherson, 2004; Mernard *et al.*, 2005). In Varanasi, North India, hydrocele was the most common manifestation of the disease in men (Sharma, 1999; Pani *et al.*, 2002).

The overt clinical manifestations of hydrocele, elephantiasis and the syndrome of acute filarial fevers, cause a lot of morbidity and stigma associated with the grotesquely enlarged limbs and genitals (Partono, 1984; WHO, 1992; Evans *et al*., 1993). An annual morbidity is estimated as 2% with resultant annual morbidity estimated as four million disability – adjusted life years.

On the whole, the number of individuals with clinical manifestation in Ado Odo Ota (15%) seemed to be lower than the number of individuals who showed prevalence of infection (21.0%). This is expected because although point prevalence of infection could be high, the total proportion of the population who eventually experience clinical signs (cumulative prevalence) may not be substantial initially because development of clinical sign is an aftermath of infection. Some of those once infected may later become amicrofilaraemia but may retain their steady drift to chronic pathology (Bundy *et al.*, 1996). The type and frequency of clinical manifestations vary from one region of the body to another. Some workers have suggested that there is correlation between the vectors preferred site and the region of the body affected by clinical filariasis (Chandra and Hati, 1993).

Most of the participants (73%) had lived in the study area for more than one year. Most of the participants from the study population were from Ado 1 and 2 (85%) while Eri had 15%. From the sampled population, 63% claimed to have been born in their village of residence and 35 % from outside.

Occupation was significantly related to disease infection in the study areas. Out of the infected participants 29% were found to be farmers, who sleep for months with open windows and doors in wood and thatched roofed farm houses that expose them greatly to vector of diseases, followed by 24.6% traders who go for bush trading. These also were easily predisposed to vectors of parasite. Most of the participants were familiar with the disease which were called local names, like Ipa (78%) and by some others Awoka (22%).

The infected participants were mostly illiterates followed by those with primary school education who reported that they were contacting the disease for the first time. A total of 55% participants (farmers and primary school leavers) belonged to the category of those contacting the disease for the first time while 45% reported it was a second occurrence after a first noticeable swelling which went down after the first contact with disease. The KAP studies also reflected their ignorance of the cause of the disease Most of the participants, 79.6% believed the cause is fetish while 73.6% of participants in the study population belief that the cure of disease could be by traditional practitioners. This pattern of belief system did not allow participants seek treatment measures which aggravated infection and enhanced pattern of spread. Only 15.4% of the population indicated the use of bed nets which is an indication of ignorance of the control and treatment measures. Level of education has been emphasized by Pani *et al*. (1991) as a major factor in the control of lymphatic filariasis.

Almost all infected participants (72.5%) agreed that fever was the only symptom of infection. They described symptoms of disease as fever with concurrent pains. Treated participants (35%) who accepted treatment in General hospitals could not remember the names of drug used for treatment while the remaining participants (65%) had been to traditional healers one time or the other. The infected participants (95.7%) believed that the disease is neither treatable nor transmitted (78.4%) by

mosquito bite rather they believe it is a vengeance of the gods on wrong doing. However transmission and treatment measures were significantly related to infection in this research study. Ignorant of these two key factors are major attributes to spread of lymphatic flariasis in these communities. There is also a strong indication of the ignorance of the studied population on the causes of lymphatic filariasis.

The Global Alliance to Eliminate Lymphatic Filariasis(GPELF) has advocated mass drug administration of albendazole and ivermectin as one of the most effective control strategies for lymphatic filariasis in endemic areas. The impact of mass drug administration has undoubtedly reduced the incidence of new cases of clinical diseases associated with lymphatic filariasis in some regions of Africa and some parts of Nigeria. With the high sensitization towards eradication of lymphatic filariasis in some parts of Nigeria, some areas are however still neglected due to lack of up to date geographical distribution map for the disease in the country. Instability in the political and management system which often times hampers effective drug delivery to the affected areas is also a contributing factor limiting the implementation of mass drug chemotherapy.

The present study identified lymphatic filariasis as a major health problem in Ado-Odo Ota Local Government Area, Ogun state, Nigeria, and shows the need for intervention programs. Application of conventional insecticides or implementation of measures for source reduction, as means of vector control in the mainly Anopheles-transmitted foci, appear impracticable, because of the demanding logistics and the many scattered and inaccessible mosquito breeding sites. The use of insecticide treated net to prevent infection is advocated for the management of the disease. School-based mass chemotherapy in lower age groups is necessary to abate the morbid clinical manifestations associated with filarial worm infection in the adults later in life. Routine introduction of treatment to women at antenatal clinics in endemic areas is also recommended.

5.1 Conclusions and Recommendation

Ado- Odo Ota has never undergone mass drug treatment for lymphatic filariasis and this should be considered.

Hydrocele affected individuals should be recommended for hydrocelectomy and the government should be ready to subsidize treatment considering the fact that majority of affected participants in this study belong to the very poor class.

There is a great need for educational awareness, on the cause, treatment, prevention and control of lymphatic filariasis. Therefore there should be health education about the disease in the area.

Lastly there is a great need for provision of social amenities, as the LGA is still largely dependent on river and stream waters for domestic purposes which are breeding sites for the vectors not only of lymphatic filariasis but of other zoonotic diseases that are also associated with these areas.

This research study is the first to present a baseline data on lymphatic filariasis in Ado–Odo Ota LGA, Ogun State. The baseline data will be a prelude to mass drug administration in the community by the State Ministry of Health. This research study has also educated and enlightened the people in the study area on lymphatic filariasis and its management.

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APPENDIX

Questionnaires

Epidemiology and Control of Lymphatic Filariasis in Ado –Odo Ota Local Government Area, Ogun State South-West Nigeria.

I am a Post Graduate Student of University of Ibadan, Department of Zoology (Parasitology Unit), working on the Epidemiology and control of Lymphatic filariasis in Ado –Odo Ota Local Government Area in Ogun State, Nigeria.

This questionnaire is directed to infected people in the community and non-infected adults. The objective of the questionnaire is simply to find out your knowledge, attitude and practice in the management of lymphatic filariasis that might play in its epidemiology. Your sincere responses to these questions will be highly appreciated. Every information given will be treated as highly confidential and no publication will be made with names and addresses attached to it. Thank you

Demographic Information

Individual's Code----------

Age ----------

Sex----------

Occupation----------

Village of Residence----------

Date and Place of Birth----------

How long have you been in this village? ----------

Highest education level:

Tertiary Institution ☐ Senior Secondary School ☐ Primary School ☐

I did not go to school ☐

KNOWLEDGE OF FILARIASIS

What is the name of this disease in your local dialect?

Have you been infected before? Yes ☐ No ☐

If yes is there any swelling in any part of your body? Yes ☐ No ☐

Is this your first time of contacting this disease? Yes ☐ No ☐

What were the symptoms of the disease?

Have you been treated before? Yes ☐ No ☐

If yes, where were you treated?

What were the names of the drugs you were given?

What causes this disease?

How is the disease transmitted?

Do you think this disease can be transmitted by mosquitoes? Yes ☐ No ☐

If yes, how can it be prevented?

Is it transmissible from one person to the other?

Can this disease be treated? Yes ☐

No If yes, how?

How can the disease be prevented?

Do you use bednets?