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SERO-EPIDEMIOLOGICAL AND SOCIO-CULTURAL STUDIES ON LYMPHATIC FILARIASIS IN BENUE STATE, NIGERIA

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B.Sc., M.Sc (Jos)

A THESIS IN THE DEPARTMENT OF ZOOLOGY, FACULTY OF BIOLOGICAL SCIENCES, SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, UNIVERSITY OF NIGERIA, NSUKKA, IN FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN PARASITOLOGY OF THE UNIVERSITY OF NIGERIA NSUKKA.

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CERTIFICATION

MR EDWARD AGBO OMUDU, a postgraduate student in the Department of Zoology, has satisfactorily completed the requirements for research work for the degree of Doctor of Philosophy (Ph.D) in Zoology (Parasitology). The work embodied in his thesis is original and has not to our knowledge been submitted in part or full for any other Degree or Diploma in this or any other University

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DEDICATION

This thesis is affectionately dedicated to all members of the extended Omudu family of Odelle Okpiko in Ohimini Local Government Area of Benue State, Nigeria and to God Almighty and all His children.

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(2008)

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW

CHAPTER TWO: MATERIALS AND METHODS

CHAPTER THREE: RESULTS

CHAPTER FOUR: DISCUSSION

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABSTRACT

Lymphatic filariasis continues to constitute immense public health problem and obstacle to socio-economic development in endemic countries. The disease cause widespread and chronic suffering and social stigma resulting from ignorance and incorrect beliefs. Information on the physical and psychology disability resulting from lymphatic filariasis in Nigeria is scarce. This study was therefore designed to describe the degree of disease burden, extent of distribution and community knowledge, attitude and perception (KAP) using serological, clinical manifestations and quantitative questionnaires in Benue State. The serological diagnosis employed the use of the whole blood Immunochromatographic Card test (ICT) for detection of circulating filarial antigen (CFA). Eight hundred and forty-five (845) randomly selected persons in rural communities were tested using the ICT test kits with 264 (31.2%) testing positive. Infection was significantly higher in male subjects (X2=7.02, df=1, $P < 05$). The prevalence of hydrocoele and lymphoedema were employed as rapid community diagnosis procedures. Out of the 1,702 subjects examined, 107(6.28%) had various stages of scrotal swelling while 33 (1.94%) had various stages of elephantiasis of the limb. Hydrocoele prevalence in investigated communities was not statistically significant ($P > 0.05$). Correlation analysis showed a weak positive association between ICT rates and hydrocoele prevalence ($r=0.367$, $P < 0.016$). On the other hand, correlation analysis showed a strong positive association between hydrocoele and lymphoedema rates ($r = 0.847$, $P < 0.207$). There was an observed decline in ICT positively, hydrocoele and lymphoedema prevalence rates beyond the 50-59 age group. The three diagnostic procedures gave a consistent pattern in the trend and distribution of the disease in Benue State. Quantitative questionnaires were administered to 118 persons with visible manifestations of the disease and 1,610 community members with no visible signs of the disease. The questionnaires were to investigate lymphatic filariasis-related knowledge, attitude and practices (KAP). The socio-cultural traditional beliefs of the three major ethnic groups influence their knowledge on the causation, mode of transmission, prevention and psychosocial consequences of the disease. The Igede ethnic group's perception on lymphatic filariasis were significantly ($P < 0.05$) influenced by superstition when compared to the Tiv and Idoman groups. Gender variation in the KAP was observed amongst patients, though these were not significant ($X^2 = 5.91$, df =1, P >

0.05). Lymphoedema and hydrocoele significantly ($P > 0.05$) affects physical, psychological and social functioning in affected individuals. Ranking exercise revealed preference of traditional medicine over modern medicine. Patients' KAP and choice of health providers were influenced by prevailing traditional and superstitious norms in the community. There was no significant correlation between the level of formal education of respondents and their response to causes, mode of transmission and prevention of lymphatic filariasis. This study provides a reliable estimate of the prevalence, distribution and burden of lymphatic filariasis in Benue State. The combination of hydrocoele and lymphoedema prevalence which are classical manifestations of the disease and rapid ICT filariasis test are being recommended for community mapping which is critical pre-requisite for commencement of intervention activities. Morbidity control, in addition to control of physical disability, should also target and address psychological needs of affected persons in order to mitigate the consequences of lymphatic filariasis. These findings may be used in the development of group-specific health education programmes to change health behaviours and to achieve higher involvement of the community in the planned mass drug administration to eliminate lymphatic filariasis. Several areas of community misconceptions, lack of knowledge or erroneous beliefs and practices were identified in this study, the challenge for the Nigerian lymphatic filariasis elimination programme is to translate this information into practical ways of promoting and improving lymphatic filariasis prevention, control and management for individual and communities.

LIST OF ACRONYMS

ADL - Acute Adenolymphangitis

ADLA - Acute Dermatolymphangioadenitis

AFL - Acute Filarial lymphangitis

APOC - African Programme for Onchocerciasis Control

CDC - Centre for Disease Control

CF - Compliment Fixation

CFA - Circulating Filarial Antigen

DALY - Disability Adjusted Life Year

DBL - Danish Bilarziasis Laboratories

DEC - Diethycarbamazine

ELISA - Enzyme Linked Immunosurbent Assay

FAST - Falcon Assay screening Test

FMOH - Federal Ministry of Health

GAELF - Global Alliance for Elimination of Lymphatic Filariasis

GIS - Geographic Information System

ICT - Immunochromatographic card test

IHA - Indirect Haemagglutination

ITBN - Insecticide Treated Bed net

ITM - Insecticide Treated Materials

KAP - Knowledge, attitude and perception

LF – Lymphatic filariasis

LGA - Local Government Area

MDA - Mass Drug Administration

mF - Microfilaria

MOH - Ministry of Health

NGO - Non- Governmental Organization

NIGEP - Nigeria Guinea Worm Eradication Programme

NLFEP - Nigerian Lymphatic Filariasis Elimination Programme

NOCP - National Onchocerciasis Control Programme

NPC - National Population Commission.

OCP	-	Onchocerciasis Control Programme
PCR	-	Polymerase Chain Reaction
PHC	-	Primary Health Care
RAM	-	Rapid Assessment Method
RAP	-	Rapid Assessment Procedure
REM	-	Rapid Epidemiological Mapping
RGRG	-	Regional Programme Review Group
RBM	-	Roll Back Malaria
TDR	-	Tropical Disease Research
UNICEF		United Nation Children Fund
WHO	-	Word Health Organization

CHAPTER ONE

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction.

Lymphatic filariasis (LF) commonly known as elephantiasis is a painful and profoundly disfiguring disease that has a major social and economic impact in Asia, Africa, the Western Pacific and parts of the Americas. It is one of the leading causes of permanent and long-term disability in the world. About one billion people in 80 different countries are known to be at risk of this disease (WHO 1998). Globally, the disease is known to affect about 120 million people in 73 endemic countries.

Estimates from the 1993 World Bank Development Report (which uses Disability Adjusted Life Years as a measure for comparing the public health impact of diseases) indicate that lymphatic filariasis accounts for 850,000 DALYs lost. In sub Saharan Africa, it is estimated that about 512 million people are at risk of the infection and about 28 million are already infected. Of this number, there are 4.6 million cases of lymphoedema and over 10 million cases of hydrocoele. These represent about 40% of the global burden of the disease (Michael *et al* 1996).

Lymphatic Filariasis is caused by long thin filarial worms *(Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*) that live in lymph channels in the human body. In most endemic countries, it is transmitted at night by the female *Culex* and *Anopheline* mosquitoes through the process of taking a blood meal from individuals infected with microfilaria (mf) which are millions of larval forms produced by paired adult worms. The mosquito ingests the microfilaria over a period of about L2 days. The microfilaria progress through several larval stages to an infective stage, called the L3 larvae, which breaks out of the mosquito mouthparts, escapes, and finds its way into the human

bloodstream during another blood meal. The L3 matures into an adult worm within the human host between 3 to 15 months, migrating to the lymphatics, where it pairs with an adult of the opposite sex and initiates the production of microfilaria. The adult worms may live up to 8 years on the average but there have been reports of some worms living beyond 20 years (Wentworth 1988, WHO 1992).

As a result of this parasitic infection, the lymph channels get damaged and blocked thereby preventing the proper flow of lymph fluid through the body. The accumulation of lymph fluids leads to the chronic manifestation of lymphatic filariasis in the extremities of the body namely elephantiasis of the upper and lower limbs, which affects about 4.6 million people in Africa. Hydrocoele is another manifestation of lymphatic filariasis and is also known to affect about 10 million men in Africa alone (Michael *et al.*, 1996). Women have been known to have infections of the breast and female genitalia but these are rare. In terms of sex differences, Brabin (1990) has noted that the intensity of infection and clinical disease are higher in men than in women. Similar findings have also been reported in India (Ramaiah *et al.*, 1996) and other geographical sites (Pani *et al.*, 1997).

Lymphatic filariasis is commonly seen among the poorest of the poor and for many years has a very low public health rating in the health priorities in African countries where it is prevalent. Clinical manifestations ranges from periodic reoccurring attack of localized inflammation, tenderness and pain, often accompanied by fever, nausea and vomiting, known as acute adenolymphangitis (ADL) to chronic symptoms including lymphoedema, hydrocoele and elephantiasis. As many as 27 million men are believed to have filarial hydrocoele and 16 million people have lymphoedema or elephantiasis

(WHO 2002). These manifestations are very severe and disfiguring and result from a complex interplay of the pathogenic potential of the parasite, the immune response of the host, and external ("complicating") bacterial and fungal infection (Rajagopalan 1990, GAELF, 2005).

Although Lymphatic filariasis is not fatal, the chronic symptoms often afflict individuals in their most reproductive stage of life and therefore impose a significant social and economic burden on society. Lost productivity due to lymphoedema, genital damage and adenolymphangitis caused by Lymphatic filariasis costs millions of dollars each year. At a recent meeting in The Hague, in relation to discussions about incorporating LF into APOC/OCP, Haddix (1999) presented figures on the economic impact of filariasis. These figures indicated that while APOC countries may loose $1.3 billion each year due to lost in productivity, OCP countries lose about $350 million each year due to lost in productivity. The report added that over 80% of these losses are due to disability in men with hydrocoele. Surgical treatment for hydrocoele has been known to impose a tremendous burden on the health care systems in endemic areas and on the sufferers of the disease. In Ghana, one-third of all surgeries are for hydrocoele repairs, a hydrocoele operation costs US $30 representing over a month of income for the average worker. In India, a hydrocoele operation represents up to three months in wages. It has been conservatively estimated that filariasis in India, where one-third of cases occur, costs over one billion dollars each year in lost productivity (Addiss and Brady 2007). In some communities in India, 7 - 8% of male labour is lost because of chronic lymphatic filariasis, primarily hydrocoele (Ramaiah *et al.*, 1997, 1998, 1999, 2000).

The Chinese now estimate that every US dollar invested in filariasis control has produced more than US $15 in benefits (WHO 1998). The direct cost of the disease on affected individuals and on community productivity is catastrophic. The disease has been responsible for the continued socio-economic stagnation in many endemic communities. In a study by Ramu *et al* (1996), the productivity of male weavers with chronic LF was found to have reduced by as much as 27.4% in the cloth weaving industry and thus reduce wage earning. In China where LF has been eliminated, the primary motivation behind the elimination campaign was the impact of the disease on agricultural productivity (WHO 1999). Even though grave, the direct cost on treating the disease is low since very few people travel to seek treatment for their condition. This is mainly due to treatment seeking behavior related to local concepts on the perceived cause of the disease (Ramaiah *et al.*, 1996).

1.1.1. Lymphatic filariasis in Nigeria

The third most endemic country in the world for this disease (after India and Indonesia) is Nigeria, where it is caused by *Wuchereria bancrofti*, and 22.1% of the population is thought to be infected (Eigege *et al.*, 2002). Results from Nwoke *et al* (2000), Braide *et al* (2003), Badaki and Akogun (2001), Terranella *et al* (2006) and the report to the postal survey by the Nigerian Lymphatic Filariasis Elimination Programme (NLFEP) have shown that lymphatic filariasis is prevalent and widespread. However, a lot more epidemiological information is needed on the disease distribution and intensity in many parts of the country because many areas in Nigeria are yet unidentified and

unstudied. This situation no doubt has continued to affect the planning and implementation of any control or elimination measures against lymphatic filariasis.

Urbanization and deteriorating sanitary conditions will continue to exacerbate the lymphatic filariasis transmission in Nigeria. Currently almost a quarter of the entire Nigerian population may be infected with *Wuchereria bancrofti* and at least 90 million Nigerians are considered to be at risk of developing lymphatic filariasis (Hassan et al., 1998, Lindsay and Thomas 2000, Sabesan *et al.*, 2006). Focus for filariasis control as being implemented by the National Onchocerciasis control programme (NOCP) has been on rural areas, where the disease burden is highest. Urban populations, though not exempted are not specifically targeted for mass drug administration (MDA). In contrast to the onchocerciasis control programme, lymphatic filariasis is also a disease of impoverished urban populations, where poor sanitation and over- crowding have led to the rise of the mosquito vectors that spread the infection. Terranella *et al* (2006) reported that urban lymphatic filariasis is expected to rise as urban population swells from current 44. 8 million to 55.5 million by 2015.

Existing epidemiological records on the distribution and prevalence of lymphatic filariasis in Nigeria shows that very little has been documented. While countries like Ghana, Tanzania and Kenya have National filariasis control programmes targeted at aggressive vector control and Mass Drug Administration (MDA) (Gyapong *et al.*, 1996, Gasarasi *et al.*, 2000), filariasis control is yet to come on mainstream in Nigeria. Geographically isolated endemic foci in Nigeria has however been recognized with significant morbidity. Further more; models of global climate change predict extension of the endemic areas of lymphatic filariasis during the coming decades (Sebesan *et al.*,

2006). Emerging epidemiological factors like rural to urban migration and increasing urbanization, both of which are occurring increasingly seem to justify this fear. Most importantly, is the inadequate waste disposal and deteriorating sanitary conditions in the country, which increases the number of breeding sites for the mosquito vectors.

A few cases of high prevalence of *Wuchereria bancrofti* have been reported in Nigeria with infection rates ranging between 9.1% and 18.8% in the eastern region and northeastern region (Badaki et al., 1999). Mbah and Njoku (2000) reported a prevalence rate of 18.8% recently in Anambra State, noting only slight differences in prevalence among sexes (48.9% in females and 51.1% in males) 4.2% of males had hydrocoele with 7.5% having varying degrees of elephantiasis of the lower limb. Udonsi (1986) in studies in Eastern Nigeria observed the prevalence rates of 8.7%, 11.8% and 14.9 - 25.6% in Cross Rivers, Imo and Rivers state respectively. He also reported a prevalence rate of 21.21% in some villages in Rivers and Bayelsa States where he observed co-endemicity of *Wuchereria bancrofti* and *Loa loa, Onchocerca volulus* with *Mansonella perstans*. In more recent observations by Braide *et al.,* (2003) 13 cases of various lymphatic filariasis manifestations were reported in Cross Rivers State. Amadi and Udonsi (2004) also reported a prevalence rate of 4.4% in Ogoniland in Rivers State. They attributed poor response of victims to submit themselves to examination and refusal to give night blood samples as formidable challenge to lymphatic filariasis studies in Nigeria

The real burden of lymphatic filariasis is unknown in Nigeria and there is that problem of identifying those in need of treatment because of the nocturnal periodicity of

the parasite. Parasitological examinations of night blood are inconvenient both to scientists and the patients and this is culturally unacceptable in many parts of Nigeria especially in the north where women are not permitted to leave their household at night. This has always been the constraint to accurate diagnosis and reporting of the disease in Nigeria. Badaki *et al* (1991) used low dose of ivermectin to provoke daytime emergence of microfilariae in the blood for purpose of diagnosis. They reported that microfilariae of *Wuchereria bancrofti* were observed in daytime blood collected 30 minutes after administration of drug.

Vector studies by entomologists in Nigeria indicate a widespread distribution of mosquito species incriminated for transmitting lymphatic filariasis in parts of Africa and elsewhere. *Culex quinquefasciatus* is the main vector in Nigeria though sometimes *Aedes* and *Anopholes* species are also suspected. These species are frequently encountered breeding in domestic water holding containers and temporal peridomestic water pools (Service 1991, Nwoke *et al.*, 1993, Omudu 1998). The breeding of these filariasis vectors in and around human dwelling indicates an intense man-vector contact and this is epidemiologically significant.

Vector control has traditionally played an important role in the control of lymphatic filariasis, but for this to be effective, a good understanding of vector population dynamics and behaviour is essential. The involvement of more than one species of mosquito in transmission of this disease justifies entomological survey of the study area to identify the principal vector species, their breeding habitat preference and biting activity. This is very important to facilitate specifically targeted intervention.

Table 1: Report of Lymphatic Filariasis studies in Nigeria

	Location	**Number Examined**	**Number with ADL**	**No with Limb Enlargement**	**No. with (scrotal swelling)**	**No. Post. for ICT Test**	**References**
1	Plateau & Nasarawa	4116	-		53(12.9)	927(22.5 %)	Eigege *et. al* (2002)
2	Jos	7250	1(0.013)	9(0.13)	6(0.08)	-	Terranella *et al* 2006
3	Nationwide	536*	-	-	197(36.8%)		Nwoke *et al* 2006
4	Plateau	4451	-	-	-	22.4%	Hopkins *et al* 2002
5	Anambra	500	94 (18.8%)	7(1.4%)	2(0.8%)	-	Mba & Njoku 2000
6	Taraba	785	-	256(32.6%)	-	-	Badaki and Akogun (2000)
7	Cross River State	19	-	4 (13)	-	-	Braide *et al* (2003
8	Niger Delta	1351	170 (13.0%)	14 (9.4 %)	-	-	Udonsi (1986)
9	Ebonyi	1243	210# (16.9%)				Anosike *et al.*, (2005)

* Villages examined, # Microfilariae.

Table 2: Result of rapid epidemiological mapping (REM) of lymphatic filariasis in some States in Nigeria (After Nwoke *et al.*, 2006).

State	No of villages selected	No of villages Inaccessible (%)	No of villages examined (%)	No of villages without hydrocoele (%)	No of villages With hydrocoel e (%)	Frequency of percentage hydrocoele in relation (%) to No of villages with hydrocoele		
						1-4	4-6	>6
1.Bauchi	46	11(23.9)	35 (76.1)	8 (22.9)	27 (77.1)	9(33.3)	12(44.4)	6(22.2)
2.Adamawa	7	0 (0.0)	7 (100.0)	2 (28.6)	5 (71.4)	4(80.0)	1(20.0)	0(0.0)
3.Katsina	116	0 (0.0)	116(100.)	101(87.1)	15(12.9)	4(26.7)	3(20.0)	8(53.3)
4.Nasarawa	5	0(0.0)	5(100.0)	2(40.0)	3 (60.0)	2(67.7)	1(33.3)	0(0.0)
5.Jigawa	35	5(14.3)	30(85.7)	30(100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
6. Kano	12	1(8.3)	11(91.7)	11(100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
7. Imo	18	0(0.0)	18(100.0)	15(83.3)	3(16.7)	3(100.0)	0 (0.0)	0 (0.0)
8. Edo	11	1(9.1)	10(90.9)	9(90.0)	1((10.0)	1(100.0)	0 (0.0)	0 (0.0)
9. Ondo	13	1(7.8)	12(92.3)	11(91.7)	1(8.3)	1(100.0)	0 (0.0)	0 (0.0)
10. Ekiti	6	0(0.0)	6(100.0)	5(83.3)	1(16.7)	1(100.0)	0 (0.0)	0 (0.0)
11. Kaduna	22	6(27.3)	16(72.7)	12(75.0)	4(25.0)	4(100.0)	0 (0.0)	0 (0.0)
12. Osun	18	3(16.7)	15(83.3)	13(86.7)	2(13.3)	2(100.0)	0 (0.0)	0 (0.0)
13. Oyo	20	0(0.0)	20(100.0)	18(90.0)	2(10.0)	2(100.0)	0 (0.0)	0 (0.0)
14. Ogun	16	3(16.7)	13(81.3)	13(100.0)	0(0.0)	0 (0.0)	0 (0.0)	0 (0.0)
15Akwalbom	23	4(17.4)	19(82.6)	5(26.3)	14(73.7)	3 (21.4)	5(35.7)	6(42.9)
16. Plateau	11	0(0.0)	11(100.0)	3(27.3)	8(72.7)	2 (25.0)	3(37.5)	3(37.5)
17.Yobe	23	4(17.4)	19(82.6)	14(73.7)	5(26.3)	2 (40.0)	2(40.0)	4(20.0)
18. Kogi	27	0(0.0)	27(100.0)	5(18.5)	22(81.5)	2 (9.1)	9(40.9)	11(50.0)
19. Taraba	25	0(0.0)	25(100.0)	13(52.0)	12(48.0)	5 (41.7)	0(0.0)	7(58.1)
20. Kwara	28	0(0.0)	28(100.0)	20(71.4)	8(28.6)	5 (62.5)	2(25.0)	4(12.5)
21. Kebbi	64	2(3.1)	62(96.9)	42(67.7)	20(32.1)	11(55.0)	8(40.0)	4(5.0)
22. Gombe	32	5(15.6)	27(84.4)	5(18.5)	22(81.5)	8 (36.4)	10(45.5)	4(18.2)
23. Bornu	56	15(26.8)	41(73.2)	39(95.1)	2(4.9)	2(100.0)	0 (0.0)	0(0.0)
24. Sokoto	41	13(31.7)	28(68.3)	14(50.0)	14(50.0)	8 (57.1)	5 (35.7)	11(7.1)
25. Zamfara	38	15(39.5)	23(60.5)	17(73.9)	6(26.1)	6(100.0)	0 (0.0)	0(0.0)
Total	**625**	**89 (14.2)**	**536(85.8)**	**339(63.2)**	**197(36.8)**	**87(44.2)**	**64(31.0)**	**49(24.9)**

1.1.2 Significance of study

Lymphatic filariasis is leading cause of permanent disability and yet one of the most neglected diseases in tropical Africa. The direct cost of treatment is enormous while the indirect losses resulting from incapacitation and loss of labour results in severe stress on the household, local and national economies (Haddix and Kestler, 2000). Furthermore, the disabling physical problems of lymphatic filariasis has serious psychology and social consequences such as sexual dysfunction and social exclusion of men, women and children afflicted by hydrocoele, lymphoedema and other genital abnormalities.

Informed by the serious economic and social burden of lymphatic filariasis and the recent remarkable advances in the disease diagnosis, clinical understanding, successes of trials and control programmes as well as increasing political commitment. The 50th World Health Assembly in May, 1997 passed a resolution identifying as a priority the elimination of lymphatic filariasis as a public health problem (WHO 1997). The Global Programme of Eliminate Lymphatic Filariasis (GPELF) was set up to develop a strategic plan. The programme is based on a strategy of eliminating transmission of lymphatic filariasis using mass drug administration (MDA) and alleviating the suffering of those infected through disability prevention efforts. This programme is encouraged by the Mectizan Donation Programme for the elimination of lymphatic filariasis through dual treatment of the disease with donated Mectizan and albendazole to endemic countries.

If planned interventions are carried out, it will provide much needed care to the poorest of the poor, thus increasing their health, quality of life and potential productivity. Richards (2005) asserts that eliminating lymphatic filariasis will be one major step closer to creating vibrant productive communities for future generations. A lot is yet to be

understood about distribution, prevalence and socio-economic impact of lymphatic filariasis in Nigeria. Compared to other filariases like onchocerciasis and dracunculiasis, very little work has been done and documented in Nigeria. As a result of this, cultural concepts of beliefs and perception of the disease is highly influenced by traditional folklores and this has strengthened stigmatization and negatively impacted on treatment seeking behaviour.

The prevalence and epidemiological factors influencing transmission of lymphatic filariasis in many rural areas like most of Benue State where the nation's agricultural mainstay exist are scarcely known. Before lasting solution is reached and planned global elimination accomplished, reliable baseline data on the epidemiology, clinical pathology and socio-cultural impact of the disease must be available. This study intends to contribute to that needed information that will guide intervention activities in Benue State and in Nigeria.

Some sub-Saharan countries like Ghana, Kenya Tanzania have developed programmes for mass chemotherapy for treatment of lymphatic filariasis, for Nigeria to commence any of such programmes, this kind of study is very crucial to provide and guide intervention strategy. Vector control has traditionally played an important role in the control of lymphatic filariasis, but for this to be effective, a good understanding of vector population dynamics and behaviour is essential. The involvement of more than one species of mosquito in transmission of this disease justifies entomological survey to identify the principal vector species, their breeding habitat preference and biting activity. This is very important to facilitate specifically targeted intervention.

Immunodiagnosis is not commonly reported in epidemiological surveys in Nigeria though it is expected to give a better view of the infected proportion of the community. Its use is fast becoming indispensable especially with the contemporary trend towards immunology and immuno-chemistry of parasitic infections. Sero-diagnostic techniques intended for this study are expected to justify the use of immunodiagnostic test for epidemiological surveys. Vector-borne disease control programmes mostly rely on controlling the parasite and /or vector ad have often overlooked the importance of the target population's knowledge, belief and behaviour in the transmission and control of disease ignorance and incorrect beliefs can lead to negligence in prevention and control measures and in accepting inappropriate treatments. Participation of individuals and communities is an important component of filariasis control activity (Kumar, *et al.*, 2005). To attain community participation and design socially acceptable control strategies, researchers must be familiar with people's knowledge, beliefs and behaviour in relation to filariasis.

Such information on lymphatic filariasis is scanty as very studies have been carried out to understand these issues in Nigeria. This study intends to present the results of a detailed investigation into people's knowledge, beliefs and behaviour in relation to lymphatic filariasis. Information on the socio-economic consequences of the disease and the possible benefits of mass chemotherapy in Nigeria is very scarce. Since the study areas are reputable agrarian communities, this study will provide much needed information on the impact of the disease on productivity and costs of lymphatic filariasis -related disability and the possible improvement in quality of life and potential productivity following different strategies to combat the disease.

1.1.3 Study aim and objectives

The overall aim of this study is to determine the prevalence, distribution and lymphatic filariasis related knowledge, attitude and perception in Benue State, Nigeria.

The main objectives are

1. To determine the prevalence and distribution of lymphatic filariasis in selected Local Government Areas (LGAs) of Benue State using serological and clinical techniques.

Specifically this objective will examine

- The prevalence of *Wuchereria bancrofti* circulating antigen using the Immunochromatographic card test and clinical manifestations of lymphatic filariasis.
- Ascertain community prevalence using search for lymphoedema and hydrocoele as rapid assessment procedures to determine the prevalence of the disease in the communities.

(2) To investigate lymphatic filariasis related knowledge, beliefs and perception, the social, economic and psychological impact of this disease on daily life and how these influence treatment seeking behaviour.

Specifically, this objective seeks to determine

- ❖ The community's definition of filariasis and their knowledge, cause and transmission of the disease.
- ❖ The community's attitude towards individuals with filariasis particularly evident chronic disease.
- ❖ To estimate the clinical and socioeconomic burden of the illness and its implications to economic and productive activities.
- ❖ The gender differences in perception, impact and burden of lymphatic filariasis.

1.2 LITERATURE REVIEW

1.2.1 Epidemiology of Lymphatic Filariasis

Causes and Transmission.

Lymphatic Filariasis is caused by long thin filarial worms *(Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*) that live in lymph channels in the human body. In most endemic countries, it is transmitted at night by the female *Culex* and *Anopheline* mosquitoes through the process of taking a blood meal from individuals infected with microfilaria (mf) which are millions of larval forms produced by paired adult worms. The mosquito ingests the mf over a period of about 12 days. The mf progress through several larval stages to an infective stage, called the L3, which breaks out of the mosquito mouthparts, escapes, and finds its way into the human bloodstream during another blood meal. The L3 matures into an adult worm within the human host between 3 to 15 months, migrating to the lymphatic, where it pairs with an adult of the opposite sex and initiates a second infection with the production of mf (Fig. 1). The adult worms may live up to 8 years on the average but there have been reports of some worms living beyond 20 years (WHO, 1996).

1.2.2 Epidemiology

As in other filariases, the epidemiology of lymphatic filariasis involves an insect vector; the mosquito, the parasite; *Wuchereria bancrofti* and man and his environment. Much progress have been made by the World Health Organization in the control and elimination of this disease, the Tropical Disease Research (TDR) strategic emphases matrix grouped lymphatic filariasis in TDR Disease; Category 3. (Diseases with control strategy proven effective, disease burden falling and elimination planned). (WHO 2002). However, the numbers of infected persons are increasing worldwide due to unchecked

urbanization in many endemic areas (Sabesan *et al.*, 2006). Poor sanitation and rapid population growth in tropical and subtropical areas of the world has created more breeding grounds for mosquito and has resulted to new infections. Furthermore, global climate change is affecting the behaviour and population dynamics of mosquitoes, warmer temperature are beginning to cause mosquitoes to expand their habitat range and bite more frequently, thus bringing new populations in contact with the disease and increasing chances of infection. Harb *et al* (1993) reported the resurgence of lymphatic filariasis in the Nile delta; this was after years of steady decline as a result of treatment and vector control.

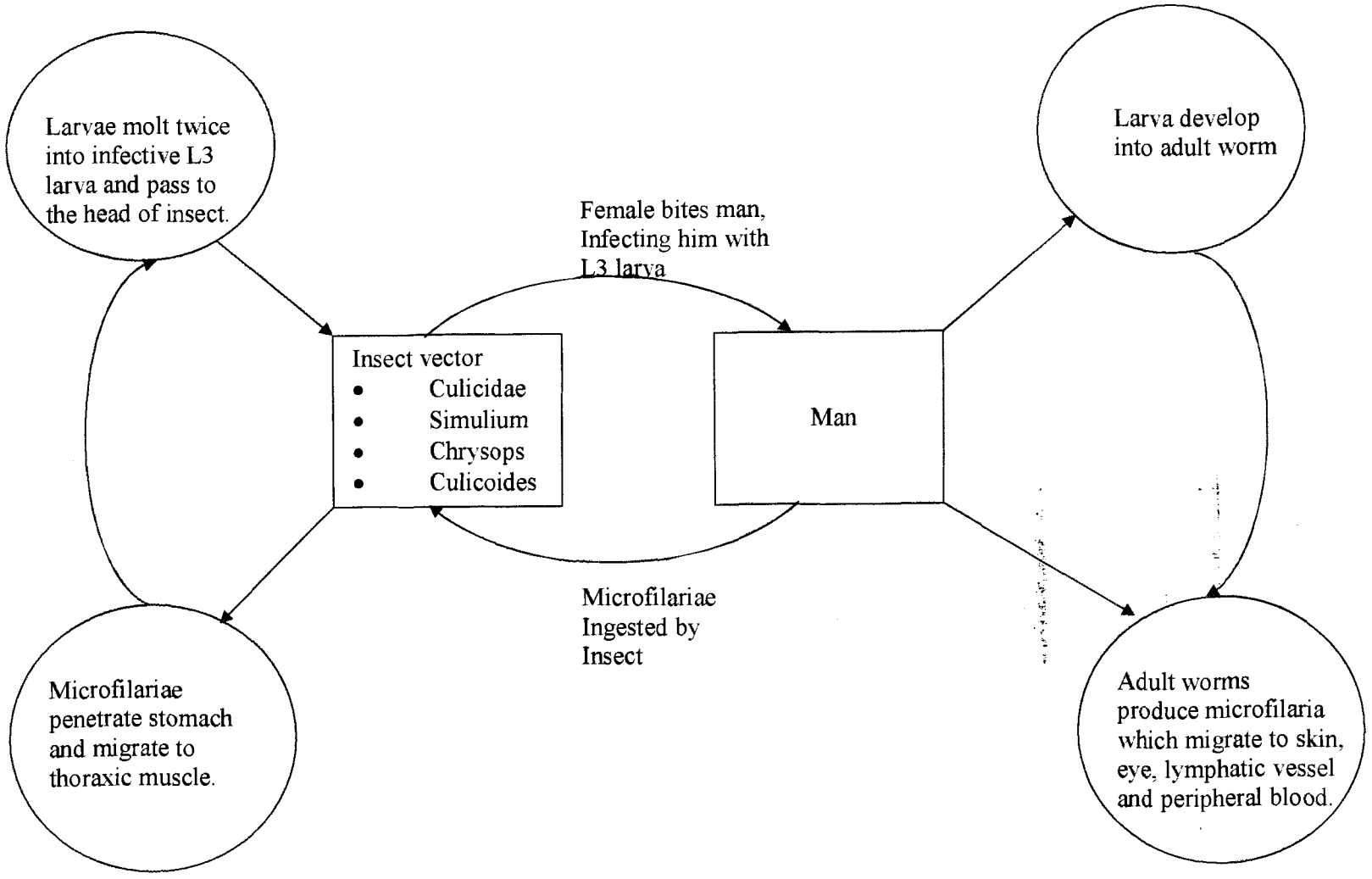


Fig 1: Life cycle and transmission pattern of filariases

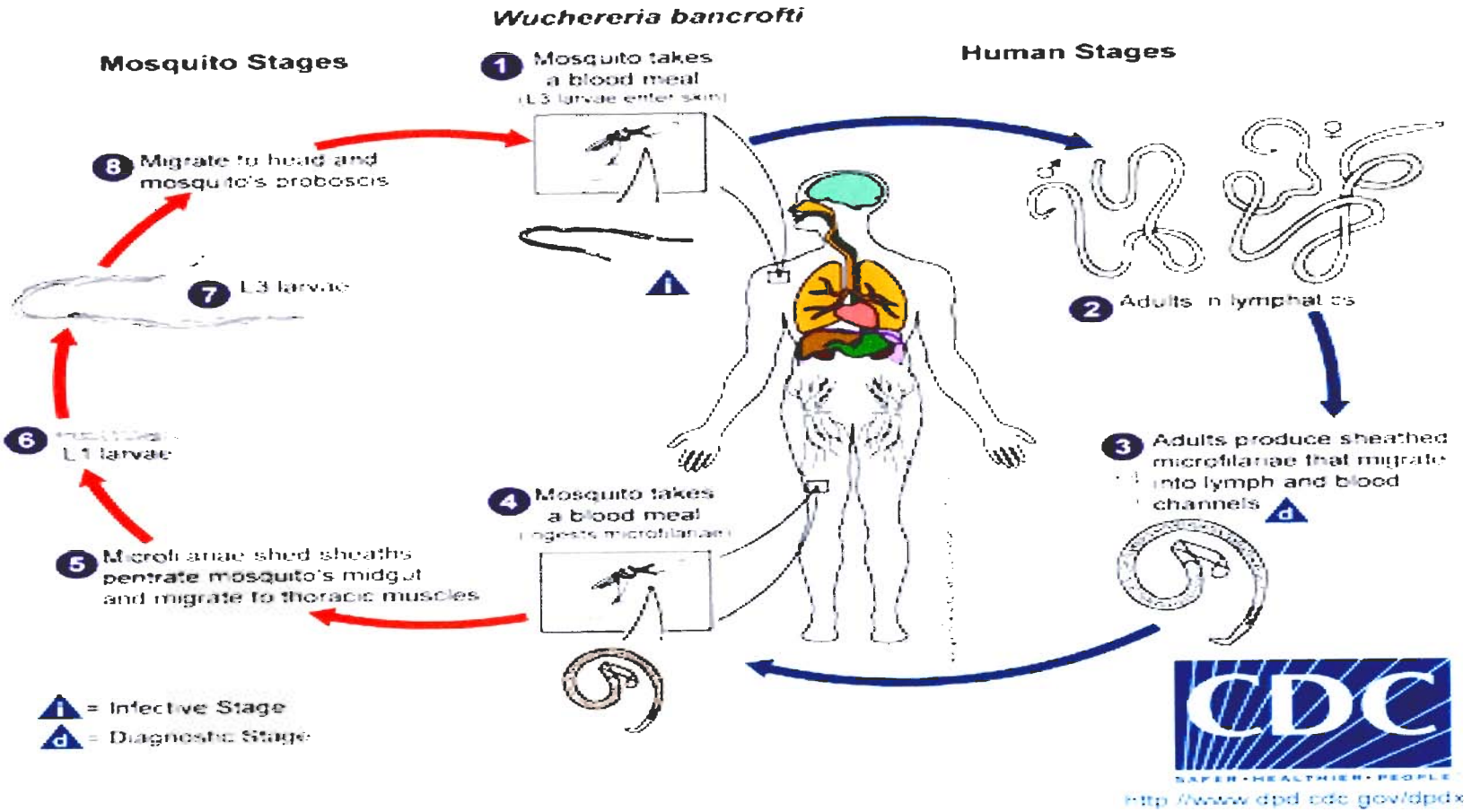


Fig. 2: Life Cycle of *Wuchereria bancrofti*:

Table 3. Characteristics of the common species of filariae of man and their microfilariae (WHO, 1984)

			Microfilariae		
Species	**Location**	**Vector**	**Periodicity**	**Sheath**	**Distribution**
Wuchereria Bancrofti	Lymph nodes, lymphatic	Culicidae (Mosquitoes)	Nocturnal, sub periodic	Yes	Tropics Global
Brugia malayi	Lymph nodes, lymphatic	Culicidae (Mosquitoes)	Nocturnal, sub periodic	Yes	South East Asia
Brugia timori	Lymph nodes, lymphatics	Culicidae (Mosquitoes)	Nocturnal	Yes	Indonesia
Brugia pohangi	Lymph nodes, lymphatics	Culicidae (Mosquitoes)	Nocturnal	Yes	Malaysia
Onchocerca volvulus	Skin, eye, lymphatic	Simulium spp (Blackfly)	None of little	No	Africa, Central and South America
Loa loa	Subcutaneous tissue eye	Chrysop Spp	Diurnal	Yes	Africa
Mansonella perstans	Body cavities, tissues	Chrysop Spp	None	No	African South America
Mansonella ozzardi	Peritoneal cavity	Chrysop Spp	None	No	South America
Dipetalonema streptocerca	Subcutaneous tissue	Chrysop Spp	None	No	Africa

1.2.3 Map of lymphatic filariasis endemic Countries

An estimated 1.3 billion people around the world are at risk of lymphatic filariasis infection, and more than 120 million are infected. Countries where lymphatic filariasis is found are mostly in the tropical and sub-tropical regions of the world (Fig. 3). They also are among the world's poorest countries, as lymphatic filariasis is closely linked to poor sanitation and poor housing quality.

1.2.3.1 Regional Programme Review Groups

The effort to eliminate lymphatic filariasis is organized at a regional level into 6 Regional Programme Review Groups (RPRGs), which review national plans, review applications for drug donations, provide technical guidance and identify operational research issues. Lymphatic filariasis elimination is a concerted effort that requires years of cooperation to ultimately achieve success. Not every country has been able to begin lymphatic filariasis elimination efforts simultaneously. This section highlights those countries that have been especially successful in moving forward with a national lymphatic filariasis elimination programme. Many of these countries began with pilot projects in one or two regions and are now facing the challenges of scaling up the program to cover all areas with lymphatic filariasis in the country.

1.2.3.2 Countries with Current Programmes

The approximately 40 countries that currently have elimination programmes have been particularly successful in creating an environment to set up successful programmes, establishing effective task forces to oversee programme activities, mapping lymphatic filariasis to determine where endemic areas within the country are, deciding on mass drug administration strategy and finally, creatively developing ways to help those afflicted with lymphatic filariasis. These countries are shaded in Figure 5.

Countries with Lymphatic Filariasis (LF) Elimination Programs

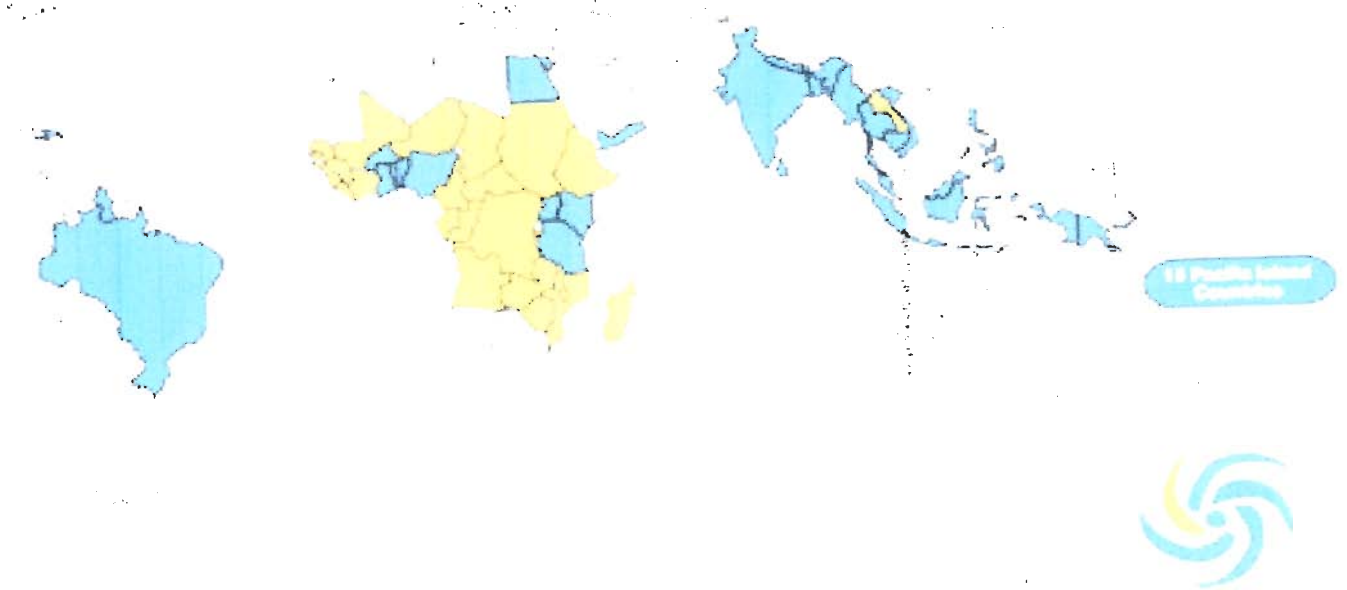


Table 4: list of lymphatic filariasis endemic countries

African PRG (39)
Angola
Benin
Burkina Faso
Burundi
Cameroon
Cape Verde
Central Africa Rep
Chad
Comoros
Congo
Congo, Dem Rep of
Cote d'Ivoire
Equatorial Guinea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Liberia
Madagascar
Malawi
Mali
Mauritius
Mozambique
Niger
Nigeria
Reunion
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Tanzania, United Rep of
Togo
Uganda
Zambia
Zimbabwe

American PRG (7)
Brazil
Costa Rica
Dominican Republic
Guyana
Haiti
Suriname
Trinidad and Tobago

Eastern Mediterranean PRG (3)
Egypt
Sudan
Yemen

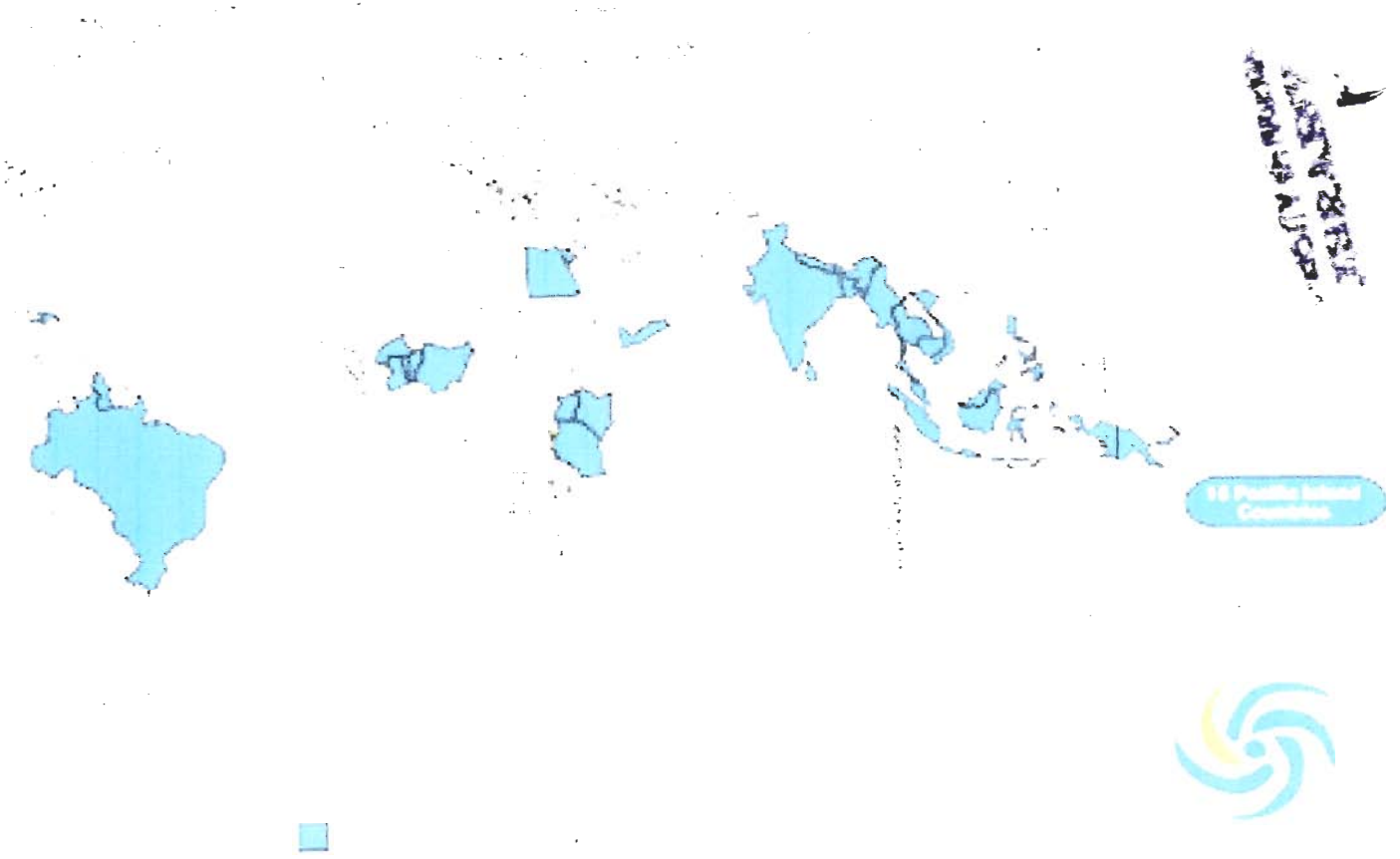
Mekong-Plus PRG (8)
Brunei Darussalam
Cambodia
China, People's Rep
Lao, PDR
Malaysia
Philippines
Korea, Rep of
Viet Nam

PacCARE PRG

(Pacific Elimination Programme) (17)
American Samoa
Cook Islands
Fiji
French Polynesia
Kiribati
Marshall Islands
Micronesia, Fed States of
New Caledonia
Niue
Palau
Papua New Guinea
Samoa
Solomon Islands
Tonga
Tuvalu
Vanuatu
Wallis and Futuna

South-East Asia PRG (9)
Bangladesh
India
Indonesia
Maldives
Myanmar
Nepal
Sri Lanka
Thailand
Timor-Leste

Countries with Lymphatic Filariasis (LF) Elimination Programs



1.2.4 The Mosquito Vector

The vector of lymphatic filariasis in Africa is the *Culex quinquefasciatus, culex cinereous* and sometimes *Aedes,* and *Anopholes* species. These species breed in domestic and peri-domestic natural or man-made water- holding containers. These species are also the frequently encountered container-breeding mosquitoes especially in Nigeria (Nwoke *et al.,* 1993, Omudu 1998). The larvae of these mosquitoes have high ability to tolerate starvation; this explains their success in colonizing domestic containers and even temporal water pools.

Most container-breeding mosquitoes frequently enter houses to feed on man and are endophagic in their feeding habits. The fact that these mosquito vectors are able to breed in household containers, polluted waters in septic tanks and pit latrines during the harsh dry mouths when most seasonal surface water bodies are dry is epidemiologically important. The breeding of these mosquitoes, vectors of filariasis in and around human dwelling results to intense man-vector contact. *Culex* species the principal vectors occur through out the tropics, their population has increased in many towns due to increasing urbanization and the resultant proliferation of unsanitary collections of water. *Culex quinquefasciatus* is principally a night-biting mosquito co-inciding with when microfilariae are released into peripheral blood. After feeding adult may rest in houses, natural infection rates of mosquitoes with infective larvae of *W. bancrofti* vary from about 0.1-5% depending greatly on the vector species and local conditions (Service 1991).

In a recent study in Jos, Nigeria by Richards *et al* (2005) resting *Anopholes gambiae, Anopholes funestus* and *Culex* species were collected from 92 sequentially sampled households and dissected. Mosquitoes habouring any larval stage of *W. bancrofti* were classified as "infected" and those containing the third-stage larvae of the parasite were classified as "infective". The outcome of the study showed high

prevalence of mosquito infection (8.9%) and infectivity (2.9%) before chemotherapy with Mectizan and albendazole, after three years of annual treatment with the combination of these drugs, only anopheline mosquitoes were found to still harbour ***W. bancrofti*** larvae though infection level dropped to 0.6% and infectivity down to 0.4 %. In a similar study in north-western Cameroon, Ivoke (2000) dissected a total of 1440 female mosquitoes belonging to three major species. Anopholes gambiae *sl.* was the dominant species and the one found to be naturally infected with microfilaria.

The epidemiological significance of this study is that both anopholine and culicine mosquitoes in urban, semi-urban and rural areas in Nigeria are infected and may be able to transmit lymphatic filariasis. Changes in rainfall pattern, deteriorating sanitary conditions and overcrowded housing will no doubt favours the multiplicity of mosquito-vectors of lymphatic filariasis. Furthermore, as government fail in her responsibility to provide portable water both in rural and urban areas, individuals will continue to acquire more water storage containers thereby providing more habitats for mosquito colonization.

Culex quinquefasciatus is an important vector of urban bancroftian filariasis in the tropical world. Despite its public health importance, much of its olfactory mediated behaviour is poorly understood. Studies on source-location behaviour, in particular the role of semiochemicals in its behaviour, are required to understand the relationship between the mosquito, its host and the surrounding environment to effectively control bancroftian filariasis. Mboera (1999) investigated the role of semiochemicals in the host-location behaviour and oviposition site-selection of *Culex quinquefasciatus*. The olfactory responses of the host-seeking female *Culex quinquefasciatus* to various odour stimuli in a dual-choice olfactometer showed that the mosquito responds more to foot skin emanations than to carbon dioxide and

moisture. These results present evidence that kairomones used during the host-seeking process by *Culex quinquefasciatus* are present in human skin emanations. The preference of *Culex quinquefasciatus* between humans, and domestic animals, was investigated in the field. The response of the mosquito to the humans, cattle and goats was also compared to its response to carbon dioxide. The mosquito responded to human olfactory cues in significantly larger numbers than to the calf or goat cues. The response of the mosquito to either the calf or goat was similar.

It can be concluded that with equal availability of the three vertebrates, *Culex quinquefasciatus* would respond significantly more to cues from human hosts than from either a calf or a goat. The major olfactory cue from goat or a calf, to which this mosquito responds is probably carbon dioxide. Furthermore, the response of *Culex quinquefasciatus, Anopheles gambiae s.l.* and *An. funestus* to human odour was compared with that to carbon dioxide in the field. Human odour attracted a larger number of host-seeking *Culex quinquefasciatus, An. gambiae* and *An. funestus* than carbon dioxide.

Defection of infection in vectors is important for assessing microfilaria transmission and is essential when monitoring large scale control programmes. The ecological setting of wet equatorial climate, adequate plant cover, rivers and tributaries provide characteristic breeding habitats for the three potential mosquito species incriminated as vectors of lymphatic filariasis in Africa. Whether these vectors are anthrophagus rather than zoophilic and whether the breed in environments close to human habitation are important entomological considerations in vector studies.

1.2.5 The Parasite

Wuchereria bancrofti is one of a group of filarial nematodes. The adult worms live in the lymph gland; the females are 65-100mm long and only 0.25mm in diametre. The males are about 40mm long and 0.1mm in diametre. The female worms give birth to microfilariae, which are surrounded by delicate membrane or sheaths. These microfilariae appear in the peripheral circulation chiefly between 10:00pm and 4:00am. The reason for this periodicity has been a subject for intensive research, GAELF (2005) were of the opinion that the larvae are concentrated in the internal organs during the day, and circulate in the peripheral blood at night to coincide with their night-biting mosquito transmitters. The further development of the microfilariae depends on their being sucked with blood by the culicine mosquito. In the thorax of the mosquito, the microfilariae undergo two molts and the larvae become infective. They now leave the thorax muscles and make their way towards the proboscis of the mosquito. When the mosquito bites man, the infective larvae escape from the proboscis and penetrate human skin (Fig.3).

1.2.6 The Environment

The increase in transmission of lymphatic filariasis seen mainly as an urban disease is increasingly becoming a serious health problem even in rural areas. Environmental factors tend to promote transmission of this disease, poor sanitation and rapid population growth in tropical and subtropical areas of the world where the disease is common, has created more places for mosquitoes to breed and has led to more people becoming infected. Overcrowding also places on extra burden on water, sewage and waste disposal systems, making sanitation and personal hygiene difficult. The dearth of clean and safe water has resulted in the proliferation of domestic water storage containers. Studies have shown that mosquito-vector of lymphatic filariasis colonise

artificially created water for breeding purposes. Such breeding sites include clay pots, plastic containers, drums and pots used for cassava fermentation (Iwuala 1979) abandoned automobile types (Baumgartner 1988). Man's meddling with the environment creates artificial breeding sites for mosquitoes, sanitary conditions in most urban and rural areas in the tropic will continue to deteriorate and will no doubt result in increase in the prevalence of this disease.

The geo-environmental risk model developed on a GIS platform could be employed for spatial delimitation of filariasis risk on a macro scale, particularly to identify "non-risk" areas, more precisely. *Wuchereria bancrofti* transmission is largely determined by the geo-environmental variables, and hence it is possible to identify the areas where risk of transmission can be determined on a macro-scale (Sabesan et al., 2006). Environmental conditions are widely conducive, to transmission efficiency; human factors are also key determinants contributing to the local occurrence of filariasis.

The influence of human factors such as population density, movement, economic status, occupation, literacy level and health seeking behaviour on the occurrence of lymphatic filariasis at micro level has been described elsewhere (Sabesan et al., 2006). Similarly, the vector abundance may vary widely at micro level depending on the geo-physical and human associated factors, but the 'vectorial capacity' (vector survival and capacity for parasite development) and the transmission of infection are greatly determined by the geo-environmental factors at macro level.

1.2.6.1 Climatic Changes and Lymphatic Filariasis Transmission

Alterations to the environment, whether natural or man-made contribute to the transmission of lymphatic filariasis. These include global warming, SAREC (1994) reports that warmer temperatures cause disease pathogens to multiply more quickly in mosquitoes and the mosquitoes to expand their habitat range and bite more frequently, thus bringing new populations in contact with the disease and increasing the chances of infection. Torrential rain also gives mosquitoes an advantage by providing more breeding places. Other ecological changes due to deforestation that increase contact between man and mosquitoes, as man encroach into the remote ecosystems, may trigger outbreaks of diseases through favouring the spread of mosquitoes. The extreme sensitivity of lymphatic filariasis to climate change and sanitation and deforestation prompted the World Health Organization to cite these environmental phenomenons as important public health challenges of the upcoming century (WHO 1998).

1.2.7 The Human Factors (Globalization)

Contemporary phenomenon like globalization is exacerbating the transmission of lymphatic filariasis, massive migration of people from rural areas into big cities or from one country to another brings non-immuned people into zones that are endemic and predispose them to infection. Both the immigrant population and the resident population carry different disease burden and the mixing of this hitherto different population have been reported to facilitate transmission of lymphatic filariasis from one country to another (Krishna *et al*, 1998; Omudu and Ortese 2004) Swaddipong *et al* (1996) conducted a study of transmission of bancroftian filariasis in urban Thailand, a country with prevalence of about 0.9%. Of the 8377 Myanmar immigrants into the industrial area of Thailand who were screened for *W. bancrofti*,

2.5% were found to be infected and immigrant who had stayed for over 10 years still remained positive. With the abundance of mosquito vector *Culex quinquefasciatus* in Thailand, they concluded that immigration may lead to an increased risk of infection amongst Thai population.

Cunninghan (2002) suggested that with the current rate of immigration into the USA from developing countries where poor socio-economic conditions are favourable for transmission of lymphatic filariasis, American primary care physicians should be familiar with the clinical presentation, diagnosis procedure and treatment of lymphatic filariasis. Immigrants from developing countries in Asia and Africa comprise approximately 1.9% of U.S population. Omar (1999) investigated the prevalence of lymphatic filariasis amongst immigrants from Southeast Asia working in Saudi Arabia of the 762 immigrants from India, Bangladesh, Sri Lanka and Philippines examined, microfilarial infection rate of 3.5% was reported. The study also investigated the susceptibility of local *Culex* mosquitoes to *W. bancrofti.* Mosquitoes reared in the laboratory fed directly on microfilaraemic volunteers; L3 infective stage larvae were later found in the mouthparts of 30.9 % the mosquitoes.

The implications of these findings is of great epidemiological concern for Nigeria where social, economic and political conditions seem to be fueling the emigration of able bodied men and women to every part of the world in search of greener pastures. As Nigerian immigrant population in South East Asia begin to swell, the likelihood of these individuals returning home with acquired lymphatic filariasis is likely to compound an already complicated disease dynamics.

Another human factor that will facilitate the transmission of lymphatic filariasis in Nigeria is the current rate of unprecedented urbanization. The urban population of Nigeria is currently about 44.8 million (representing 38% of the total

population) and this is expected to rise to 55.5 million by 2015 (Terranella *et al* 2006). Migration of unskilled individuals from the rural areas into the urban centers will continue to swell the population of Nigerians already in the urban slums where housing, sanitation and other environmental conditions favour the breeding of mosquitoes and consequently transmission of lymphatic filariasis. Studies in Brazil, Tanzania and Nigeria showed that the epidemiological pattern of filariasis in urban populations was marked with high prevalence (Albuqueque *et al*, 1995, Perdersen *et al*, 1999, Terranela *et al* 2006).

1.2.8 Clinical Manifestations.

As a result of the parasitic infection described above, the lymph channels get damaged and blocked thereby preventing the proper flow of lymph fluid through the body. The accumulation of lymph fluids leads to the chronic manifestation of lymphatic filariasis in the extremities of the body namely elephantiasis of the upper and lower limbs, which affects about 4.6 million people in Africa. Hydrocoele is another manifestation of lymphatic filariasis and is also known to affect about 10 million men in Africa alone (Michael *et al.*, 1996). Women have been known to have infections of the breast and female genitalia but these are rare. In terms of sex differences, Brabin (1990) has noted that the intensity of infection, and clinical disease are higher in men than in women. Similar findings have also been reported in India (Ramaiah *et al* 1996a) and other geographical sites (Pani *et al* 1997). In Ghana however, more women than men seem to be infected (Gyapong *et. al* 1994).

Manifestations of lymphatic filariasis begin with acute attacks known as adenolymphangitis (ADL) characterised by fever, general malaise, pain tenderness and swelling. In Tanzania and Ghana, the incidence has been found to be closely associated to rainfall patterns (Gyapong *et al* 1996a, Gasarasi *et al.*, 2000). Studies in

India however found no seasonal pattern in the occurrence of the ADL episodes (Ramaiah 1996) Acute attacks have been known to recur at irregular intervals from once a month to less than once a year and may continue to do so, often until the end of life. The frequent inflammatory attacks are known to leave some residual swelling over the years, and thus lead to the recognised chronic disease states associated with lymphatic filariasis mentioned earlier. Several studies however indicates that in some endemic countries, there are individuals who do not develop obvious chronic disease but may have had a history of long standing recurrent acute attacks (Gyapong *et al.*, 1996, Pani *et al.*, 1995, WHO, 1992).

Earlier studies on ADL assumed that it was a result of human immune response to parasite products released by the adult worm or by microfilariae (Addis *et al.*, 1994; Dreyer *et al.*, 1999). Recently, Dreyer *et al* (2000) identified two types of acute attacks, which occur in residents in Brazil. One is caused by the death of the adult filarial worms and its clinical presentation varies from asymptomatic to the syndrome of acute filarial lymphangitis (AFL). The second type they found out is due to secondary bacterial infections, which cause acute adermatolymphangiodenitis (ADLA). Studies in India and Ghana have also confirmed the finding of bacteria being a cause of ADL attacks (Rajagopalan 1990, Gyapong et *al.*, 1996, Shenoy 1998).

As adult establish and fertilise in the lymphatic system, the female continue to produce large numbers of larvae known as microfilariae. The vast majority of the millions of the millions of microfilariae remain in the immature forms, and the die after some six months to two years. It is the moving, secreting, excreting and dying of these foreign bodies that cause the immense havoc on the host. The adults, several centimeters long may also cause blockage of the lymphatic ducts resulting to

collection of fluid in the arm, breast, leg and genital areas causing swelling. The name for this swelling is lymphoedema, the swelling and the decreased function of the lymph system make it difficult for the body to fight germ. The bacterial infection on skin and lymph system may result to hardening and thickening of the skin, which is referred to as elephantiasis.

While genital damage (particularly hydrocoele) and lymphoedema, elephantiasis are the most recognizable clinical entities associated with lymphatic filarial infections, there are much earlier stages of lymphatic pathology and dysfunction whose recognition has only recently been made possible through ultrasonographic and lymphoscintigraphic techniques. For example, ultrasonography has identified massive lymphatic dilation around and for several centimeters beyond adult filarial worms which, though are in continuous vigorous motion, remain fixed at characteristics sites within the lymphatic vessels.

Farris *et al* (1998) investigated the values of scrotal ultrasound as a mean of evaluating sub clinical lymphatic pathology; they concluded that scrotal ultrasound is an important means of non-invasively visualizing adult filarial worms and assessing sub clinical lymphatic damage in Bancroftian filariasis. Chaubal *et. al.* (2002) in their study to determine the value of the filarial dance sign as a diagnostic sign of scrotal filarial infection and to recognize unsuspected scrotal filariasis also conclude that high-resolution ultrasonography is a useful technique for diagnosing scrotal filariasis in symptomatic patients. It is also very useful in the follow-up period for assessing the response of worms to treatment. These recent advances elucidating the clinical progression resulting to hydrocoele are of immense importance for treatment evaluation and the overall elimination efforts.

1.2.8.1 Pathogenesis of Acute Adenolymphangitis (acute attacks)

The aetiology of acute inflammatory episodes in lymphatic filariasis has long been a subject of debate and confusion. Indeed, a variety of terms have been used in the literature to describe them, including 'adenolymphangitis (ADL)', 'acute attack', 'filarial attack', and 'endemic lymphangitis', among others. As early as the 1920s, some scientists argued that bacterial infections were the primary cause of 'filarial' lymphangitis. In 1924, the British Filariasis Commission went so far as to state that "all the pathological manifestations" of lymphatic filariasis were caused by secondary bacterial infections (Dreyer 2000). During World War II, clinical and pathologic studies of soldiers with adenolymphangitis and other early clinical manifestations demonstrated the importance of *Wuchereria bancrofti* adult worms or 4th-stage larvae. The debate continued after World War II, when the role of the immune system in triggering adenolymphangitis, as well as other forms of filarial pathology, was emphasized (Addiss and Brady 2007).

One of the major factors contributing both to the debate and the confusion during the latter half of the 20th century was the relative lack of emphasis on careful clinical observation and case definitions. Dreyer et al (1999), working in Brazil, defined two distinct clinical syndromes: acute filarial lymphangitis (AFL), caused by death of the adult worm, and acute dermatolymphangioadenitis (ADLA), associated with secondary bacterial infection. AFL is characterized by lymphangitis that progresses distally or in a 'retrograde' fashion along the lymphatic vessel, producing a palpable 'cord'. Rarely, AFL is accompanied by mild fever, headache, and malaise. Distal lymphoedema may occur, but is usually mild and reversible, i.e. self-limited. In contrast, ADLA develops in a reticular or circumferential pattern, and is clinically

similar to erysipelas or cellulitis. Symptoms of local pain and swelling, as well as fever and chills, are present. In filariasis-endemic areas, ADLA occurs much more commonly than AFL (Dreyer 2000, Dreyer *et al.*, 1999).

Although there is general agreement on the two clinical syndromes as described by Dreyer et al. (1999), it has also been suggested that exposure to 3rd-stage filarial larvae causes lymphangitis and triggers the onset or progression of lymphoedema. A role for 3rd or 4th-stage larvae in lymphangitis or lymphoedema is supported by animal studies, experimental infections, reports of disease in individual patients traveling from non-endemic areas and epidemiologic observations that associate incidence of acute adenolymphangitis with filarial transmission intensity (Shi *et al.*, 2000, Bockarie *et al.*, 2002). However, a case definition has not been established for larva-associated lymphangitis that distinguishes it from AFL or ADLA; this makes epidemiological study difficult. Additional work is needed to clarify the incidence, possible mechanisms, and clinical expression of larva-associated filarial lymphangitis and to assess its public health importance in filariasis-endemic areas.

Addiss and Brady (2007) have suggested that the pathogenesis of disease in lymphatic filariasis is multifactorial, and have proposed a model that involves the immune system and also allows for a variety of possible causes. Limited attention has been paid to the differences in pathogenesis and clinical manifestations between brugian and bancroftian filariasis. Obvious differences have been noted, such as the absence of male urogenital involvement and chyluria and the much more frequent occurrence of abscesses at the site of lymph nodes in brugian filariasis. However, the reasons for these differences are poorly understood.

1.2.8.2 Pathogenesis of Acute dermatolymphangioadenitis

Evidence for a bacterial aetiology of ADLA in filariasis-endemic areas comes from the distinctive clinical signs and symptoms, isolation of bacteria at the time of the acute episode, and changes in antibody titres between acute and convalescent serum specimens. In India, the bacteria most frequently associated with ADLA are Group A *Streptococcus*. Other bacteria are often found in cultures, including those that are usually regarded as non-pathogenic (Olszewski *et al.*, 1999). Available evidence indicates that the immune system may amplify or modulate ADLA. The relative infrequency with which bacteria are isolated from patients with ADLA, as well as from persons with cellulitis in areas not endemic for lymphatic filariasis, suggests a role for inflammatory mediators perhaps even in the absence of bacteria.

Little has been published on the antimicrobial sensitivity of bacteria isolated from persons with ADLA in filariasis-endemic areas. Available experience suggests that the organisms most commonly involved are sensitive to penicillin; thus, penicillin is usually recommended for treatment (Addiss and Brady 2007). Clinical descriptions of ADLA in filariasis-endemic areas are remarkably similar to those of erysipelas and cellulitis, Group A *Streptococcus* is the classical causative organism for erysipelas, and lymphoedema is a well-recognized risk factor for erysipelas and cellulitis in areas not endemic for lymphatic filariasis (Olszewski *et al.*, 1999).

1.2.8.3 Epidemiology of Acute inflammatory episodes

During the early 1990s, the Special Programme for Research and Training in Tropical Diseases (TDR) sponsored a series of population-based studies on the incidence of 'acute attacks' among the general population in filariasis-endemic areas. The case definition – localized pain, lymphadenitis and/or lymphangitis and/or

cellulitis and local warmth, with or without systemic manifestations of fever, nausea, and vomiting (in some studies, lasting for at least three days) – is consistent with ADLA. In these studies, the overall incidence of ADLA ranged from 33 per 1000 per year to 97 per 1000 per year (Dreyer 2000). A study from Papua New Guinea, which found an incidence of 31 attacks per 1000 population per year, included only cases with fever (Alexander et al., 1999). Another study in an area endemic for *Brugia malayi*, which also included only cases with fever, found an incidence of 371 episodes per 1000 people per year (Roa et al., 1982). Taken as a group, these studies indicate that the rate of ADLA is higher in persons with chronic disease, principally lymphoedema. Among patients in filariasis-endemic areas, the mean annual reported incidence of ADLA ranges from 1.5 to more than 7 episodes per patient (Addiss and Brady 2007).

The duration of ADLA, primarily based on patient self-reporting, ranges from 1 to 16 days. Recurrent ADLA episodes result in significant short-term disability, and are of much greater concern to patients than is lymphoedema *per se* (Person *et al.*, 2006). Studies in Ghana indicate that patients with ADLA are incapacitated for 3 of the 5.1 days of ADLA duration, in Tanzania, patients are incapacitated for 3.7 of the 8.6 days of ADLA. In India, total disability from ADLA lasted no more than 3 days in an area with brugian filariasis (Addiss and Brady 2007). However, preliminary data from Haiti and Togo suggest that the number of workdays lost may exceed the duration of the acute ADLA episode itself (Richards *et al.*, 2007).

Among persons with lymphoedema, risk factors for ADLA include increasing patient age, poor hygiene and illiteracy (Addiss and Brady 2007). Gender, lymphoedema severity, and the presence of entry lesions are additional risk factors.

Females tend to experience higher rates than males. The relationship between lymphoedema stage and incidence of ADLA is not consistent among all studies. It is complicated, in part, by the use of different systems to stage lymphoedema. Most studies show a positive association between lymphoedema stage and observed or patient-reported incidence of ADLA (Dreyer *et. al.*, 2006). The epidemiologic association between ADLA frequency and stage, as well as extensive clinical experience from both filariasis-endemic and non-endemic areas, strongly suggest that ADLA episodes are a major – likely the most important – factor in lymphoedema progression, particularly in filariasis-endemic areas.

1.2.9 Lymphoedema

The literature on lymphoedema in filariasis-endemic areas suffers from a lack of standardization, terminology, and agreed-upon criteria for diagnosis and case definition. Indeed, many authors use the term 'elephantiasis' for all forms of lymphoedema. Further, even in non-endemic areas, there is no one system for classifying or staging lymphoedema that is universally accepted (Braide *et al.*, 2003, Addiss and Brady 2007). The lack of standardization limits our understanding of the epidemiology, prevalence, and severity of lymphoedema. Further, the prevalence of co-morbidity, especially venous disease, associated with lymphoedema in filariasis-endemic areas is unknown. An urgent need exists for standardization of terms and common case definitions, and for improved knowledge about co-morbidity and its effect on recommended treatment practices.

1.2.9.1 Pathogenesis of Lymphoedema

The pathogenesis of lymphoedema in filariasis-endemic areas has been a matter of intense debate. For many years, it was believed that a shift in antifilarial

immunity triggered the onset of lymphoedema, before which time the asymptomatically infected host was 'in harmony' with the parasite (Person et. al., 2006). However, clinical observations and ultrasonographic and lymphoscintigraphic examinations demonstrated that lymphatic vessel dilatation and dysfunction commonly occur in the absence of lymphoedema. The processes that stimulate lymphatic vessel dilatation, and the mechanisms by which this process is maintained, are unknown. The clinical model proposed by Dreyer (2000) emphasizes that lymphoedema in filariasis-endemic areas is a multifactorial process.

Alternative models have been proposed. Epidemiologic associations between transmission intensity and the prevalence of lymphoedema have suggested to some investigators that third-stage larvae trigger lymphoedema (Addiss and Brady 2007). This hypothesis is supported by observations of decreases in lymphoedema prevalence and severity following mass treatment with antifilarial drugs. Although such reductions are not always observed, these findings suggest that mass drug administration could have therapeutic benefits on filarial morbidity. Longitudinal studies showing that asymptomatic microfilaraemic persons are less likely than uninfected persons to develop lymphoedema suggest an immunologic mechanism (Ravindra et. al., 2003).

1.2.9.2 Epidemiology of Lymphoedema

Globally, an estimated 16 million persons suffer from lymphoedema in filariasis-endemic areas of the world (Michael et al., 1996). Clinically, so-called filarial lymphoedema is often indistinguishable from lymphoedema of other causes, and there is no laboratory marker that proves, at the individual level, that the initial

cause of lymphatic vessel dysfunction was damage associated with adult filarial worms.

The earliest onset of lymphoedema in filariasis-endemic areas is usually observed around the time of puberty, and the prevalence increases with age (Mba and Njoku 2000, Braide et al 2003). In many areas where bancroftian filariasis is endemic, lymphoedema of the leg is more common in women than in men (Gyapong *et al.*, 1996), although this finding is not universal, especially in areas with brugian filariasis (Ravindra *et al.*, 2003). Gyapong and colleagues have reported an association between the community prevalence of lymphoedema and that of microfilaraemia (Gyapong et al., 1996).

Little is known about what triggers the onset of clinical lymphoedema in filariasis-endemic areas, or about what factors cause lymphoedema, once triggered, to persist. After lymphoedema is established, recurrent episodes of ADLA are thought to be the major factor associated with disease progression, although the role of other factors remains largely unexplored. Scarification of the skin, a traditional practice in many filariasis-endemic areas, is considered a risk factor for rapid progression of filarial elephantiasis because of the increased risk of ADLA (Dunyo et. al., 1997, Ahorlu et. al., 1999).

1.2.10 Hydrocoele

Despite the greater public health burden of male urogenital disease in lymphatic filariasis, much more attention has been focused to date on management of lymphoedema of the leg. This is beginning to change, as surgery programmes have been launched in several centres. However, many questions remain about diagnosis,

optimal management, and cost and benefits of intervention. The use scrotal swellings associated with lymphatic filariasis is being recommended as indicator for rapid community diagnosis in endemic areas (Gyapong et al., 1996, Eigege et al., 2002, Nwoke et al., 2006)

1.2.10.1 Pathogenesis of Hydrocoele

In many research papers on lymphatic filariasis, all genital swelling in men was labeled as 'hydrocoele'. Dreyer (2000) recently emphasized the distinction between lymphoedema of the scrotal and penile skin, which has the same pathogenesis as lymphoedema of the limbs, and swelling due to increased fluid inside the cavity of the tunica vaginalis. This fluid, which is usually considered to be 'hydrocoele', actually is comprised of several distinct entities including true hydrocoele, chylocele and hematochylocele. The term 'filaricele' has been suggested recently to include all of these manifestations (Addiss and Brady 2007). Norões et. al.(2003) has shown that true filarial hydrocoele is triggered by death of the adult worm, which produces an inflammatory nodule that occludes the lymphatic vessel. In this study, the incidence of acute hydrocoele following a single 'scrotal nodule event', whether spontaneous or induced by DEC, was 22%. Of these, 24% persist to become chronic. These data are similar to those of ultrasonographic and clinical studies from Egypt (Hussein et. al., 2004).

Rupture of lymphatic vessels inside the scrotal cavity can lead to the presence of straw-coloured ('lymphocele') or milky (chylocele) fluid, sometimes with red blood cells. Little is known about the relative frequency of these conditions in different filariasis-endemic areas, and techniques and markers to discriminate among them preoperatively are currently inadequate (Addiss and Brady 2007).

1.2.10.2 Epidemiology of Hydrocoele

An estimated 27 million men suffer from fluid accumulation in the tunica vaginalis in areas endemic for bancroftian filariasis (Eigege et. al., 2002, Nwoke et al., 2006). The prevalence of this condition appears to be strongly associated with intensity of parasite transmission. Gyapong et. al.(1998) documented a robust association at the community level between hydrocoele prevalence and microfilaraemia prevalence in Ghana, and this association has been observed in Nigeria (Eigege et. al.2002, Nwoke et. al., 2006). The prevalence of hydrocoele increases with age; this is widely reported from endemic areas (Addiss and Brady 2007).

It is important to understand that hydrocoele being the predominant manifestation in Bancroftian filariasis, detection of scrotal swellings among a fixed number of males in study sites by trained health workers has been found to be a valid method of rapid assessment procedure (RAP) (Srividya et al., 2000, Pani et al., 2005). The prevalence of scrotal swelling as detected by trained health workers had a positive significant correlation with that detected by physicians. Therefore, data obtained for scrotal swelling prevalence by physical examination of males by health workers can also be used for rapid epidemiological mapping for filarial disease prevalence (Gyapong *et al.*, 1998, Addiss and Brady 2007). Recently hydrocelectomies conducted (as proportion of all surgical operations carried out) in some areas has been used successfully as an indirect marker of prevalence of disease in these localities and this could be pursued, as a method for rapid assessment, rapid mapping and also for assessing the current burden on available surgical facilities in different parts of the world (Srividya *et al.*, 2000, Pani *et al.*, 2005). The detection of

hydrocoele is useful for disease burden estimation and mathematical models for prediction of intervention outcome (Pani et *al.*, 2005)

1.2.11 Socio-economic impact of lymphatic filariasis

Socio-economic research on lymphatic filariasis covers a broad range of topics concentrated on:

- Quantifying productivity loss due to lymphatic filariasis
- Measuring the financial burden of treatment for individuals and health care systems
- Calculating the cost of the elimination programme and identifying affordable strategies
- Cost-effectiveness of lymphatic filariasis elimination programmes

Most of what is known on socio-economic impact of lymphatic filariasis are outcomes of studies in India, Philippines China, Southeast Asian countries, Egypt and Ghana (GAELF; 2005, Evans *et al,* 2003, Gyapong *et al.*, 2000). Lymphatic filariasis is estimated to cause several billion US dollars a year in productivity losses. Chronic lymphatic filariasis patients in Orissa, India, lost a total of 68 days of work per year, equivalent of 19% of the total working time of the year (Babu *et al* 2002). In fact, in all of India, lost productivity due to lymphatic filariasis is estimated at almost US$ 1 billion a year. Entire communities are known to have changed productive pursuit to adapt to lymphatic filariasis. These activities often have lower economic return but are less physically demanding.

Financial burden on patients and health care systems in addition to the lost of productivity, costs for medical treatment add on extra burden. For example, Babu *et al* (2002) and GAELF (2005) reported that three-quarters of chronic lymphatic filariasis patients in rural communities in India and China sought treatment for their conditions.

They spent an average of US$ 8.70 a year on treatment, mostly on medicines, equivalent to 2% of their average yearly wage. Lymphatic filariasis creates a major drain on government resources through medical care and treatment provided by government hospitals and clinics. It is common to seek treatment for acute attacks and hydrocoele surgery. In hospitals in Northern Ghana, 25% of all surgeries in 1998 were for hydrocoele (Gyapong *et. al.*2000).

This type of research should be a major priority in Nigeria considering the fact that the country is ranked third most endemic in the world (Eigege *et. al.* 2003). Putting together the little that is known about the socio-economic determinants of lymphatic filariasis in Nigeria could lead to finding an acceptable, sustainable and effective intervention strategy. The search for less expensive, yet effective control options requires a lot of research in Nigeria. This should focus not only on the economic losses resulting from the disease but also the cost of various options and determinants of community acceptance, compliance and participation. Socio-economic research in Nigeria will allow for the allocation of limited resources for the greatest impact. Researches of this nature provide information about efficiency in achieving results and programme sustainability even with little donor fund.

Although lymphatic filariasis is not fatal, the chronic symptoms often afflict individuals in their most productive stage of life and therefore impose a significant social and economic burden on society. Lost of productivity due to lymphoedema, genital damage and ADL caused by lymphatic filariasis costs millions of dollars each year. Haddix (1999) presented figures on the economic impact of filariasis. These figures indicated that while APOC countries may loose $1.3 billion due to each year lost in productivity, OCP countries lose about $350 million due to each year lost in productivity. The report added that over 80% of this loss is due to disability in men

with hydrocoele. Surgical treatment for hydrocoele has been known to impose a tremendous burden on the health care systems in endemic areas and on the sufferers of the disease. In Ghana, one-third of all surgeries are for hydrocoele repairs. In Ghana, a hydrocoele operation costs US $30 representing over a month of income for the average worker. In India, a hydrocoele operation represents up to three months in wages.

It has been conservatively estimated that filariasis in India, where one-third of cases occur, costs over one billion dollars each year in lost productivity. In some communities in India, 7-8% of male labor is lost because of chronic lymphatic filariasis, primarily hydrocoele. The Chinese now estimate that every US dollar invested in filariasis control has produced more than US $15 in benefits (WHO 1999). The direct cost of the disease on affected individuals and on productivity is grave (Ramaiah *et al* 1997, 1998, 1999, 2000). In a study by Ramu *et al* (1996), the productivity of male weavers with chronic lymphatic filariasis was found to have reduced by as much as 27.4% in the cloth weaving industry and thus reduce wage earning. In China where lymphatic filariasis has been eliminated, the primary motivation behind the elimination campaign was the impact of the disease on agricultural productivity (WHO 1999). Even though grave, the direct cost on treating the disease is low since very few people travel to seek treatment for their condition. This is mainly due to treatment seeking behavior related to local concepts on the perceived cause of the disease (Ramaiah 1996, Ahorlu et al., 1999, Person et al., 2006).

1.2.11.1 Economic and psychosocial impact of Acute Adenolymphangitis

Cost. Studies from India, Ghana and Haiti indicate that ADLA treatment costs to patients range from US$ 0.25 to US$ 1.62 per episode, as much as two days' wages (Gyapong et. al., 1996, Ramaiah et al., 1998). In Sri Lanka, Chandrasena reported costs of US$ 7.38 per episode for care from private practitioners, although most patients received free treatment at government clinics (Chandrasena et. al., 2004). These costs included direct costs of treatment, including self-medication, as well as travel. Some studies also included costs of food and accommodation. In all cases, except for consultations with herbalists in Haiti, patients seeking care from health centres or private providers spent more money than those seeking care from traditional practitioners, primarily because these providers had higher consultation charges. In addition, payment was often provided in-kind when care was given by members of the extended family or traditional practitioners (Addiss and Brady 2007).

Productivity.

Much of the burden of ADLA comes not from treatment costs, but from indirect costs due to lost productivity. ADLA episodes significantly affect patients' abilities to carry out both economic (farming, market activities, building) and domestic (household chores, cooking, taking care of children) activities (Ramaiah et. al., 2000, Chandrasene et. al., 2004). ADLA episodes are more disabling than other febrile illnesses. This incapacitation results in productivity losses; studies in India and Tanzania showed that patients with ADLA spent an average of 2.7–3.6 hours less per day on economic activities than controls (Ramaiah et. al., 2000).

Studies indicate that ADLA episodes reduced potential community labour supply in Ghana by 0.79% and in Indian communities by approximately 0.1% [Gyapong et al., 1998, Ramaiah et al., 1998). While these figures represent a much smaller loss than that from chronic filarial disease (7% of potential labour lost), they do not adequately capture the impact of ADLA at the level of the household. Household-level effects, including time lost from work and school for caregivers, have not been studied in detail especially as it relates to schooling children.

Quality of life.

Several studies have reported a strong negative effect of ADLA on quality of life (Chandrasena et al., 2007). A study of patients at a filariasis clinic in Haiti found that ADLA affected several quality of life indicators, including how much one thinks about the disease and the ability to work (Wynd et al., 2007). A qualitative study in the Dominican Republic found that the greatest physical and psychological distress occurs during ADLA, regardless of stage of lymphoedema (Person et al., 2006). Ninety-six per cent of women interviewed in this study described distress not only from the pain and disability caused during the ADLA episode, but also from anticipation of future episodes. A study of the effect of lymphatic filariasis on schoolchildren in India found that ADLA led to frequent absenteeism and impaired performance.

In another recent study, patients in India ranked ADLA higher than lymphoedema and hydrocoele in terms of severity, with an average severity score of 25–27 on a scale of 0–28. Patients also cited 'very severe problems' in the domains of mobility, self-care, usual activities, pain, anxiety/depression and social participation on an extended scaling system (Kumari et. al., 2005). They reported curtailing their

activities and interactions with others in an attempt to prevent future ADLA attacks from occurring. Other studies have noted the pain, restrictions and dependency that result from ALDA episodes, but have not translated this into standard quality-of-life indicators (Addiss and Brady 2007).

Health-seeking behaviour.

Studies in India found that 49%–98% of lymphoedema patients sought treatment for ADLA during the previous 6–12 months, either by consulting government or private health personnel or self-treating. Patients in urban areas were more likely to seek treatment (Babu et al 2003). In a study in rural Haiti, approximately 50% of people experiencing an ADLA episode sought treatment from health clinics, traditional healers, or by self-treating (Wynd et al., 2007). In rural Ghana, Gyapong et al. found that 55% of those suffering ADLA episodes sought care (with only 1% going to government health facilities), compared to 88% of those with other febrile illnesses. Because of distance to health facilities, difficult terrain, and the pain associated with ADLA, many patients do not seek treatment outside the home until the episode is almost over (Gyapong et al., 1996). In addition, many patients believe that ADLA is not preventable, since it recurs even with treatment, so they stop seeking treatment (Ahorlu et al., 1999). Data from Togo confirm this impression, and indicate that many patients have sought help in the past for ADLA from a wide variety of sources, but currently either self-medicate or do not seek help (Richard et al., 2007). Traditional practices for ADLA include herbal preparations which are smeared on the affected limb, scarification or cutting the skin, and analgesics bought from local drug peddlers (Dunyo et al., 1997, Ahorlu et al., 1999).

1.2.11.2 Economic and psychosocial impact of lymphoedema

Cost

Costs to patients for lymphoedema treatment, reported as both per-visit and per-year costs, vary greatly by study. A study in India reported an average of US$ 0.56 per visit, more than half a day's wages (Ramaiah et al., 1998). A Ghanaian study reported costs for treatment of chronic disease (both lymphoedema and hydrocoele) of US$ 0.87 per visit, equivalent to almost one day's wages (Gyapong et al., 1996), and greater than costs incurred by controls with other chronic diseases. In India, the annual cost for lymphoedema treatment ranges from US$ 2.17 to US$ 8.70 per person. Average treatment costs are often low, in part because many patients who find potential treatment costs prohibitive either self-treat or do not seek treatment (Babu et al., 2002, Person et al., 2006).

Productivity

Productivity losses from lymphoedema have been captured as lost working hours and as changes in individual output. Lymphoedema patients in India lose 0.55 to 1.61 hours per day in time at work; 11%–31% of workdays are lost annually (Addiss and Brady 2007). These findings are similar to those of another study of both lymphoedema and hydrocoele patients, which estimated 1.13 hours lost per day, for a total of 19% of workdays lost per year (Babu et al., 2002). In Ghana, female labour input loss due to lymphoedema was estimated at 1.5% per year, using the average percentage of lymphoedema patients unable to complete certain activities and the local prevalence of lymphoedema (Gyapong et al., 1996). In general, many patients report changing to less strenuous occupations or giving up working altogether due to lymphoedema and ADLA. A study of male weavers in India with chronic disease,

26% of whom had lymphoedema, found a 27% decrease in output compared to controls (Ramu et al., 1996).

Quality of life

Several studies have quantified the impact of lymphoedema on quality of life using standardized measures (McPherson 2003, McPherson and Penzer 2003, Babu et al., 2006). McPherson (2003) using a 30-point Dermatology Quality of Life Index in Guyana found a mean baseline score for lymphoedema patients of 10.9 (comparable to patients with psoriasis and atopic eczema in the United Kingdom), with controls scoring 0.5. Six months after starting regular hygiene treatment, the scores improved significantly by an average of 6.8 points (Amuyunzu 1997). In Haiti, Kanda compared different ways of measuring quality of life among rural people with lymphoedema (Addiss et al., 1999). Using the EuroQol scale, he found that no respondents had extreme problems in mobility or self-care, but more than half reported pain or discomfort. On a depression scale, the CES-D, these same patients had a mean score of 13.2 (16 and above indicates depression).

On the CDC Healthy Days questionnaire, Addiss and Brady (2007) reported that 88% of patients ranked their health as fair or better; however, they also reported an average of 9.9 physically or mentally unhealthy days during the past month. Advanced age, advanced stage of illness, and low educational level were strongly associated with lower quality-of-life measures. In India, patients with lymphoedema scored from 9.2 to 12.4 on a 28-point scale of 'health state severity' using an extended EuroQol measuring system (Kumari et al., 2005). Severity was associated with stage of lymphoedema; in higher stages, 'severe or very severe problems' were reported for the domains of usual activities, pain, anxiety/depression, cognition and social

participation. Among men, the severity score for lymphoedema was significantly higher than that for hydrocoele (Addiss and Brady 2007).

Stigma.

Many studies mention the stigma surrounding lymphoedema, but they differ in the severity of stigma reported. Diminished marriage prospects and/or threat of divorce due to diminished economic productivity and attractiveness are often cited as problems for persons with lymphoedema, both by the patients themselves and by other community members (Gyapong et al., 1996, Coreil et al., 1998, Ahorlu et al., 1999, Lu et al., 2002, Braide et al., 2003, Wynd et al., 2007). This effect appears to be dependent on age of lymphoedema onset and disease stage. In Haiti, patients reported that their children had the most difficulty coping, as they were often teased or embarrassed about the mothers' lymphoedema (Coreil et al., 1998). Following a series of 'soap opera' radio broadcasts in Haiti, which were intended to decrease social stigma associated with lymphoedema, patients reported improved self-efficacy and social support (Wendt 1999).

Impact on activities.

A study in Ghana, which did not distinguish between lymphoedema and hydrocoele, found that those with chronic filariasis were significantly less likely to be able to perform market and building activities than matched controls (Gyapong et al., 1996). Among patients in India who were visited at home during the course of a year, those with chronic filarial disease were found to be totally incapacitated at 22% of visits, compared to 13.4% for controls, a significant difference (Ramaiah et al., 1998). Another study in India found that lymphoedema patients reported a negative impact

on domestic activities (15%–33% of patients), economic activities (65%–83%), and movement (67%–78%) (Ramaiah *et al.*, 1997). Lymphoedema patients in Haiti reported decreased ability to walk, difficulty in finding appropriate footwear, and sometimes inability to sell at the market or do household chores (Person et al., 2006). Among those practicing lymphoedema self-care, 25% stated that lymphoedema limited their ability to work (Addiss and Brady 2007).

Emotional impact.

Among filariasis clinic patients in Sri Lanka, 18% felt they were being shunned by society, although these data were collected after the patients had been enrolled in treatment (Chandrasena et al., 2004). In other studies, almost all patients report negative feelings of frustration, isolation, or embarrassment resulting from their condition or their inability to find effective treatment [Gyapong et al., 1996, Ahorlu et al., 1999, Coreil et al 1998, Nwoke et al., 2006). As lymphoedema progresses, the negative emotional and psychological impact often worsens. Patients in an Indian study expressed suicidal thoughts (Kumari et al., 2005) and depression was common among patients in Haiti and Togo (Kanda 2004, Richard et al., 2007). Anecdotal reports from other filariasis-endemic countries suggest that suicidal ideation and depression are not uncommon among persons with lymphoedema.

Social support.

A study in Haiti of patients enrolled in a lymphoedema treatment clinic found that the odds of regularly practicing hygiene and skin care were 3.7 times greater among patients who believed that family members supported them than among those who didn't mention family member support (Wendt 1999). Participation in patient

support groups was shown to decrease the number of ADLA episodes and improve quality of life among lymphoedema patients in Haiti (Coreil et al., 1998). In Brazil, patients 'Hope Clubs' have been developed to provide ongoing opportunities for social and emotional support, problem-solving, and continued learning (Dreyer and Addiss 2000).

Health-seeking behaviour

Studies in India and Ghana show that 46%–100% of persons with lymphoedema sought treatment from health care centres, local healers, or pharmacies during the previous year (Gyapong et al., 1996, Ahorlu et al., 1999, Ramaiah et al., 1998). The studies in Ghana show that modern medical care often is avoided due to lack of interest from health care workers and a belief by patients that lymphoedema treatment requires spiritual interventions (Hunter 2000). Although many patients believe lymphoedema progression cannot be prevented, they continue to consult spiritualists and treat themselves with herbal preparations or analgesics (Ahorlu *et al.*, 1999).

In contrast, in areas of India with networks of public healthcare facilities, most patients seek care from modern medical practitioners, although a minority consults doctors or use home remedies first (Nanda and Ramaiah 2003). Access to care is not necessarily universal, however; young women in India may not seek treatment because of social constraints, such as the paucity of female doctors (Ramaiah *et al.*, 1998). Other barriers to care include distance to a health facility, lack of awareness, lack of time, lack of childcare, perceived severity of disease, and dissatisfaction with previous treatment (Person et al., 2006). Even when patients seek treatment, health personnel often will prescribe antifilarial or other drugs that are expensive and

ineffective. Inadequate knowledge of lymphoedema management by health workers results in suboptimal patient care (Addiss and Brady 2007).

Beliefs and traditional practices

Beliefs about the cause of lymphoedema include heredity, supernatural and spiritual causes, and natural causes such as injury, standing in cold water, stepping on insects, and ingesting unhygienic food or drinks (Gyapong et al., 1996, Lu et al., 1999, Ahorlu et al., 1999, Mba and Njoku 2000, Braide et al., 2003, Onwurili et al 2005). In filariasis-endemic areas, people with lymphoedema seek help from traditional healers, herbalists, sorcerers, and pharmacies, or they self-treat. Traditional treatment for lymphoedema includes herbal preparations, burial of the leg, scrubbing the surface of the foot with ants, bloodletting, and scarification, among others (Person et al., 2006). Even in areas with established clinics for lymphoedema management, where patients have learned the importance of hygiene, skin care, elevation and proper footwear, many still hope for a permanent cure (Wynd et al., 2007, Addiss and Brady 2007).

1.2.11.3 Economic and psychosocial impact of Hydrocoele

Costs of non-surgical treatment

Patient expenditures for hydrocoele treatment are generally low, as treatment other than surgery is found to be ineffective and most patients cannot afford to pay for surgery. Hydrocoele patients in India paid from US$ 1.38 to US$ 4.29 per year for non-surgical treatment; daily wages in the areas studied averaged less than US$ 1.00 (Ahorlu et al., 1999, Ramaiah et al., 1999, Babu et al., 2002). A Ghanaian study found an average of US$ 0.87 a year (almost one day's wages) spent for treatment of chronic filariasis, which included both hydrocoele and lymphoedema – significantly more than was spent by patients with other chronic diseases (Gyapong et al., 1996). In

general, treatment costs are difficult to collect accurately as much of treatment is paid in-kind or provided by traditional healers who are members of the extended family.

Costs of hydrocoele surgery

Published costs to patients for hydrocoele surgery range from US$ 5 to US$ 60, depending on the country and source of care. The types of surgery performed and the parameters of costing are not known for all studies. Ramaiah et al (1999) reported costs of US$ 5–14 in government hospitals and US$ 15–47 in private hospitals in India, while Babu et al (2002) reported costs of US$ 44 in another Indian study. In Ghana, Gyapong et al (2000) reported surgery costs of US$ 30–35 at local hospitals and Ahorlu et al (2001) reported surgery costs of US$ 30–60 for surgery sponsored by non-governmental organizations (NGOs). Interestingly, the patients in Ahorlu's study estimated that surgery would have cost US$ 75–125 at local hospitals before the NGO programme was put in place. The study also reported other costs associated with surgery, including transport to hospital and food, estimated by patients at US$ 20–30, with an average hospital stay of 4–12 days.

Productivity

Early studies on hydrocoele differed in their conclusion about the impact on productivity, and reductions in productivity were not quantified. In recent studies, the effect of hydrocoele on productivity has been quantified in three different ways:

• *Individual working hours*. Studies in India have shown that hydrocoele patients work approximately one hour less per day than matched controls (Ramaiah et al., 1999, Babu et al., 2002). Lu et al. (1988) in the Philippines found that 30% of 22 males interviewed lost time from work due to hydrocoele.

• *Individual output.* A study of weavers with chronic filarial disease in India, 69% of whom had hydrocoele, showed that those with disease produced 27% less cloth than matched controls (Ramu et al., 1996).

• *National output.* In India, 8% of potential male labour input was estimated lost due to hydrocoele and lymphoedema (Ramaiah et al.,1999) and this loss was valued at US$ 704 million per year. In Ghana this figure was similar, with more than 7% of potential labour lost (Gyapong et al., 1996).

There is almost no evidence on the degree to which hydrocoelectomy improves productivity, with only one study reporting qualitative data (Ahorlu et al., 2002).

Quality of life

Early studies described the socially unacceptable nature of hydrocoele, but they were vague about the degree of associated stigma, its consistency across communities and cultures, and the psychosocial burden of hydrocoele on those affected (Amuyunzu et al., 1999, Addiss and Brady 2007). To date, research has not been carried out on quality of life in men with hydrocoele in filariasis-endemic areas that would allow for comparison with other diseases, or with men who do not have hydrocoele.

Stigma.

Hydrocoele patients report both 'enacted stigma' (teasing, problems with marrying and divorce) and 'felt stigma' (ashamed to be part of community activities) (Ahorlu et al., 1999, Gyapong et al., 2000). However, they often develop coping strategies to deal with the stigma (Ahorlu et al., 2001). For example, men with hydrocoele were less likely to admit that they avoided social events or suffered

teasing than were unaffected people to report that they ill-treated men with hydrocoele. The severity and visibility of hydrocoele, as well as the relationship of patients to community members, seems to correlate with the degree of stigma (Addiss and Brady 2007). Gyapong et al. (1996) described general community acceptance of men with hydrocoele, but reported that patients with advanced disease often feel ostracized and embarrassed. In Kenya, 36% of men with hydrocoele interviewed responded that they were laughed at, while 29%, mostly patients with small hydrocoele, reported no reaction from the community (Amuyunzu et al., 1997). When community members were asked about their reactions to men with hydrocoele, those who had family members with hydrocoele expressed understanding and sympathy, while others tended to joke about it. In non-endemic villages in Ghana, considerable stigma was associated with hydrocoele and lymphoedema, much more than in hyper-endemic villages (Hunter 1992).

Impact on activities.

In rural India, 8%–10% of men with hydrocoele reported a negative impact on domestic work, 53%–55% reported a negative impact on economic activities, and 53%–63% reported decreased mobility (Ramaiah et al 1997). A study in Ghana found that 10%–60% of persons with chronic filarial disease, which included both lymphoedema and hydrocoele patients, were unable to perform certain daily activities and were less likely to perform market and building activities than matched controls who had other chronic diseases (Gyapong et al., 1996). Of 14 school-aged boys with hydrocoele interviewed in India, one had dropped out of school as a result of being stigmatized and six had high rates of absenteeism (Ramaiah and Kumar 2000). An Indian study measuring the psychosocial and physical burden of hydrocoele found

that patients' usual activities and social participation were affected by hydrocoele, especially for those with larger hydrocoele. In addition, as noted in earlier studies (Kumari et al., 2005), many men had switched to less demanding occupations as a result of hydrocoele.

Emotional impact.

Men with hydrocoele often describe themselves as frustrated, losing hope and even suicidal (Lu et al., 1988, Dreyer et al., 1997, Gyapong et al., 2000). In the Philippines, Lu et al (1988) reported that those in higher socioeconomic classes were less emotionally affected as they were aware of, and had access to, surgery.

Male identity and sexual function.

In 1993, the limited literature on hydrocoele in filariasis-endemic areas suggested that hydrocoele had little impact on sexual activity or fertility (Evans et al., 1993). More recently, hydrocoele patients in India reported that hydrocoele adversely affected their sexual functioning and caused 'moderate problems' with anxiety/depression, based on an extended EuroQol scale (Kumari *et al.*, 2005). In Ghana, both community members and men with hydrocoele reported that hydrocoele impeded sexual intercourse, sometimes leading to divorce (Ahorlu *et al.*, 1999, Gyapong *et al.*, 2000). Qualitative research in Ghana found that men "whose hydrocoele interfered with (this) concept of male identity were deeply frustrated"; they felt as if they were a burden to their families because of difficulties in providing for them (Gyapong et al., 2000). In Brazil, Dreyer and colleagues reported several concerns of men with urogenital disease, including genital elephantiasis, which ranged from lack of intimacy in marriage to thoughts of suicide (Dreyer et al., 1997).

Social support.

While perceived social support is important for psychological well-being as obtainable for lymphoedema, published studies that addressed the impact of hydrocoele on patients' social support networks or the impact of social support networks on recuperation after surgery were difficult to find. However Addiss and Brady (2007) strongly recommended the need for social support and home-based care for patients with hydrocoele.

Health-seeking behaviour

A wide range (25%–80%) of hydrocoele patients seeks treatment (Ramaiah et al., 1999, Addiss and Brady 2007). Patients seek treatment from local health centres, traditional healers, and through self-medication. In certain countries, the belief that hydrocoele has a supernatural cause leads people to seek out traditional healers or sorcerers instead of modern medical care (Gyapong et al., 1996). While most studies describe treatment only during the previous year, patients may have tried various remedies in the past but stopped seeking care after the treatments were ineffective (Amuyunzu et al., 1997, Gyapong et al., 2000). Other reasons for not seeking treatment include problems with access, such as cost of surgery or medical treatment, distance from the health centre, inability to take time off work for recovery, and cultural issues such as fear of anaesthesia during surgery and stigma associated with having hydrocoele (Lu et. al, 1988, Wynd et al., 2006). A study in coastal Kenya found that, in highly endemic districts, hydrocelectomies accounted for 23% of all major operations (Mwobobia et al., 2000).

Beliefs and traditional practices

Beliefs about the causes of hydrocoele vary by culture and geography, but can be grouped into supernatural causes (including witchcraft and sorcery), heredity, exposure to extreme hot or cold, excessive sexuality, and consumption of certain foods or drinks (Gyapong et al., 1996, Ahorlu et al., 1999, Ramaiah et al., 1999). Some studies also mention hard work or trauma as the cause of hydrocoele (Ahorlu et al., 2001). Few mention mosquitoes, even in regions where mass drug administration and health education have occurred (Evans *et al.*, 1993, Gyapong *et al.*, 2000, Addiss and Brady 2007). Only 2.5% of hydrocoele patients in a study in rural South India believed that filariasis was transmissible (Ramaiah *et al* 1996). And the link between filarial infection, hydrocoele and lymphoedema is often not understood. Only 1%–4% of people interviewed in an Indian study knew that filarial infection was a major cause of hydrocoele (Ramaiah *et al.*, 2005). In a study in Orissa, India, while less than half of respondents knew that mosquitoes contributed to the spread of hydrocoele, about 70% named them as the cause of lymphoedema (Babu *et al.*, 2004).

Traditional remedies used to treat hydrocoele include herbal preparations, sorcery spells and rites, and draining with hollow reeds (Gyapong *et al.*, 1996, Amuyunzu *et al.*, 1997, Ahorlu *et al.*, 1999). Perceptions of treatment efficacy vary greatly by region, with a majority of people naming surgery as a cure (Gyapong et al., 1996, Amuyunzu et al., 1997, Ahorlu et al., 1999, Babu et al., 2004). However, 90% of persons with lymphoedema and/or hydrocoele interviewed on the Kenyan coast believed their disease was incurable. This may have been influenced by the experience of two elderly men in the area who had a recurrence of hydrocoele after surgery (Amuyunzu et al., 1997).

1.2.12 Lymphatic Filariasis and Poverty

Lymphatic filariasis is a disease caused by poverty and the disease itself perpetuates the poverty cycle. The loss of productivity of infected individuals and reduced productivity from structural changes in the economies of endemic villages exacerbate the burden of illnesses associated with lymphatic filariasis. The impact on economic productivity as a result of economic losses resulting from the disabilities associated with acute attacks and chronic manifestations of the disease reduce significantly the individual and community potential to create and generate wealth even in the midst of abundant resources. While lymphatic filariasis imposes poverty on individuals and communities, poor living conditions create enabling environment for mosquito breeding sites.

Poverty therefore conspires with the most deadly and painful filarial parasitic disease to make life a wretched existence. An assessment of the burden of tropical diseases on the poorest and riches 20% of global population reveals the widening socio-economic gap between the "haves" and the "have not" and its implication on the epidemiology of parasitic diseases (Gwatkin and Guillot 1998). The disabling effects of clinical filariasis in most tropical communities especially in Nigeria are difficult to evaluate exactly, as lymphatic filariasis occurs primarily in rural areas where quantitative measurements in man-days or man-hours of time lost from illness are not usually recorded. Individuals with the most severe elephantiasis of the legs or scrotum are confined to their homes and may require full-time care by their families resulting to serious economic loss not of infected individuals but also of family caregivers.

Though communicable disease experts tend to focus exclusively on the biological mechanisms through which diseases operates when developing their

interventions, epidemiologists usually point to a "*web of causation*" that attributes the presence or absence of infection to the interactions between the agent, the host and the environment. Rural people in developing countries make up the largest group of people in the world enduring poverty, poor nutrition, poor sanitation and lack clean drinking water. The understanding of the holistic factors inter-relating for the continued transmission of lymphatic filariasis can be represented in the "web of causation" (Fig. 4).

In 1998, the World Health report ranked lymphatic filariasis as the 4th leading cause of permanent disability. (WHO 1998) lymphatic filariasis is a disease of poverty. In 2003, the World Bank classified eighty percent of lymphatic filariasis endemic countries as low or lower-middle income countries. Rural to urban migration and increasing urbanization, both of which are occurring increasingly in low-income countries, facilitate the spread of lymphatic filariasis. This is mostly due to inadequate waste disposal and sanitation facilities, which increase the number of breeding sites for the mosquito vectors. (Evans *et al.* 1993) lymphatic filariasis is one of the neglected diseases that, if targeted, will provide much needed health care to the poorest of the poor, thus increasing their health, quality of life, and potential productivity.

Information on socio-economic consequences of the disease and the benefits of the country programs to eliminate it is still forthcoming. More studies are needed globally to better document the costs of lymphatic filariasis -related disability and the costs of different strategies to combat lymphatic filariasis especially in countries like Nigeria where epidemiological indicators and vector dynamics seem to suggest high endemicity but reliable information on disease burden and impact are not forth coming.

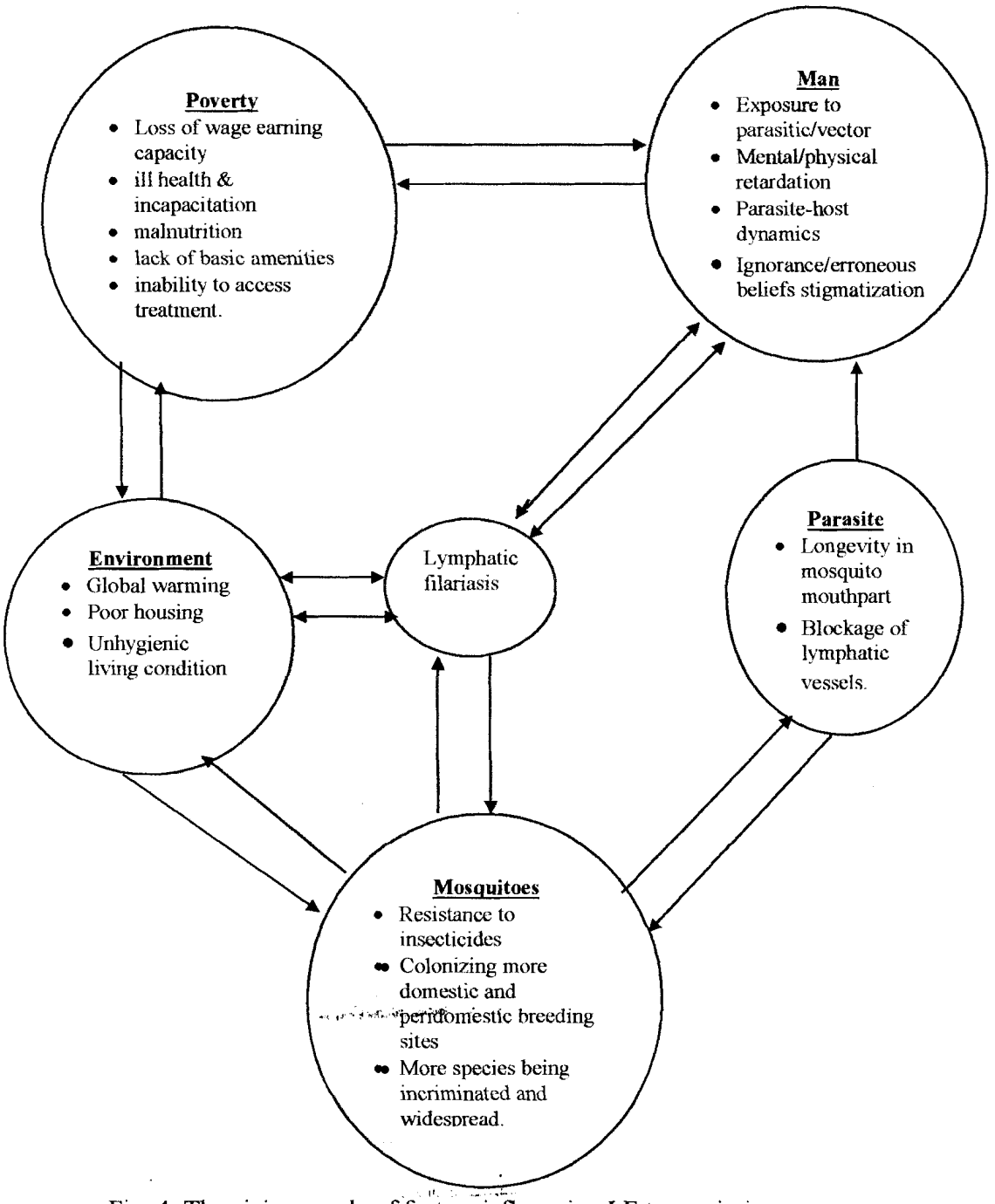


Fig. 4: The vicious cycle of factors influencing LF transmission

1.2.12.1 Impact on Productivity

Lymphatic filariasis is thought to cause several billion US dollars a year in productivity losses. The following Published findings on the impact of lymphatic filariasis socio-economic productivity were accessed on the Emory Filariasis Group website in October 2006 (http//www. emorygroup.com): -

- In India, LF causes almost $1 billion a year in lost productivity. (Ramaiah *et al.* 2000)
- In Africa, LF causes more than $1 billion in losses. (Haddix *et al* 1999)
- Reduced productivity from LF disability has been documented in many industries.
- Rubber tapers in Malaysia. (Kessel 1957)
- Agricultural workers in (then) British Guiana. (Gigliolo 1960)
- In Haiti, women with lymphoedema often are unable to participate in market trading, the major form of economic activity available to women. (Coreil *et al.* 1998)
- In Rufiji District, Tanzania the average duration of an adenolymphangitis (ADL) episode (also referred to as an acute attack) was 8.6 days. In 72.5% of the episodes the affected individuals were incapacitated and unable to do their normal activities for an average duration of 3.7 days. (Gasarasi *et al.* 2000).
- In northern Ghana, 7% of potential male labor input may be lost due to chronic LF (Gyapong et al. 1996) In some areas of Ghana, incidence of acute adenolymphangitis (ADL) reaches its peak during the rainy season, the time of peak agricultural activity, thus compounding productivity loss. (Gyapong *et al.* 1996).
- India ¾ Cost of productivity loss to male weavers in India is estimated to be as high as 27% (Ramu *et al.* 1996) ¾ Chronic LF patients in Orissa, India lost

a total of 68 days of work per year, equivalent to 19% of the total working time of the year. In addition, compared to the control group, which worked an average of 6.06 hours per day, the chronic LF group worked an average of 4.94 hours per day, a statistically significant difference. (Babu et al. 2002).

- An estimated 8% of potential male labor is lost to LF. (Ramaiah et al. 1999)
- Compared to matched controls in a study in India, female patients spent 0.31 ± 1.42 hours less on domestic activity per day. (Ramaiah et al. 1999).
- Estimated average per capita loss to the endemic population due to LF per year is US$2.00. The endemic population in India is 420 million people. Entire communities have changed productive pursuits to adapt to LF. These activities often have lower economic returns but are less physically demanding (Ramaiah *et al.* 2000).
- In Tanzania, some villages have switched from fishing to farming. (Muhondwa 1983)
- In Ghana, LF disability severely impacts subsistence farming communities causing them to switch to less productive, but less labor-intensive, crop and livestock activities (Gyapong *et al.* 1996).

1.2.12.2 Financial Impact on Patients in India

- Three-fourths of chronic LF patients in rural communities in Orissa, India sought treatment for their conditions. They spent an average of US$8.70 a year on treatment, mostly on medicines. This is equivalent to 2% of the average yearly wage (Babu *et al.* 2002).
- The overall treatment cost per visit for chronic LF patients in urban areas was US$0.35. The average cost per ADL episode was US$0.46. Medicines

accounted for approximately 45% of the total expenditures. (Nanda *et al.* 2003).

- The direct treatment cost per year for adenolymphangitis (ADL) for individuals in Tamil Nadu India ranged from US$0.70 to $2.38. Income foregone by patients due to reduced working time ranged from US$4.29 to $16.53 per year. (Krishnamoorthy 1999).
- It is estimated that over US$842 million is lost to patients and households in India every year from treatment cost and reduced working time. (Ramaiah et al. 2000).

1.2.12.3 Impact on Health Care Systems

Acute attacks of Adenolymphangitis (ADL), it is common to seek treatment for acute attacks. (Ramaiah *et al.* 1999; Gasarasi *et al.* 2000) In India, over 10 million people seek treatment each year, costing over US$30 million. (Ramaiah *et al.* 2000)

Lymphoedema

Preliminary data from Haiti put the cost of a lymphoedema treatment clinic at US$8000 per year for the health system. (Kanjilal 2003)

Hydrocoele

- A district hospital in Tanzania reported that 15% of major surgeries were for hydrocoele (Wegesa *et al.* 1979).
- In a hospital in Northern Ghana, 25% of all surgeries in 1998 were for hydrocoele. However, at US$30, the hydrocoele operation costs more than the average monthly Ghanaian income, so most sufferers remain untreated. (Gyapong *et al.* 1996).

- Globally, most men cannot afford hydrocoele surgery (Lu 1988; Wegesa 1979) and many mention the high cost as a barrier to receiving treatment. (Ahorlu *et al.* 2001).

1.2.13 Medical and Biosocial Science concepts and its application to filariasis.

Medical Anthropology is concerned with how people in different cultures and social groups explain the causes of ill health, the types of treatment they believe in and to whom they turn if they get ill. It is also the study of how these beliefs and practices relate to biological, psychological and social changes in the human organization in both health and disease (Gyapong *et al.*, 1998, Wynd *et al.*, 2007). The discipline lies at the intersection of the social and natural sciences and benefits from insights of multidisciplinary approaches. It is a bio-cultural discipline concerned with both the biological and socio-cultural aspects of human behaviour, and particularly with ways in which the two have interacted throughout human history to influence health and disease (Helman 1993). The discipline is heavily based on theory (as in other areas of anthropology), which provides a conceptual framework for research and interpretation of culture. In addition, interpretive theories frame accounts of ill health and serve as a focal point for teaching clinicians to elicit the sick people's point of view in the context of clinical work. (Vlassoff and Bonilla 1994).

The political economic theories bring into focus the health consequences of global power relations. The central concepts are social class and social relations and are useful in drawing attention to factors of social class, poverty and power as determinants of health, illness and health care. These theories look at a condition within a wider social context. In other words, an effort to understand health issues in the light of the larger political and economic factors that pattern interpersonal

relationships, shape social behaviour, generate social meaning and condition collective experience (SAREC 1994).

Ecological and bio-cultural theories, influential in the early 1970's view the human species as part of environmental systems interacting with other animal and plant species in energy exchange cycles. The ecological perspective grew in prominence through multi-disciplinary projects such as the studies of the high altitude populations of the Andes and the peoples of the Kalahari Desert (Helman 1994). With increasing reliance on mathematical modeling, ecological theory continues to shape research on hunting-gathering and agricultural systems and there is a growing interest among human biologists in applying an ecological perspective in urban settings. Gyapong (2000) find that ecology is still a logical and productive framework for investigating human reproductive patterns, epidemiological change, and differential access to health care resources.

The cognitive approach deals with the study of beliefs and practices associated with illness by persons from diverse cultures. It suggests frameworks for studies of lay health beliefs and care seeking. Whilst a number of studies have used this framework in health problems like diabetes (Greenhalgh 1998), parasitic diseases with sexual repercussions (Okafor and Omudu 2005) Guinea worm (Edungbola and Parakoyi 1991), onchocerciasis (Nwoke 1998), parasitic diseases (Onwuliri *et al.*, 2006), other studies indicate the problems arising from inattention to cognitive approaches (Edungbola 1984).

1.2.13.1 Contributions of Medical anthropological approaches to disease control

A community base is a key element in the design of effective disease control programs. However, persons involved in control programs have reported problems with mobilizing community involvement in such programs. There is however a

number of issues that needs to be considered. The first one is the fact that in each society, community is a cultural domain and community relationships are culturally patterned. Each community is unique and the social structures, housing patterns and other political, social and economic issues need to be looked at in detail (Wellborne 1992).

A search through the literature indicates that there is currently a growing interest in the incorporation of anthropology in public health (Hahn 1999). This growing interest has arisen because very few anthropologists conduct studies on perceptions and beliefs and the methods used are rapid and tend to loose a lot of contextual information. The tropical disease that has had a lot of attention with regards to anthropology/social science is malaria. Here, the areas of interest have been in terms of perceptions and treatment seeking behaviour, (Ahorlu 1997). Similar areas of interest have been found in studies on Onchocerciasis (Braide *et al.*, 1991, Ovuga 1995, Amazigo 1993,). With regards to Tuberculosis the concern has been on socio-cultural aspects and compliance to treatment (Khan, 2000).

From the anthropological perspective, concepts of illness, treatment and control must be appreciated from the human centered perspectives situated in particular localities, and resulting from the complex web of forces that bind us all within our natural environments. Hartigan (1999) labels these forces social determinants and catalogues them under the rubrics of individual household, community and broader social conditions. This article focused on some anthropological contributions to the control and prevention of tropical diseases focusing on methodological issues.

Manderson (1998) in concluding her paper on anthropology in infectious disease control notes that, anthropological research in infectious disease control has

often focused on the specifics of illness, especially cultural perceptions of illness entities, understanding local perceptions of the cause of particular diseases and treatment seeking. The ethno graphic details of this work reported in various publications typically serve academic interests rather than informing practical interventions. In contrast there is relatively little which demonstrates this use partly because the interventions are frequently government or NGO initiatives, where program reports are internal documents and accountability is to funding agencies rather than accountability to an informal public.

While anthropological input in terms of community perceptions of illness including local taxonomies and etiology, have value in developing health educational materials to support interventions, a more sophisticated understanding of cultural and social dimensions of illness and disease draws attention to the structural barriers to change and to the difficulties of introducing and sustaining community interventions. Anthropological involvement ensures that some account is taken of knowledge, cultural influence on the patterns of disease and structural barriers to good health. Although the social cultural and political contexts in which people experience illness and seek to recover is a small section of a more complicated puzzle, interventions that overlook these components risk failure as the structures around it crumble.

Hewlett and Cline (1997) also looked at anthropological contributions to Schistosomiasis control. They used ethnographic data to help them understand treatment seeking behavior and issues related to cost of health care. Ethnographic information helped educators to modify their educational material to be in line with beliefs regarding delay in seeking health care. Ethnographic studies also contributed to the snail control efforts that were put in place.

The need for anthropologists and people working in disease control to work hand in hand cannot be over emphasized. Gubler (1997) notes that in order to achieve substantive successes in disease prevention and control, there is the need to include social scientists in the control process primarily due to demographic and societal changes that have contributed to the transmission and spread of infectious diseases. Secondly, the top down approach of interventions was found to be unsustainable, finally, the unavailability of funds to support such programs. To be more sustainable, disease prevention and control programs must involve the citizens in the community where the problems occur and health officials and researchers must be able to understand the ethno cultural diversities that occur and to communicate with the different segments of the lay population.

1.2.14 Socio-Cultural Aspects of Filariasis

Sustainable and equitable health programmes require a grounded understanding of the context in which they are being implemented. This socio-cultural understanding is pivotal for effective delivery of elimination programmes. Standardised valid methods are needed for gathering authentic socio-cultural insights. The currently recommended protocol for collecting Lymphatic Filariasis related socio-cultural data, while moving in the right direction, is inadequate. To collect data which provides an understanding of local health beliefs and practices, and communities' understanding of lymphatic filariasis, techniques must be developed that are both valid and time efficient. An approach developed in the Pacific by Wynd *et al* (2007) provides a basic snapshot of socio-cultural insights that are crucial to the development of relevant and sustainable health education and elimination programmes. Before then several studies have examined filariasis related cultural

concepts and beliefs though, few have been found to enhance the understanding of LF to a very large extent.

The earliest of these studies of the social aspects of the disease were by Muhondwa (1983) in Tanzania, Lu *et al* in the Philippines (1989) and Gyapong *et al* (1992) in Ghana. After these came research on the large-scale social and economic impact of filariasis initiated by WHO/TDR. These were the first multi center studies, and they had a significant ethnographic component in which researchers spent a year in the field learning about local beliefs and disease concepts. At the same time, a few other studies were underway on the same topic in other parts of the world (Lu *et al.*, 1988, Ramaiah et al., 1996, Ramu *et al* 1996, Eberhard *et al* 1996, Amuyunzu 1997, Ahorlu 1999).

These researches have shown that, according to local illness concepts, the disease is unrelated to the mosquito and the different manifestations are seen as different disease entities. Treatment is mainly by self-medication or by consulting a traditional healer. Although the disease is not fatal, the chronic symptoms often afflict individuals in their most productive stage of life, and it therefore imposes a significant social and economic burden on society and a heavy psychosocial burden upon affected individuals. Persons with hydrocoele and lymphoedema are often shunned and become isolated within their communities. For people with this condition, the chances of finding a spouse are slim, and since they are often unable to work, they become dependent for care and financial support, leading to further insecurity, shame, isolation and economic loss (Wynd *et al.*, 2007). The disease was mainly attributed to supernatural and spiritual factors. Except for a few instances of neglect, the community was generally caring towards people with the disease. Other issues related to marriage, stigma, concealment and leadership as it affects victims indicates

that the disease is highly stigmatized. The importance of these findings in the control of LF cannot be overemphasized. However, only few ethnographic studies on tropical diseases have provision for their results to influence control programs (Gyapong et al., 1996).

Other studies to investigate KAP of endemic communities on lymphatic filariasis have generally revealed that superstition replaces the true disease etiology and this has also influenced treatment-seeking behaviour. Rauyajin *et al* (1995) examined the contribution of socio-cultural and behavioral factors in mosquito borne lymphatic filariasis transmission in Southern Thailand. The research was conducted in Nakornsri-thamarat province, which is noted for having the nation is highest *Brugia malayi* filariasis morbidity rate. Factors examined include traditional knowledge and cultural beliefs concerning etiology, transmission and symptomatology perceived susceptibility and severity; social stigma, social support in disease prevention and control and behavioural risk factors and illness behaviour. Data were collected through a multi-method, predominantly qualitative based approach, including rapid support and mapping, group interviews, focus group discussions, in-depth interviews and participant observation. Results indicate that poor knowledge and lay, indigenous, traditional belief systems contribute to high-risk behaviour, and in-appropriate, preventive, illness and treatment choice behaviour.

Similar studies in Haiti to assess knowledge, attitude, and perceptions about bancroftian filariasis by Eberhard *et al* (1998) revealed that only 6% of those surveyed knew that mosquitoes transmitted the disease. Hydrocoele was thought to be caused by trapped gas in the scrotum while elephantiasis was believed to be as a result of walking bare foot on soil or water. The outcome of this study again emphasizes

how important it is to undertake studies of this nature in order to develop control programmes that will target community education.

1.12.14.1 Gender Implications of Lymphatic Filariasis

Gender is a comparative construct that refers to neither men nor women in isolation, but rather to the relations between them and how these are socially constructed. Reports on filarial disease reveal that both men and women are affected. However, occupational and socio-cultural activities may influence disease intensity, prevalence, contact with vectors and coping strategies, thereby resulting to difference in prevalence and burden in men and women. This section therefore reviews the social, economic and psychological impact of Filariasis from a gender perspective.

Age and gender distribution and relation with infection status

Understanding the age and gender distribution of the disease is important to identify the target groups for intervention. The prevalence of infection and disease are significantly higher in males compared to females (Michael et al., 1996, Addiss and Brady 2007). Young adults in age group of 15-44 recorded the highest prevalence of infection (Pani et al., 2005). This group also formed the predominant age class in the population. Micheal et al.(1996) estimated that globally, this age class contributes to 58.5% of all microfilaria (mF) carriers, 47.2% of lymphoedema cases and 58.3% of hydrocoele cases and constituted 46.9% of the total population (Michael et al., 1996). Children and young adults below the age of 20 years also record high prevalence infection, detected by newer techniques for antigenaemia (Ramaiah et al., 2003).

The prevalence in these individuals ranged between 6.74 in South India (VCRC unpublished data) and 7.70% in Ghana (Addiss and Brady 2007). This suggests that they are also infected, but do not exhibit mF in the night in peripheral blood for some or other reason. Therefore, coverage of mass treatment in these age

classes will be crucial. Prevalence of chronic disease increases monotonically from young adult age classes (about 15 years) onwards to reach a peak in older age classes due to a cumulative effect, as chronically diseased persons remain life long diseased (Pani et al., 2005). The incidence of acute ADL also shows a similar age pattern as chronic disease prevalence, since episodes of ADL predominantly occur in people with severe chronic disease (Ramaiah et al., 1996). Males record very high prevalence of disease particularly due to occurrence of hydrocoele. However, if hydrocoele is not considered, the patterns are similar for both genders (Sabesan et al., 2000).

In stable endemic areas, the prevalence of chronic disease and hydrocoele show an age dependent rise. A distinct monotonic increase in age prevalence is seen for hydrocoele. In most Asian and African stable endemic sites, the prevalence of hydrocoele can be as high as 50% in older age classes above 45 years of age. Meta-analyses in 1996 have also shown an age specific rise in hydrocoele prevalence. However, as the total number of males in the age class of 15-44 is highest among all males in the endemic countries, this most productive age class accounts for 15.62 out of a total of 26.79 million hydrocoele cases in the world (Michael et al., 1996).

Available report on lymphatic filariasis reveals that both men and women are affected, however, occupational and socio-cultural activities and beliefs may influence disease intensity, progression and contact with vectors thereby resulting to differences in the burden of the disease in men and women. Lymphatic filariasis has differing health and socio-economic consequences for men and women, for example, women have been reported to suffer greater social consequences of disfiguring and deformities resulting from lymphatic filariasis (Hartigan 1999, Person *et al.*, 2006).

As a result, they may not seek medical care for fear of stigmatization and may begin to exhibit withdrawal behaviour.

Coreil *et. al.* (1998) investigated the ethnographic context of filarial elephantiasis among women in Haiti, they focus on the explanatory models of the illness, the impact of the disease on women's lives and the difficulties patients experienced in following therapeutic regimen provided at a local hospital. Results indicate that traditional understanding and treatment for the disease are prevalent in the community, although biomedical explanations are gaining credence as a result of long- term filariasis control activities in this area. Women's lives are substantially burdened both socially and economically by the physical impairment of elephantiasis, most notably is the loss of income due to restrictions and immobility. The degree of social discrimination encountered varies by the timing of the onset of symptoms. Difficulties encountered with the physical therapy regimen included maintenance of comprehensive bandage and the availability of suitable footwear.

In Latin America, Person *et al.* (2006) have examined the complex relationship between health-seeking behaviors, self-care practices and the cultural context of this behaviour among women who live with chronic manifestations of disease. Lymphoedema management requires compliance with a prescribed, simple regime of self-care practices including leg hygiene, elevation, exercise, and self-examination with self-referral for appropriate medical care as needed. Healthcare providers need to understand a woman's cultural perspectives of illness, her natural networks of support and referral and behavioural practices of care seeking and self-management that she believes support her health. Providing optimal care should also be informed by understanding the financial, psychological, and emotional costs

associated with health seeking that women face. Person et al. (2006) recommended that mainstreaming specialized care for women with lymphoedema should include:

(1) Exploring specific health beliefs, health-seeking behaviors and self-care practices specific to women with lymphoedema in filariasis-endemic areas.

(2) Provide recommendations for morbidity control programmes for lymphoedema management.

Assessment of the gender implications of lymphatic filariasis is hampered by lack of qualitative and quantitative information in areas where the disease is endemic. Sex specific studies have however revealed different socio-cultural interpretations and diverse beliefs on the physical manifestations of the disease. Ramu *et al* (1996) in a study on the impact of lymphatic filariasis on the productivity of male weavers in a rural community in Tamil Nadu State (India) reported that lymphatic filariasis has an adverse impact on the productivity and wage-earning capacity of men. A cohort of 39 male weavers with chronic filariasis (27 with hydrocoele, 10 with lymphoedema and 2 with both) and a cohort of 39 without filariasis were recruited to this case-control study. The 78 weavers were visited daily for 184 consecutive days (6 months). Matched analysis demonstrated that the median difference in number of hours worked was not significantly different from zero (sign test, P=0.75), but that the median difference in productivity (metres of cloth produced per hour) was significantly different from zero (sign test, P=0.0001). Therefore, although the cases and controls worked a similar number of hours, the productivity of the cases was significantly less than that of the controls; the productivity of cases was reduced by an average 27.4%, in comparison with the matched controls. The result of this study clearly implies that lymphatic filariasis has an adverse impact on the productivity and wage-earning capacity of men. In communities where men are supposed to be breadwinners, this

could precipitate psychological issues, like low self-esteem and jeopardize family harmony.

Gyapong *et al* (2000) also assessed the burden of hydrocoele on men in Northern Ghana, they reported that though the disease was a problem to men and women, men with hydrocoele suffered greater psychological burden. Men with small hydrocoele were also reported to seek health care from wider range of providers than men with larger ones. The pain associated with adenolymphangitis (ADL) rendered men inactive for up to five days. Complications of lymph scrotum and ridicule from community members were a problem. Unmarried men with hydrocoele found it difficult to find spouses and various degrees of sexual dysfunction were reported amongst married men.

As elsewhere, various manifestations of lymphatic filariasis have been reported in both men and women, in Nigeria (Mbah and Njoku; 2002, Braide *et al* 2003, Eigege *et al* 2002, Nwoke *et al.*, 2006). The gender implications have however not been emphasized nor been the subject investigation. Medical and anthropological researches into the gender aspects of lymphatic filariasis therefore need serious considerations. It has been suggested that interventions in communicable disease should be planned with cognizance of the way in which gender influences the degree to which men and women, as individuals and population groups, have access to and control of the resources needed to protect their own health (Hartigan 1999, Person *et al.*, 2006). Gender stereotypes will continue to influence the burden of lymphatic filariasis and determine communities' willingness to participate in intervention activities. The clinical significance and the value of time and attention for counselling to mitigate the effects of the disease on damaged male identity and the need for gender studies to address male issues and the need for including psychosocial issues

in the calculating of disability adjusted life years (DALY's) are suggested. Further anthropological researches are therefore required for a thorough understanding of how the experience of lymphatic filariasis differ between men and women and vary from one community to another in Nigeria.

1.2.14.2 Lymphatic Filariasis and Sexual Disability

Though lymphatic filariasis is not sexually transmitted, the blockage of lymphatic vessels may affect male and female reproductive organs causing direct pathological damages leading to impaired fertility and sexual dysfunction. It is estimated that 40 million people suffer from the chronic, disfiguring manifestations of lymphatic filariasis, including 27 million men with testicular hydrocoele, lymph scrotum or elephantiasis of the scrotum (Dryer *et. al.* 1997) An estimated 13 million people, the majority of which are women have filarial-associated lymphoedema or elephantiasis of the leg, arm or breast (WHO, 1998). The attention of biosocial science researchers is being drawn to medical and social implications of genital manifestations of tropical diseases. Richens (2004) ranked hydrocoele (seen with lymphatic filariasis) as the most stigmatized parasitic manifestation with serious sexual repercussions.

The impact of lymphatic filariasis manifestations on male identity and sexual function is attracting serious attention from researchers. In 1993, the limited literature on hydrocoele in filariasis-endemic areas suggested that hydrocoele had little impact on sexual activity or fertility (Evans et al., 1993). More recently, hydrocoele patients in India reported that hydrocoele adversely affected their sexual functioning and caused 'moderate problems' with anxiety/depression (Kumari et al., 2005). In Ghana, both community members and men with hydrocoele reported that hydrocoele impeded

sexual intercourse, sometimes leading to divorce (Ahorlu et al., 1999, Gyapong et al., 2000). Qualitative research in Ghana found that men "whose hydrocoele interfered with (this) concept of male identity were deeply frustrated"; they felt as if they were a burden to their families because of difficulties in providing for them (Gyapong et al., 2000). In Brazil, Dreyer and colleagues reported several concerns of men with urogenital disease, including genital elephantiasis, which ranged from lack of intimacy in marriage to thoughts of suicide (Dreyer et al., 1997).

Immobility, clumsiness, embarrassment and depression have been observed in many suffers in southeastern Nigeria (Mbah and Njoku 2000). These problems results to severe functional impairment of occupational and sexual activities. Prevailing socio-cultural beliefs in the endemic community significantly influences the experience of lymphatic filariasis. Hydrocoele is associated with sexual disability, impotence and infertility; women often suffer greater social and psychological consequence of limb and genital enlargement. The fear of stigmatization drives many victims underground. As a result this disease condition is rarely reported at health centers (Vlassoff and Bonilla 1994, Hartigan 1999, Okafor and Omudu 2005, Onwuliri et al., 2006, Addiss and Brady 2007).

Ahorlu *et. al.* (2001) assessed the consequences of hydrocoele and benefits of hydrocoelectomy on the physical activities and social life in three lymphatic filariasis endemic villages in Ghana. They reported that hydrocoele especially large ones; severely reduce the patient's work capacity and impaired sexual function. Reasons why patients refused hydrocoelectomy in the past were given as the high cost of the surgery fear of death and impotence and sterility that might result from the operation. Patients that underwent hydrocoelectomy reported remarkable improvement in quality of life, work capacity and sexual function. Other benefits of Hydrocoelectomy

included the restoration of self-esteem, thus enabling affected individual to participate more in community activities.

Although lymphatic filariasis is ranked as the second leading known cause of permanent disability worldwide (WHO 1995), little attention has been paid to the important, but hidden disability associated with the genital manifestations of the disease. Further multi-disciplinary investigations on genital filariasis have become very crucial in understanding the psychological and social cost of scrotal swelling and limb enlargement. The outcome of these investigations could be utilized to develop community health education strategy aimed at the holistic understanding of genital filariasis etiology in order to reduce stigma and encourage better health seeking behaviour.

1.2.14.3 Impact of Lymphatic Filariasis in Children

In children, the infection from lymphatic filariasis is usually symptomless and not clinically detectable. The damage caused by adult worms in the lymphatic develops slowly, and it is generally not apparent until children are four or five years of age. However, swollen lymph glands may be observed as early as two years of age while 30% of infected children of about seven years of age will start to show ultrasound-detectable, irregular ballooning of the tiny walled lymphatic duct and noticeable swelling of lymph glands (GAELF, 2005).

The progression of the disease in boys and girls within the age bracket of 9-15 differ to some extent, at about 13 years, girls may start to show clinically visible sign of infection of the lymph vessels in the leg. Further cumulative damage to the lymphatic drainage system predisposes them to lymphoedema resulting from an abnormal accumulation of lymph fluid in the tissues causing swelling of the limb.

This may progress to elephantiasis (painful and disfiguring swelling of the leg, arm, breast or genitals, up to several times their normal size with thickening of the skin) in adulthood (Dreyer et al., 2001).

In boys, by about 11 years, detectable ballooning of the lymphatic vessels in their scrotum may start to show. By about 13 years, they may start to develop hydrocoele – a fluid filled, balloon-like enlargement of the sacs around the testes. Scrotal nodules often develop in adulthood and further bacterial infection can lead to massive enlargement of the scrotum and gross deformation of the penis. Less commonly, boys may also develop lymphoedema and elephantiasis of the extremities similar to girls. However, the parasites in males seem to prefer the lymphatics of the scrotum to those of the extremities. Thus, the genital manifestations of the disease are more common in males, and are the most common of all clinical manifestations of lymphatic filariasis.

Only a limited number of studies have been carried out focusing on very young children, the reasons may be that of low prevalence of microfilaremia and few clinical cases. Recent applications of highly sensitive antigen assays have detected more infections among children than recognized previously, and the importance of early infection in relation to future clinical manifestations have been suggested (Weerasooriya *et. al.* 2003). In addition, infections in childhood have been recognized as a valuable indicator of recent transmission levels which can be used to evaluate effects of control measures (GAEL F, 2005).

Most socio-economic studies on lymphatic filariasis involve adults and the problem of filariasis in children has received poor attention. Ramaiah *et. al.* (2000) reported that many children (5-15 years) in endemic communities in India and Haiti were affected with the disease. In one of those communities investigated, 28 children

with acute and/or chronic forms of the disease were in school all 11 had completely discontinued school as a result of the disease. Further socio-economic consequences of lymphatic filariasis on children's psychosocial wellbeing in India and elsewhere have been documented (Ramaiah and Kumar 2000).

The role of maternal or paternal filarial infection on the microfilarial infection status of their offspring has been a subject of several investigations. Subranmanyam *et. al.* (1995) reported that children of microfilaria positive mothers were 5.2 times more likely to be microfilaria positive than those of amicrofilariae mothers, the association was however not-significant. Kumar (1997) also reported that the highest prevalence of microfilariae was observed in children aged between 0-9 years whose parents were both positive for microfilariae and/or had filarial symptom in Puri, India. He concluded however, that parent's filarial infection status and microfilariae infection status in children were not closely associated. Malhotra (2003) investigated the influence of maternal filariasis on childhood infection and immunity in Kenya. Children of infected mothers had a three-fourfold increased risk of filarial infection, as ascertained by circulating antigen, relative to children of uninfected mothers. Paternal infection did not correlate with childhood infection status, indicating a specific maternal effect. They concluded that maternal filarial infection increases childhood susceptibility to *Wuchereria bancrofti*.

The risk of filarial infection may not be equivalent for all members of filarial-exposed populations, evidence for a genetic factor that influences acquisition of infection has been growing. Studies to address whether there is a genetic basis to the development of the disease are seriously required in endemic communities. Epidemiological studies of lymphatic filariasis in children will be very crucial if

planned elimination is taken seriously, this will also facilitate proper understanding of disease progression and evaluate control impact.

1.2.15 Diagnosis of Lymphatic filariasis

1.2.15.1 Trends in Diagnosis of Lymphatic Filariasis

Until recently, diagnosis of filarial infection depended on the direct demonstration of the parasite microfilariae in blood or skin specimens using relatively cumbersome techniques and having to contend with the periodicity (Nocturnal) of microfilariae in blood. Parasitological diagnosis of lymphatic filariasis has traditionally relied on detection of microfilariae in blood films. This method is relatively insensitive and often impracticable due to the necessity of blood collection at night between 10:00pm and 2:00am. Although the sensitivity can be increased by membrane filtration of venous blood, people in endemic areas are often reluctant to comply for religious and cultural reasons (Mbah and Njoku 2000, Eigege *et al.*, 2002, Onwuliri *et al* 2005, Nwoke *et. al.*, 2006). Alternative methods based on detection of antibodies by immunodiagnostic tests which were developed to solve this problem did not prove satisfactory since they failed to distinguish between active and past infections and also had problems with specificity owing to their cross-reactivity with other common parasites. Subsequently other techniques of diagnosis are being developed and are at various stages of field trial.

1.2.15.2 X-rays Diagnosis

Conventional X-rays are rarely helped in diagnosing lymphatic filarial infection, except in the case of tropical eosinophilia where the picture can be variable but may include interstitial thickening and diffuse nodular mottling in the lung fields. Ultrasonographic examinations of the lymphatics (especially scrotal lymphatics in men, the breast and retro-peritoneal lymphatics in women) can reveal rapidly moving

("dancing") adult worms, and lymphoscintigraphy, though not diagnostic of filarial infection, can identify lymphatic functional and gross anatomical abnormalities. While ultrasonogrphy involve the use of ultrasound apparatus to detect adult worm movement in affected organs in the body, lymphoscintigrpahy is a method used to identify the sentinel node. A radioactive substance that can be taken up by lymph nodes is injected at the site of the tumor, and a doctor follows the movement of the substance on a computer screen. Once the lymph nodes that have taken up the substance are identified, they can be removed and examined to see if they contain tumor cells.

Farris *et al* (1998) reported that of 1,201 lymphatic filariasis patients; at least half appear clinically asymptomatic, though they have microfilariae circulating in their blood. Essentially all infected individuals have hidden damage to their lymphatics, as evidenced by lymphoscintigrpahy, and/or their renal systems (microscopic haematuria and/or proteinuria). Situations of lymphadenopathy with or without accompanying inflammation of the nodes or lymphatic vessels, biopsy can often detect adult worms, but this approach is rarely used as diagnostic procedures.

The value of scrotal ultrasound and dance of adult filarial worm as diagnostic sign and means of evaluating lymphatic filariasis infection has received attention lately from researchers. Faris *et a*l (1998) explored the value of scrotal ultrasound as a means of evaluating Bancroftian filariasis. Colour Doppler motile adult filarial worms (dancing worms) in dilated lymphatics. Sixty-one male subjects from a filariasis-endemic area in Egypt were studied including 19 clinically normal microfilaria (MF) carriers (seven with dancing worms and eight with sub clinical hydrocoele), 13 MF-negative subjects with positive filarial antigen test results (three with dancing worms and seven with sub clinical hydrocoele), 22 exposed subjects with no MF and

negative antigen test results (no dancing worms, four sub clinical hydrocoele), even seven subjects with clinical filariasis (no dancing worms, seven hydrocoele). Thus, all men tested with clinical filariasis and most clinically normal subjects with either microfiolaraemia or filarial antigenaemia had abnormal ultrasound examination results. Ultrasound findings often changed after therapy with diethycarbamazine with disappearance of dancing worms and development of new scrotal calcifications or hydrocoele. This study confirms the value of scrotal ultrasound as a means of non-invasively visualizing adult filarial worms and assessing subclinical lymphatic damage in bancroftian filariasis. Dreyer *et al* (1999) also investigated the use of ultra-sound in diagnosis of lymphatic filariasis in endemic areas to refine the concept of *endemic normals*, they recommended that for healthy adult males at risk of *Wuchereria bancrofti* infection, half-yearly ultra-sound examination of the scrotal area may be useful to identify and treat early infections before microfilaria appear in the blood and lymphatic damage and progression of subclinical disease occurs.

Chaubal *et. al.* (2002) used high- resolution ultrasonography to stress the importance of live adult filarial worm dance as a reliable sign of scrotal filarial infection in symptomatic patients. Eight symptomatic patients in whom the filarial dance sign was shown on high-resolution ultrasonography were studied, investigated, and followed after treatment with diethylcarbamazine citrate. Two patients underwent fine-needle aspiration. Multiple foci (nests) of motile (live) filarial worms were observed in most patients. Fine-needle aspiration of the dilated lymphatic vessels in 2 patients confirmed the presence of microfilariae. Five of 8 patients had a favorable response to treatment with diethylcarbamazine citrate. They concluded that high-resolution ultrasonography is a useful technique for diagnosing scrotal filariasis in

symptomatic patients and is very useful in the follow-up period for assessing the response of filarial worms to treatment.

The disadvantages of these methods are that they cannot be used in the filed for epidemiological surveys and these are also expensive in terms of training of technicians and management of apparatus. For these reasons, their uses are only restricted to highly specialized laboratories.

1.2.15.3 Serological Methods

Antigen detection: Circulating filarial antigen (CFA) detection should now be regarded as the 'gold standard' for diagnosing *Wuchereria bancrofti* infections. The specificity of these assays is near complete, and the sensitivity is greater than that achievable by the earlier parasite-detection assays. Essentially all individuals with microfilaraemia also have detectable circulating antigen, as well as do a proportion of those amicrofilaraemic individuals with clinical manifestations of filariasis (e.g., lymphoedema or elephantiasis) but no circulating microfilariae. In addition, some individuals who appear normal also have detectable circulating antigen that disappears after effective treatment with DEC for these cryptic infections. Two commercial configurations of this assay are available, one based on ELISA methodology that yields semi-quantitative results, and the other based on a simple card (immunochromatographic) test, yielding only qualitative (positive/negative) answers. Thus, this new diagnostic approach is equally applicable to clinical or field evaluation of bancroftian filariasis infections. Unfortunately, no such test is currently available for brugian filariasis.

Serological methods have been developed making diagnosis possible in otherwise questionable cases. A wide variety of serologic tests are available and tests

are being improved constantly. These tests vary in both sensitivity and specificity, depending upon the test methodology, the antigen used and the purpose for which the test was designed. Parasite antigen detection provides an alternative means to overcome the limitations associated with microfilaraemia detection and has the advantage of being able to detect microfilaremic infections among endemic normal.

Antigen testing is now recognized as the method of choice for detection of *Wuchereria bancrofti* infection (Weil *et al.*, 1997). Rapid, sensitive and specific diagnostic test are constantly being reviewed and validated, those that can be used in the field are more favoured than those that require specialized laboratories. Introduction of new tests continue to change the procedures of immunodiagnosis of lymphatic filariasis. New immunoblot technique offered specificity not seen before in conventional serology and FAST-ELISA (Becton-Dickinson and Co) is a rapid, simple screening method., in spite of the availability of these new methods, the more classical serological tests are still being patronized for clinical laboratories.

Complement fixation (CF), although rapidly being superceded, is still used; indirect hemagglutination (IHA), long the "workhorse" of parasitic serology is a major test; indirect immunoflourescence (HP) continues to find use; and the newer enzyme linked immunosorbent assay (ELISA) procedures are now standard for parasitic diseases like filariasis (Wentworth 1998).

Complement Fixation

In spite of its many disadvantages, complement fixation continue to be used in diseases like lieshmaniasis, however its uses has declined in filariasis. This procedure requires more training and experience and inherent errors are more easily committed. In addition, the reagents are liable to numerous substance contaminations and may cause anti-complementary activity and false positive results (Weil 1990). Experienced

technicians can solve all of these problems but other procedures have become obviously preferable.

Indirect Haemagglutinations Tests

The simplest and most adaptable procedure in parasitic serology is the Indirect Haemagglutinations Tests (IHA) test in which erythrocytes coated with antigen agglutinate in the presence of antibody. Few reagents are required and the variables are limited and easily defined. Various erythrocytes especially sheep cells have been used though have the disadvantage that many infectious diseases and other conditions cause the development of "heterophile" antibodies that produce nonspecific agglutination of sheep erythrocytes. Romia *et al* (1990) showed that one of the advantages of the IHA is the ability to use a variety of antigens including excretions, secretions, extracts, metabolic products and fractions of organisms. Other agglutination procedures such as bentonite floceulation, cholesterol lecithin agglutination and direct agglutination have been used for specific parasites diseases but have not been widely accepted, as have CF, IHA and IIF. Amuta (1993) utilized IHA and counter immunoelectrophoresis (CIE) in sero-epidemiological studies on onchocerciasis in Benue State, Nigeria.

Indirect Immunofluorescences

These techniques use antibodies or antigens labeled with fluorescent dyes, such as fluorescein or isothio Cyannate that emit visible coloured fluorescence when excited by ultraviolet light to recognize antigen-antibody reactions in tissue, cell membrane or within cells. Santos et al (1974) investigated the diagnosis of *Wuchereria bancrofti* filariasis by immunoflorescence using microfilariae as antigen; they concluded that in endemic regions, the use of this diagnostic procedure systematically prior to blood transfusion is very necessary. Although IIF has been

shown to be superior in sensitivity and specificity to IHA in many cases, technical difficulties and the need for specialized equipment often not available in developing counties has limited universal acceptable of IIF.

Procedural problems with IIF are not as great as those in CF but more prevalent than with IHA. The condition of patients serum is said to be not critical neither minor hemolysis nor bacterial contamination interferes with HF reaction (Dissanayake *et al* 1994). Specimens collected under adverse conditions in the field or on filter paper are adequate. Since the IIF reaction is read visually, the antigen used can be less refined than those needed for CF or IHA and many consist of whole organisms or microtome sections of adult worms. Wentworth (1998) noted that IIF has a disadvantage in that antigens must be visualized, so that extracts or fractionated antigens cannot be used unless attached to a suitable carrier. However, conversional IIF continues to be the method of choice for several parasitic infections.

Enzyme-Linked Immunosorbent Assay (ELISA)

ELISA and its modifications, including the FAST-ELISA, and immunoblot techniques are rapidly reshaping serodiagnosis of parasitic infections. Although earlier thought to be too complex and difficult for field use, modifications of reagents and development of more practical procedures have shown ELISA indicator system consist of an enzyme and its substrate rather than fluorescein activated by ultraviolet light. The ELISA enzymatic reaction is multiplicative and thus results in higher sensitivity; it permits the use of small molecular antigens and antibodies in parasitic infection and has been used widely in lymphatic filariasis (Well *et al* 1997, Itoh *et al* 2001). Some advantages are that the test is simple, suitable for processing large numbers of specimens and the reagents have long shelf lives. Disadvantages include long incubation times and the tendency to magnify errors because of the enzyme

amplification. ELISA has been shown to be uniquely useful in detection of IGM antibody, a measure of early infection.

The utilization of ELISA to detect filarial-specific immunoglobulin IgG4 antibodies in unconcentrated urine has also yielded encouraging results in India and Sri Lanka. Itoh et al (2001) and Weerasooriya et al (2003) all concluded that detecting filarial infection in urine samples can be useful in large scale studies to identity endemic foci in monitoring filarial infections in very young children, who are a sentinel population for evaluating for evaluating the intensity of filariasis transmission and effectiveness of control measures. These are new techniques being developed to simplify serological procedures for lymphatic filariasis, however the use of fractionated urinary filarial antigen in the diagnosis of human filariasis have been in practice since early nineties (Ramaprasad and Harinath 1995).

FAST-ELISA

The recently introduced FAST-ELISA is a simplified rapid method for testing (Wentworth 1998). It uses a newly developed polystyrene Falcon Assay Screening Test (FAST) system in which a specially designed lid for microfitration plate has 96 styrene beads on sticks such that the beads are suspended just above the bottom of each well when the lid is placed on a plate. Absorbing antigen to the beads and successively placing the cover on plates containing patient's serum, enzyme conjugate and finally substrate perform the test. Though yet to gain popularity in developing countries, Simonsen et al (1996) described the potential for the FAST-ELISA as both a diagnostic laboratory and as a field test is virtually unlimited. Weil et al (1997). However maintained FAST-ELISA procedure for filarial antigenemia may be difficult to perform in the field and this has limited their uses in lymphatic filariasis endemic countries.

Immunoblot technique

Until recently, the iummunoblot (or Western Blot) technique was used only for research purposes to characterize antigens and antibodies. Now techniques and equipment have progressed to a level that makes possible diagnostic uses. Using highly purified antigens and detecting specific bands can obtain exquisite specificity. In many cases this specificity has permitted speciation of the infecting agent (Wentworth1998). A major advantage though is the necessity for specialized equipment and training. Immunoblot can only be performed in laboratories with access to the proper antigens needed for it.

Serodiagnosis using immunochromatographic Diagnostic Test (ICT).

The ICT filariasis test is a new rapid-format filarial antigen test that was developed by ICT diagnostic Company Wales and Australia. The test detects soluble *Wuchereria bancrofti* antigen that circulate in the blood of infected humans (Weil *et al* 1997, Pani *et al.*, 2000, Eigege *et al* 2002). Human serum or blood plasma (without Pretreatment) is added to a pink simple pad that contains dried polyclonal antifilarial antibodies coupled to colloidal gold to detect filarial antigens in a sera or plasma. This test has been shown to be sensitive, specific, easy to perform and visually reliable within minutes. Ramzy *et al* (1999) noted that it however requires sera separation that makes it difficult to be executed in the filed. A new version of ICT test kits is now available based on the detection of circulating Wuchereria Bancrofti antigens in finger-prick blood directly in the field and studies have evaluated the performance of this new whole blood test in filariasis endemic areas (Eigege *et al* 2002, Pani *et al* 2000 and Ramzy *et al* 1999). The ICT card test can be performed in whole blood samples, in addition to the several advantages exhibited by the previous version; it can conveniently be performed on finger prick blood samples without requiring any

laboratory procedures and yields results in a few minutes. These significant features make the whole blood ICT card test a potential diagnostic tool to be adopted in screening and surveillance of bancroftian filariasis risk areas (Braga *et al.*, 2003).

When compared to other lymphatic filariasis serological procedures ICT are more specific, sensitive cost effective and less technical difficult to apply in field studies. The advantages of the ICT procedure over the other parasitological and serological diagnostic options for detection of *Wuchereria bancrofti* infection are ranked below.

Table 1: Diagnostic options for detection of *Wuchereria bancrofti* infection.

Methods	Sensitivity	Specificity	Technical difficulty	Cost
Clinical examination	+	++	++	NA[b]
Mf thick smear	++	+++	++ c	+
Mf membrane filtration	+++	+++	+++ c	++
DNA detection PCR	+++	++++	++++ c	++++
Antibody serology	++++	++	+++	+++
Antigen ELISA	+++++	++++	+++	+++
Antigen ICT card test	++++	++++	+	++
Scrotal ultrasound	++++	++++	+++++	++++

Keys: + lowest, +++++ highest, b- highly variable, c- may require night blood, PCR-Polymerase chain reaction. (After Weil *et. al.*, 1997).

1.2.15.4 Most utilized diagnostic methods

Early surveys for LF depended on the examination of blood films, which in most areas had to be collected around midnight because of the periodicity of mf in the blood. Alternative methods using immunodiagnosis were not satisfactory since they failed both to distinguish between active and past infections and had problems with specificity owing to their cross reaction with gastrointestinal parasites (Wentworth

1988). Two diagnostic tests were recently developed. The first to appear on the market was Trop Bio test made by Tropical Biotechnology Pty Ltd in Australia. This test uses a monoclonal antibody Og4C3 in a sandwich enzyme linked immunoabsorbent assay (ELISA) to detect Circulating Filarial Antigens (CFA) in serum specimens (More and Copeman 1990). This test raised serious concerns with respect to sensitivity and reliability.

The second test, the ICT test card produced recently by ICT Diagnostics in Australia, has been found to have a high sensitivity and specificity, can be used during the day and at night, is field usable and is currently commercially available at $1/test for public health programs (Weil et al 1997). Simonsen et al (1999) recently compared the above diagnostic tools (together with a Trop Bio for filter paper specimens) based on the detection of specific circulating antigens. They conclude that the tests have various qualities for application in different settings and for different purposes. In their opinion, the ICT card test can be performed by technical staff after a minimum of training with laboratory facilities and seems ideal for diagnosis in clinical laboratories and for surveillance in large control programs when only a negative or positive result is required. The Tropi Bio tests they found provided a graded response probably.

Reflecting the load of the adult worm infection but require more advanced laboratory equipment and well trained laboratory staff. The use of Ultrasound for the identification of adult worms was also developed in Recife, Brazil. In this, procedure, lymphatic vessels, shows peculiar aleatory movements ("filaria dance sign"). To confirm that the observed structures were living *Wuchereria bancrofti* adult worms, a segment of the lymphatic tract containing these mobile intraluminal structures was surgically removed from the left spermatic cord of one individual and checked. The

results were positive (Amaral *et al*, 1994 Dreyer *et al*, 1994). This filarial dance sign was also seen for the first time in Africa at a meeting organised by the Danish Bilharziasis Laboratories (DBL) with the use of a portable ultrasound machine and demonstrated by Peter Bernhard (Simonsen 1997). In another development, Gyapong et al (1998a) found that it is possible to obtain reliable and valid estimates of the community burden of LF by using the prevalence of hydrocoele as a rapid diagnostic index.

1.2.15.5 Development and Application of Rapid Assessment Procedures

Since community wide treatment of lymphatic filariasis commenced in many endemic countries of the world, many attempts are being made in developing a reliable rapid community diagnostic technique. Gyapong *et al* (1996) conducted a pilot study in Ghana; the assessment criteria included direct key informant interviews, focus group discussions, routine and random examination of adult males for hydrocoele. All the data collection methods were easy, convenient, non invasive and acceptable to the community. They concluded that the study provided reliable estimates of the burden of lymphatic filariasis in the community when compared with data from standard epidemiological surveys. The development of a standardized rapid community diagnosis procedure will ease the stress of tedious parasitological procedure in field surveys to determine prevalence and distribution of lymphatic filariasis.

The global effort to eliminate lymphatic filariasis as public health problem focuses on mass drug administration (MDA), this is currently recommended in communities known or suspected to have a prevalence of lymphatic filariasis greater than 1% (Eigege *et al.*, 2002). To determine community eligibility for MDA, community mapping must be conducted either through parasitological or serological

investigation. The parasitological investigation is extremely difficult because it requires collecting night blood samples; this is particularly problematic in many endemic communities in Africa with strong religious and superstitious beliefs (Gyapong *et al.*, 1996, Haddix and Kestler 2000, Braide *et al.*, 2003, Nwoke *et al.*, 2006). The development of a rapid immunochromatographic card test (ICT) that qualitatively test finger prick blood for *W. bancrofti* circulating Og4C3 antigen raised hope for quick community diagnosis (Weil *et al.*, 1997). Unfortunately, this simple, rapid, highly sensitive and specific ICT card test is not only very expensive but also not readily available in Africa. Eigege *et al.* (2002) reported that it will cost over US$100,000 to purchase the required ICT cards to test one village.

Filarial etiology of endemic hydrocoele

There have been some studies to address the question whether all hydrocoele seen in endemic areas are of filarial origin. A study in Pondicherry has shown by taking multiple criteria (clinical, histo-pathological, parasite demonstration in fluid and tissue, presence of filarial specific antibody/antigen, etc.) that 69% of hydrocoele could be assigned to be of filarial origin in Pondicherry (Pani et al., 2005). However, since hydrocoele is a pathological condition persisting for lifetime and since the specific evidence of filariasis infection may not persist that long, it is difficult to exclude filariasis as an aetiological factor in all cases in endemic areas. Since the prevalence of other hydrocoele in non-endemic areas is considerably low, unless otherwise proven all hydrocoele in *W. bancrofti* endemic areas are to be considered as of filarial origin. This question however, requires reexamination, from the viewpoint of improved diagnostic tests made available currently (ICT card test and OG4C3 ELISA for filarial specific antigens and ultra sound examination for detection of adult

parasite in the scrotum. Although scrotal ultrasound can be helpful in early diagnosis of hydrocoele secondary to LF, either by identifying living adult worms or lymphangiectasia and or fluid, ultrasound will probably not be available at many endemic sites. An epidemiological study on cumulative exposure and disease development showed that hydrocoele is a passive phenomenon after infection, not quantitatively related to exposure, unlike lymphoedema.

The need for a rapid community diagnostic procedure is therefore very crucial not only for MDA to commence but also to provide epidemiological information on the status and distribution of the disease. Since a fundamental problem envisaged in the elimination of lymphatic filariasis in Nigeria and other African countries is the dearth of information on the distribution of the disease, there is an urgent need to adopt a rapid, simple, cheap and yet efficient method for community diagnosis. Hydrocoele is the most common clinical manifestation of lymphatic filariasis, and its potential for use as a survey tool has been suggested (Gyapong *et al.*, 1998, Eigege *et al.*, 2002, Ajero *et al.*, 2006, Nwoke *et al.*, 2006).

Size of hydrocoele and relation with acute disease-results of a TDR study

In a multicentre study conducted by WHO/TDR during 1992-1995, clinical epidemiology of LF was addressed using a uniform protocol and definition of disease (WHO 2002). The sites included three from India (Pondicherry, Madras-currently Chennai and Vellore), two from Africa (Ghana and Tanzania) and one from the Philippines. The study not only addressed the issue of prevalence of different manifestations of LF but also relation of disease with the incidence of acute episodic ADL in the same population. These studies revealed that the overall prevalence of chronic disease ranged between 2.38% in Tanzania and 19.96% in Pondicherry. The prevalence of lymphoedema was lower than that of hydrocoele in all study areas

(lymphoedema was not recorded in Philippines). Hydrocoele was graded into those less and those greater than tennis ball size and it was observed that in the three Indian sites, the prevalence of small hydrocoele was higher (two thirds of total prevalence) compared to that of large hydrocoele. In Ghana, the prevalence of these two grades was more or less equal; however, in Tanzania and in the Philippines the prevalence of larger hydrocoele was higher. The co prevalence of both hydrocoele and lymphoedema in males ranged between 0.32% in Ghana and 3.77% in Vellore. The co prevalence was relatively more common in India, than in Africa. The mean age of the patients with smaller hydrocoele was lower (ranging between 31.2 $\pm$ 13.7 and 48.8 $\pm$ 17.8 years) compared to those with larger hydrocoele (ranging between 40.7 $\pm$ 19.0 and 46.6 $\pm$ 12.4), suggesting the progression of smaller to larger hydrocoele in course of time.

It is well known that ADL attacks form a part of the natural history of scrotal disease and that repeated acute attacks could lead to progression to the most severe forms, including lymph scrotum (Pani *et al.*, 1994). These attacks are could be linked to the presence of superficial bacterial and fungal infections, as is the case also with lymphoedema of the legs; or due to parasite induced inflammation. Episodic attacks ADL (acute filarial disease) continue to occur in established cases of chronic disease and in fact are responsible for the progression of chronic disease. The annual incidence of ADL per 1000 cases was generally higher in patients with lymphoedema compared to those with hydrocoele. Overall, in hydrocoele cases the ADL incidence ranged between 73.0 and 565.6 attacks per year per 1000 cases. These ADL attacks are responsible for severe physical disability and resultant loss of work.

1.2.16 Control of Lymphatic Filariasis.

1.2.16.1 Prospects for Elimination

Efforts are being intensified by the WHO to eliminate and/or eradicate lymphatic filariasis as a public health problem. The choice of this disease for elimination is based on the availability of effective technologies and tools for prevention and/or control as well as an increased access to these technologies and tools for a sustained period of time. In addition, there are no known non-human reservoirs of lymphatic filariasis (GAELF, 2005). To eliminate lymphatic filariasis as public health problem, two main objectives are being considered.

- The spread of infection must be stopped
- The levels of worm larvae in the blood of infected persons must be reduced so that mosquitoes cannot transmit the worms from one human to another.

The GAELF believes that lymphatic filariasis elimination programmes are good investments in health and poverty reduction. Increase in productivity and earning potential have been observed in areas where lymphatic filariasis is eliminated (Ramaiah *et. al.* 2000). Gain in labour and productivity come directly from the prevention of acute attack, hydrocoele and lymphoedema, conditions which severely decrease worker's productivity. Savings on medical treatment from the elimination of lymphatic filariasis represent another significant gain for individuals and health systems. Recent advances in diagnostic technologies and development of products with both microfilaricidal and filaricidal properties make lymphatic filariasis elimination relatively simple and cheap. Yet the disease is until recently one of the most neglected diseases because it affects the poorest of the poor in remote communities at the *"end of the road"*. Countries where lymphatic filariasis is found

are mostly in the tropical and sub-tropical regions of the world, they also are among the world's poorest countries as lymphatic filariasis is closely linked to poor sanitation and poor housing quality.

No public health programme has ever expanded as quickly as the Global Programme to eliminate lymphatic filariasis. Governments in endemic regions increasingly view the programme as a tangible way to address poverty and improved health. As a result, annual treatments have jumped rapidly, up from 25 million in 12 countries in 2000 to over 250 million in 39 countries in 2004 (GAELF, 2005). Despite the rapid progress of the global effort to eradicate lymphatic filariasis, much work remains to be done especially in sub-Saharan Africa where the latest diagnostic technologies are yet to be available and the cost of some essential drugs still beyond the reach of the poor.

For the endemic countries in Africa to join the global coalition for lymphatic filariasis elimination, diagnostic procedures, treatment and vector control must be upgraded to meet the goal of elimination by 2020. Gyapong *et. al.* (2000) reported that lymphatic filariasis cost Africa US$ 1.3 billion per year from lymphatic filariasis-related disability: 6% (US$ 78 million) from acute attacks, 11% (US$140 million) from lymphoedema, 83% (US$ 1.1 billion) from hydrocoele. The lymphatic filariasis elimination programme is expected to cost from US$ 0.20 - $0.50 per person per year (GAELF, 2005). The projected outcome of the elimination programme is that by 2020, the number of men with hydrocoele would fall from almost 20 million to less than 4 million, the number of people with lymphoedema from about 4 million to less than 1 million and the incidence of acute attacks would almost disappear. But until programmes are fully funded in Africa, these expected returns on investment will be unrealized. An important requirement is to have information on spatial spread and

status of the risk of filarial infection, which would facilitate an appropriate planning for control and /or elimination.

Lymphatic filariasis elimination is a concerted effort that requires years of cooperation to ultimately achieve success. Not every country where lymphatic filariasis is endemic has been able to begin elimination efforts simultaneously. For a country to commence elimination activities, it must: -

- Establish effective task forces to oversee programmes activities
- Conduct mapping of lymphatic filariasis to determine where endemic areas within the country are
- Decide on mass drug administration strategy and
- Creatively develop way to help those afflicted with lymphatic filariasis.

1.2.16.2 Mapping

Twenty years ago, it was extremely difficult to determine whether lymphatic filariasis existed in a particular community because of the difficulties in collecting night blood samples for community diagnosis. Research into lymphatic filariasis has led to the development of a simple, finger-prick diagnostic blood test, called Immunochromatographic Card Test (ICT). The ICT is very sensitive and specific to lymphatic filariasis, detecting the infection within minutes at any time of the day, without the need for laboratory facilities. In areas where the presence of lymphatic filariasis is unknown, a carefully chosen sample of school children is tested using the ICT cards. The area is classified as endemic if there are positive findings. The ICT along with spatial analysis has allowed communities to be mapped more efficiently. This in turn, helps governments establish areas for targeted elimination activities.

The epidemiological mapping of lymphatic filariasis in Nigeria by Nwoke *et. al.* (2000) used only the Rapid Assessment Procedure (RAP) which is based on examination of adult males of 20 years of age and above for hydrocoele. Only the Global 2000 Foundation in collaboration with Carter Center in Atlanta (USA) used the ICT procedure in Plateau and Nasarawa States in Nigeria (Eigege *et. al.*, 2002). Until these new technologies are available in Africa, the most affected continent will continue to draw back the pursuit of lymphatic filariasis elimination.

In terms of the control of lymphatic filariasis three main options are available. Vector control, morbidity control and mass chemotherapy.

1.2.16.3 Vector Control

Several methods of mosquito control are available for use in lymphatic filariasis prevention, since most African countries are involved in the Roll Back Malaria programme, the adoption of the same strategies for lymphatic filariasis will not be problematic. The principal vector of the disease ***culex quinquefasciatus*** has widespread distribution in Nigeria, their ability to breed in household water holding containers make application of insecticides difficult. Human activities, housing and sanitation are determinant factors in mosquito population dynamics, Omudu (1998) and Nwoke (1993) reported that human activities and poor sanitation in Nigeria create conducive breeding sites for vectors of malaria and Lymphatic filariasis.

Mosquito control options that can be employed are:

- Insecticide application
- Use of plant products,
- Biological control (use of predators, parasites and pathogen of mosquitoes)

- Use of insecticide treated materials (ITMs)
- Environment sanitation

Several studies in Africa used residual spraying and dropping polysterine beads in wet pit latrines (Castlebery and Cech 1990). There are now new improved techniques for enhancing the effectiveness of vector control, which include the use of Insecticide-Treated Materials. (ITMs), mainly bed nets and curtains, residual spraying and biological agents against container breeding mosquitoes. The use of these and other techniques has enabled the elimination of lymphatic filariasis in Japan, Taiwan, Solomon Islands, South Korea and some parts of China (Addiss and Brady 2007). These methods of reducing human vector contact still provide useful supplements to the effects of treating the human population to reduce transmission. They should however not be relied on exclusively and should be combined with other control strategies. Since no single mosquito control method yield the desired results, the integration of some of these options have been recommended (Nwoke et al., 1993).

1.2.16.4 Mass Drug Administration

Early studies on treatment of lymphatic filariasis was based on the selective treatment of patients with single annual doses of DEC (6 mg/kg) which decreases mf by 90% and decrease adult worms by 50%. In some parts of the world, it was used as a medicated salt (Dreyer et al., 1995, Plaisier et. al., 1999). Due to advances in research, there is a growing shift to the use of mass distribution programs with single or combined doses of ivermectin, albendazole or DEC. Even though the use of DEC remains the mainstay of treatment in most endemic countries, its use is limited in communities in which onchocerciasis and loaisis are endemic due to severe adverse reactions in people infected with these parasites. Ivermectin, which has been very successful in treating onchocerciasis, is now approved as a single dose or in

combinations with DEC or albendazole following several studies that have shown its effectiveness as an annual dose.

Mass Drug Administration (MDA) for Elimination

One of the two principal goals of the Global Programme is to interrupt transmission of infection, achieved by treating the entire at-risk population. Community-wide treatment entails the administration of two safe and effective drugs to members of endemic communities, once a year, for at least five years. This combination of drugs is either

- Albendazole and Mectizan (ivermectin)
- Albendazole and diethylcarbamazine (DEC).

Diethylcarbamazine (DEC), develop over 50 years ago, is an inexpensive and effective anti-filarial drug that is used to treat lymphatic filariasis in many countries. DEC is available in tablet form and in a fortified salt formulation for daily intake at meal times. However, DEC cannot be used in most of Africa because severe side reactions can occur when other infections, such as onchocerciasis and loa loa are also present (Meyrowitsch et al., 1996, Florencio and Peixoto, 2003). McLaughlin et al (2003) reported that severe adverse reactions to lymphatic filariasis treatment using DEC with or without albendazole are uncommon. Only minor and moderate reactions were noticed in their study in Leogane, Haiti. They concluded that management of these side effects remains a serious challenge to lymphatic filariasis elimination.

Mectizan (generic name: ivermectin) is an oral anti-parasitic drug discovered and developed by Merck and Co., Incorporated, which is effective against both lymphatic filariasis and onchocerciasis. Mectizan is provided free of charge by Merck and Co., Inc. for treatment of onchocerciasis in all endemic countries and for Africa

countries where onchocerciasis and lymphatic filariasis co-exist. This drug has been distributed in Nigeria for over decade for community-wide treatment onchocerciasis, it has however not had any collateral impact on the transmission of *Wuchereria bancrofti* when administered along (Richards *et. al.*, 2005).

Albendazole donated by GlaxoSmith Kline for lymphatic filariasis prevention, is a well-established anti-parasitic treatment, given to an estimated 500-800 million people, mostly children, for intestinal infections over the past 20 years. The combination of albendazole with either Mectizan or DEC has been proven to enhance the efficacy of the individual-drug treatments. Significant decrease in the prevalence of *Wuchereria bancrofti* infection in mosquitoes has been reported in Nigeria following the addition of albendazole to annual, ivermectin-based mass treatment (Dunyo et al., 2000, Richards *et. al.*, 2005). The combination of Mectizan and albendazole is most preferred in sub-Saharan Africa, however, the WHO has cautioned that for optimal safety, when this combination is first utilized in communities endemic for both lymphatic filariasis and onchocerciasis, enhanced pharmacovigilance would be appropriate (Mclaughtin *et. al.* 2003, GAELF, 2005). The organization further warns that combine treatment should not be carried out in areas where Loa loa is endemic. This pharmaceutical issues will hinder MDA in southern Nigeria where some communities are co-endemic for lymphatic filariasis and Loa loa (Udonsi; 1986, Mbah and Njoku; 2000, Nwoke *et. al.*, 2002, Braide *et. al.* 2003

Plaisier et al (1999) have shown that a dosage level of 400 micrograms/kg of ivermectin as a single dose irreversibly reduces mf production by 65%. With a dosage of 200 micrograms/kg, the reduction is at least 35%. Beach *et al* (1999) in a study, which combined albendazole and ivermectin for the treatment of intestinal

helminthes, and *Wuchereria bancrofti* in school children report that combination therapy reduced the prevalence of *Trichuris* and the prevalence of mf more than placebo or ivermectin alone. Shenoy (1999) using combinations of DEC and ivermectin also found similar reductions in mf density. Other studies include those by Addiss *et al* (1997), Ismail *et al* (1998) and Ottesen *et al* (1999), they recommended albendazole and ivermectin to be used except in the loasis or onchocerciasis zones of Africa. For endemic zones where onchocerciasis or loasis exists, once yearly single dose administration (for 4-6years) of either a two drug regimen of ivermectin (200micrograms/kg) + albendazole (400mg) or one drug regimen of ivermectin (400mg) alone. The added benefit of the two drugs as potential anti-helminthes for intestinal parasites makes it an excellent public health tool. Developing effective drug distribution mechanisms will be key to the elimination of the disease since most health services in Africa on their own, may not be able to deliver drugs to entire populations on a yearly basis. A Community Directed Treatment (ComDT) approach involving the community and other partners in the drug distribution is therefore essential.

Antifilarial drug treatment and filarial morbidity

Data on the impact of treatment with antifilarial drugs on filarial morbidity are inconsistent. Several studies have reported reductions in acute attacks, lymphoedema, and/or hydrocoele following mass drug administration, but other studies report no such association (Addiss and Brady 2007). For most of these studies, the primary outcome of interest was microfilaraemia rather than clinical morbidity. Therefore, the studies are often limited by inadequate or non-standardized case definitions, inadequate sample sizes, and intermittent or incomplete follow-up. Many studies have only evaluated the effect of drug treatment in persons with existing morbidity. Such

an approach ignores the incidence of new cases, and could lead to erroneous conclusions regarding the effect of the antifilarial drugs on disease incidence or prevalence. Clinical studies have also produced inconsistent findings. A detailed case report of a US Peace Corps volunteer demonstrated dramatic clinical improvement in lymphoedema following DEC treatment (Moore et al., 1996), but a clinical trial by Das and colleagues in Pondicherry, India found no change in limb volume or condition (Freedman et al., 1996).

Assessing the public health impact of mass treatment with antifilarial drugs is a critically important issue for programme advocacy and for planning morbidity control strategies. Studies on the impact of antifilarial drugs on the prevalence and incidence of acute inflammatory episodes, lymphoedema, and hydrocoele are needed, using rigorous case definitions, close clinical assessment, and control groups. Addiss and Brady (2007) suggested that such studies should be conducted in areas where DEC and albendazole are co administered as well as in areas where ivermectin and albendazole are used.

1.2.16.5 Challenges of MDA and the need for integrated control

Despite significant progress towards LF elimination, a number of challenges to MDA-based LF elimination programmes remain.

1. Firstly, we do not know the exact level and duration of mf suppression required for elimination to be achieved. A target goal reduction of mf prevalence below 1% for transmission elimination may not be an appropriate target where *Aedes* mosquitoes are vectors. In Samoa, mf rates were less than 0.33% between 1972 and 1974, but LF prevalence rates rose soon after MDA was stopped. It is likely that foci of mf positive individuals capable of

initiating resurgence of LF will remain after five or more MDAs with DEC and albendazole. Five years of MDA with DEC and albendazole in Egypt do not appear to have been sufficient to eliminate LF transmission in areas that had high baseline infection rates (Ramzy *et al.*, 2006). Effective tools for locating such foci in countries with a low overall residual mf prevalence after five or more annual MDAs have yet to be developed.

2. A second significant challenge in the Pacific is population mobility. Migration is particularly common in many of the Pacific islands; more Cook Islanders live in New Zealand than on the main island of Rarotonga. Samoans frequently travel between Samoa and American Samoa for economic opportunities and to visit relatives and friends living in the neighbouring country. A significant proportion of internal migrants in Papua New Guinea are mf positive (Alexander *et al.*, 2001, Omudu and Ortese 2004). Such migrants are likely to miss annual MDA treatments, thereby raising the possibility of reintroduction of LF.
3. A third challenge is the presence of individuals whose occupational or social behaviour places them at risk of infection or who consistently fail to participate in MDA, placing their communities at risk of ongoing transmission (Gyapong 2006). Merely increasing the number of years of MDA campaigns will not reach these individuals. A better understanding of their perceptions and priorities will allow tailoring of elimination messages and interventions so that they are locally appropriate and acceptable (Durrheim *et al.*, 2004).
4. A fourth challenge is the potential for *W. bancrofti* to develop resistance to either DEC or albendazole. Albendazole resistance is already common amongst helminthes of veterinary importance. Although there is currently no

evidence of resistance to DEC or albendazole in areas where LF elimination programmes are under way, no reliable assay system is currently available to allow assessment of resistance in filarial nematodes. Resistance is more likely to appear in an MDA programme after several rounds of treatment when success appears to be in sight.

5. A fifth challenge is areas where LF and loiasis are co-endemic (Gyapong 2006). MDA cannot be implemented in these areas until mf densities are reduced to levels where significant adverse reactions from MDA will not occur. This is due to severe adverse events associated with treatment with Mectizan® (ivermectin) in community directed treatment in onchocerciasis if patients have high microfilarial loads of *Loa loa*.

These challenges can be met by integrating vector control with MDA for LF elimination. Vector control is the only presently available adjunct LF control measure with the potential for immediate implementation. Although treatment with doxycycline has been shown to eliminate mf and to have macrofilaridal activity, mass treatment is not practical due to the logistic difficulties of delivering daily doxycycline treatments of 200 mg for 6 to 8 weeks (Burkhot *et al.*, 2007). In addition, doxycycline is also contraindicated for use in children under 8 years and in pregnant women.

National scale vector control programmes would have multiple potential benefits for LF elimination programmes. These include (1) the ability to suppress LF transmission without the need to identify all individual 'foci of infection'; (2) minimizing the risk of reestablishment of transmission from imported mf positive individuals; and (3) reducing the spread of any DEC or albendazole resistant *W. bancrofti* which might

emerge. Furthermore, control measures targeting vectors will also decrease the risk of dengue or malaria transmission where, respectively, *Aedes* or *Anopheles* are the LF vectors. The reduction of nuisance in addition to vector mosquito biting is likely to enhance community support for ELF programmes. Implementation of vector control strategies as adjuncts to the MDA campaigns will better ensure the success of the elimination efforts and enhance the prospects for sustainable benefit.

Mosquito surveillance and control as adjuncts to MDA are already included in many country filariasis elimination plans even though they may not be actively implemented. Among PacELF countries, activities commonly mentioned include larval surveys for filariasis vectors, environmental sanitation to reduce mosquito breeding sites, use of mosquito nets and ultra-low-volume (ULV) spraying against adult mosquitoes. We need to support vector control efforts to ensure that the limited resources available to ministries of health are spent effectively. There are a number of vector control strategies whose efficacy against transmission of LF has been demonstrated. These include the use of insecticide treated mosquito nets where *Anopheles* are LF vectors (Perdersen and Mukoko 2002) and the use of polystyrene beads for control of *Culex* vectors that breed in pit latrines or soakage pits (Burkot et al., 2007). These strategies for those vectors are ready for widespread implementation. Mosquito nets should also suppress LF transmission whenever the vectors are night-biting (i.e., *Anopheles, Culex, Mansonia; Ae. vigilax*), but the degree of the impact needs to be confirmed in controlled trials before implementation on a country basis should be advocated.

Vector control methods for LF are more than just mosquito nets and polystyrene beads. Recommendations for research and control trials were presented at a "LF

Research Forum" in 2003 (Rajagopalan *et al.*, 2003). Examples of priorities for vector control research included the evaluation of insecticide treated materials (including, but not limited to nets) on *Culex* and source reduction on *Aedes* vectors.

Dengue control campaigns are now primarily based on larval source reduction to limit transmission by the primary vector, *Ae. aegypti*. While important behavioural differences exist between *Ae. aegypti* and *Ae. polynesiensis*, there are sufficient similarities between the two species (both bite in the daytime and breed in containers) to allow LF programme managers to draw some lessons from the anti *Ae. aegypti* campaigns for *Ae. polynesiensis* control. Integration of LF with dengue control programmes in *Aedes* transmission areas makes sense. Similarly, malaria control programmes in *Anopheles* transmission areas would also suppress LF transmission though insecticide treated mosquito nets and/or IRS if LF elimination and malaria control programmes were integrated.

In addition, control of the night-biting but predominantly outdoor-feeding *Mansonia* vectors should include evaluations of the impact on the adult populations of vegetation removal from rivers and ponds (the larvae obtain air from plants via a modified siphon) as well as the use of fish to reduce the larval populations (Feachem *et al* 1983). Similarly, studies to measure reductions of *Ae vigilax* adults by environmental modifications of salt marshes will be required before vector control can be advocated for extensive geographic areas.

Before implementing a vector control strategy on a country-wide basis, the effectiveness of interventions needs to be validated at the population level, so that limited resources are targeted for optimal control. It is noteworthy that China, the first

country to apply for formal verification of interruption of transmission used an integrated control strategy that included vector control (Coa *et al.*, 1997).

It has been argued that vector control is not cost-effective for LF elimination. However, the cost of failing to achieve final elimination of LF will far exceed the short-term costs of implementing vector control for LF elimination where it is needed.

1.2.16.6 Morbidity Control

Morbidity control aims at reducing the suffering of already diseased persons, making them as functional as possible and preventing the progression of their condition to worse states. It was not appreciated as to how much could be done for individuals who were suffering from the chronic manifestations of lymphatic filarial disease. In most instances, a sense of hopelessness inhibited any active intervention. Morbidity control efforts within the GPELF have focused on: (1) basic lymphoedema management (hygiene, skin care, and simple physical measures) to reduce the incidence of ADLA and prevent progression of lymphoedema; and (2) surgical repair of hydrocoele. Since the GPELF was launched in 1998, considerable research has documented the effectiveness of basic lymphoedema management and provided a stronger scientific base for this intervention. Less work has been done to document the costs and benefits of hydrocoele surgery in filariasis-endemic areas (Addiss and Brady 2007). Additional research is needed to support efforts to 'scale up' morbidity control and disability alleviation programmes at the national level and to document the extent to which antifilarial drug treatment influences the course of filariasis-associated disease.

As a follow up to their studies on ADL mentioned earlier, Dreyer (1999) and Shenoy (1998) suggest that basic hygienic practice such as regular washing of

elephantoid limbs with soap and water reduces the incidence of acute attacks and the progression of elephantiasis. The formation of "elephantiasis clubs" in Brazil where members share experiences and help one another with washing of elephantoid limbs has been found successful in reducing suffering and psychosocial problems associated with the disease. The relieving and prevention of suffering and disability is therefore one of the targets of the GPELF (WHO 1999). In line with this target, multi country studies are currently going on in Ghana, Tanzania, Kenya and Nigeria to look at community-based management of lymphoedema and ADL. In addition, a training of trainers' course on the management of the lymphoedema and ADL was held for Filariasis. Surgical intervention for men with hydrocoele is also an important component of morbidity control. The GPELF hopes to disseminate as broadly as possible the most practical surgical techniques appropriate for the care of patients with hydrocoele.

Disability Management

The other principal goal of the Global Programme is to alleviate hardship in individuals with lymphatic filariasis-induced disability. As a result of the many different presentations of the clinical disease, there is no one drug or treatment that is effective for all cases. However, for all patients, three issues are recommended to be considered:

i. Anti-parasitic therapy

ii. Supportive clinical care, and

iii. Patient education and counseling

Anti-Parasitic Drug Therapy

To prevent possible transmission of lymphatic filariasis to others, patients with clinical disease are treated with a regimen of anti-parasitic drugs.

1.2.16.7 Clinical Care (Lymphoedema Management)

Adult worms cause permanent damage to the lymphatic system. However, symptoms can be managed by reducing the frequency of acute attacks and stopping the disease from getting worse. Patients can easily learn hygiene measures that are effective in minimizing infection and promoting lymph flow. Simple measures to be undertaken by the patient include:-

- Washing the affected parts twice daily with soap and clean, cool water and dry carefully
- Raising the affected limb at night
- Exercise the limb regularly
- Keeping the nails clean
- Wearing comfortable shoes
- Using medicated creams or anti-biotics to treat small wounds or abrasions.

The most distressing aspect of lymphatic filariasis is the attack of acute adenolymphangitis, which cause considerable short-term and also long term disability by worsening the lymphoedema. Since each episode prevents the person from attending his work for several days, the economic loss is substantial. The precipitating cause of these attacks is secondary infection, the bacteria entering the tissues through "entry lesions" in the skin. Shenoy (2002) reported that these episodes can very well

be prevented by proper "local hygiene" of the affected limbs, which is a simple, effective, cheap and sustainable method that can be carried out even in patients house.

Hydrocoele Surgery

For most hydrocoele patients, surgery is the treatment of choice. Men have a good prognosis with early and correct hydrocoele surgery under local anesthetic. Quality pre-and post-operative cares 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. Unfortunately, however, hydrocoele surgery is often too expensive for those afflicted with lymphatic filariasis. Ahorlu *et. al.* (2001) investigated the consequences of hydrocoele and the benefits of Hydrocoelectomy on physical activity and social life in three lymphatic filariasis endemic villages in Ghana where males had recently been offered surgical operations to repair their hydrocoele. Patients observed that, between 3 and 6 months after surgery, they were remarkable improvements in their work capacity and sexual function, and restoration of self-esteem, thus enabling them to participate more in community activities. The authors suggested the need for Hydrocoelectomy to be incorporated as an important morbidity control programmes.

Patient Education and Counseling

To advance broader biomedical knowledge on etiology, transmission and treatment options for Lymphatic Filariasis, psychological counseling is essential to support patients. This is because most communities where lymphatic filariasis is endemic often attribute the cause of the disease to be spiritual and/or hereditary. As a result, individuals with Lymphatic Filariasis - induced disability suffer from acute

shame, isolation, sexual dysfunction and intense chronic pain and suffering. Patient counselling will therefore demystify the disease.

1.2.16.8 Treatment and prevention of Acute Adenolymphangitis

Treatment. Treatment recommendations for ADLA include rest, cooling the affected area to relieve pain and limit thermal-related damage to the skin, analgesics and antipyretics to relieve pain and fever, systemic antibiotics, and elevation of the affected limb. Little is known about the degree to which antibiotics shorten the duration of ADLA episodes (Addiss and Brady 2007).

Prevention. *Basic lymphoedema management.* An increasing number of studies have documented the effectiveness of basic lymphoedema management, as recommended by WHO, in reducing the incidence of ADLA episodes (WHO 2004). In Guyana, McPherson found that 10 of 11 patients had reported ADLA during the six months preceding enrolment in a hygiene education programme, compared to none of them during the six months after enrolment (McPherson, 2003). A recent evaluation by WHO reported dramatic reductions in incidence of ADLA in Sri Lanka, Zanzibar (United Republic of Tanzania), and Madagascar (WHO, 2004). In India, several placebo-controlled studies have observed significant decreases in ADLA incidence among lymphoedema patients who only received instruction in foot care (Ramaiah et al., 1999).

Reductions in ADLA frequency can be maintained for several years through home-based care. In Haiti, the reported incidence of ADLA during the year before beginning treatment was 2.1 episodes per year; this decreased to 0.6 episodes after hygiene and skin care were emphasized (Addiss et al., 1999). A follow-up assessment 18 months after the patients 'graduated' from clinic visits, but continued

lymphoedema care at home, showed an annual incidence of 0.5 ADLA episodes per year (WHO 2004). Sustained practice of self-care among patients in an area endemic for brugian filariasis; some two years after patients had received 'foot care' education, 95.3% reported having fewer or less severe ADLA episodes, with a mean incidence of 2.8 acute attacks per year has been reported (Suma et al., 2002).

Prophylactic antibiotics. For patients who continue to experience frequent episodes of ADLA despite basic measures of hygiene and skin care, prophylactic antibiotics are recommended (GAELF 2005). This practice is also recommended in non-endemic countries for patients with lymphoedema who have recurrent cellulitis. The effectiveness of prophylactic antibiotics has been evaluated in several studies. In a placebo-controlled trial in Vellore, India, lymphoedema patients who received prophylactic penicillin experienced greater decreases in ADLA incidence than those who only received training in foot care (WHO 2004). However, in similar studies in Kerala, India, Shenoy et al.(1999) found that, for most patients, antibiotics provided little additional benefit if foot care was regularly practiced. Kerketta et al. (2005) in Orissa, India, observed lower rates of ADLA among patients who were randomized to receive foot care and penicillin prophylaxis than among patients not receiving penicillin, although the difference was not statistically significant. A recent Cochrane review concluded that although penicillin and foot care appear to reduce the frequency of cellulitis, further studies are needed to document the effectiveness of these measures (Badger *et al.*, 2005).

Antibiotic soap. An unpublished study from Haiti found that the incidence of ADLA in lymphoedema patients decreased to a similar extent (from 1.1 episodes to 0.4 episodes per year) in patients who washed with antimicrobial soap and those who

received standard soap (Addiss et al., 2003), suggesting that hygiene itself was more important than the antimicrobial content of the soap.

Participation in patient support groups. Participation in patient support groups has been shown to decrease the number of ADLA episodes and improve quality of life among lymphoedema patients in Haiti (Addiss et al., 1999).

Risk of death. Fatal outcomes for ADLA are thought to be uncommon, but most programme managers and clinicians who care for patients with lymphoedema are aware of at least a few cases in which ADLA progressed to septicaemia and death. The actual incidence of fatal outcomes with ADLA is unknown, and risk factors for severe or fatal ADLA are poorly characterized. The clinical experience of Dreyer and others indicates that elderly patients, alcoholics, and patients with malnutrition, hypertension, diabetes, or chronic cardiac or pulmonary disease may be at increased risk of severe ADLA (Addiss and Brady 2007).

1.2.16.9 Treatment and prevention of lymphoedema

Recognition of the importance of ADLA in the progression of lymphoedema has led to basic recommendations for the treatment of lymphoedema in filariasis-endemic areas. The cornerstones of this treatment include hygiene, skin care (early detection, treatment, and prevention of entry lesions), exercise, and elevation of the affected limb (Vagas et al., 2003). In addition to the above measures, appropriate footwear is recommended, and prophylactic antibiotics are recommended for some patients.

All of these recommendations are consistent with proper lymphoedema care in developed countries where lymphatic filariasis is not endemic (WHO 2004).

However, in these areas, additional modalities are also used, including compressive bandages, compressive garments, and manual lymphatic drainage (Shenoy et al..2003). These and other measures would no doubt be helpful for individual patients in filariasis-endemic areas, but require more training, experience, and resources, and are therefore not included in the public health approach to managing lymphoedema adopted by the GPELF for filariasis-endemic countries (Addiss and Brady 2007).

Effectiveness of treatment on leg volume

A few studies have documented changes in leg volume or circumference in response to basic lymphoedema management. Although an 'objective' measurement, leg volume can vary considerably with time of day, exercise, elevation, and other factors. In Orissa, India, Kerketta et al. (2005) reported significant reductions in leg circumference with all treatment regimens that included basic foot care. Pani et al. (1989) reported greater volume reductions in patients with oedema of recent onset than in those with lymphoedema of longer duration. A study from Haiti, which initially included compressive bandaging as one of its modalities, reported that more than 65% of 178 patients had a reduction in leg volume after two years when compared with pre-treatment measurements (Addiss and Brady 2007).

Effectiveness of treatment on entry lesions

It is commonly observed that, with basic lymphoedema management, the prevalence and severity of entry lesions decrease (Vagas et al., 2003).

Effectiveness of treatment on stage of lymphoedema

Few studies have attempted to address the degree to which basic lymphoedema management results in regression of lymphoedema stage or grade. In part, this is because most staging systems have not been developed for this purpose. Thus,

considerable improvement in skin condition or even leg volume is possible without regression in stage *per se* (Addiss and Brady 2007).

Effectiveness of treatment on limb flexibility and range of motion

Patients commonly report improved flexibility and a feeling of 'lightness', but few studies have documented the effectiveness of basic lymphoedema management on limb range of motion (Vagas and Ryan 2003).

Effectiveness of treatment on quality of life

Several studies are currently underway that address the extent to which basic lymphoedema management in filariasis-endemic areas improves quality of life. One study, by McPherson (2003) in Guyana, documented highly significant improvement in quality of life as measured by the Dermatology Quality of Life Index. Similar work in non-endemic areas has shown substantial gains in quality of life with lymphoedema treatment. Patients who incorporate regular lymphoedema management into their daily routines have reported satisfaction with the results (Shenoy et al., 2003).

Effectiveness of treatment on chronic inflammation

A study in Haiti collected skin punch biopsy specimens from the lymphoedematous legs of 27 patients before and about 12 months after they initiated basic lymphoedema management (Addiss et al.,1999). Follow-up biopsies showed significant reductions in perivascular mononuclear infiltrate in the superficial dermis (41% decrease in prevalence), in perivascular fibrosis in the deep dermis (58% decrease), and in periadnexal mononuclear infiltrate (53% decrease).

Person et al. (2006) in their study in the Dominican Republic concluded that traditional healthcare providers and indigenous healers are often an integral part of physical, mental, and spiritual healthcare for many people. They stressed the need for healthcare providers to understand a woman's cultural perspectives of illness, her

natural networks of support and referral, her behavioural practices of care seeking and self-care that she believes support her health and the financial burden of seeking care. Training both indigenous healers, considered as lay health advisors by women, along with physicians in simple, low-cost self-care regimes could increase the early detection, diagnosis, and treatment of lymphoedema among women in filariasis-endemic areas of the Dominican Republic. Family-oriented interventions and support groups for women and their families are viable ways to provide psycho-educational opportunities with skill building sessions, reinforcement for self-management efforts and emotional support for women. They reported the indiscriminate use of injectable antibiotics without medical supervision suggests a need for health education messages about this topic for women during lymphoedema management interventions. While these findings are specific to women in the Dominican Republic the methodology of inquiry into local cultural practices and beliefs to tailor interventions are not only applicable but also recommended for other countries with lymphoedema management programmes.

Optimization of treatment protocols

Although there is general agreement as to the basic elements of lymphoedema management within the GPELF, considerable regional variation exists in the availability of supplies, including soap, water, and topical skin preparations (e.g. antiseptics, antifungal and antibacterial agents). These differences contribute to variation in approaches used in different regions. For example, in some countries, macerated interdigital lesions are treated with Whitfield ointment, an inexpensive antifungal agent, on the presumption that dermatophytes are the primary pathogen. In Guyana, attempt to culture fungi from these lesions, concluded that bacteria probably play a more important role than fungi (McPherson 2003).

Programme challenges

Although there remains some debate about the optimal package of interventions for basic lymphoedema management in filariasis-endemic areas, the benefits of such treatment are generally recognized, and foci of activity in several countries have demonstrated success. However, relatively few persons with lymphoedema living in filariasis-endemic areas currently have access to treatment. Thus, the key programmatic issue is how best to 'scale up' basic lymphoedema management to state and national levels. The challenges can be considered in four major categories as listed by Addiss and Brady (2007):

• Finding patients and bringing them to treatment (many are reluctant to seek care as a result of socio-economic and cultural issues)

• Education of patients and family members on the principles and practice of lymphoedema self-care

• Encouragement and support to sustain daily self-care (this support may include improved access to supplies such as clean water, soap, antiseptics, topical antibacterial and antifungal agents, and oral antibiotics)

• Referral networks for management of ADLA and for patients with advanced lymphoedema or lymphoedema complicated by other diseases.

There is general agreement that most patients can manage their lymphoedema routinely at home, and that this is preferable and less costly than clinic-based care. WHO has developed training packages for 'informal caregivers' to instruct patients on home-based care, and this approach has been adopted by most programmes.

Prevention

Considerable anecdotal evidence suggests that the onset of chronic lymphoedema is triggered by the first or second episode of ADLA. Data from a filariasis-endemic area of Haiti indicate that skin lesions between the toes, which could provide portals of entry for bacteria, are common in children, and are significantly more common in those who test positive for circulating filarial antigenaemia (Fox et al., 2005). Similar findings have been observed in northeast Brazil and Ghana (Ahorlu et al., 2001). The degree to which initial ADLA episodes, and therefore lymphoedema, can be prevented through school-based education programmes focused on hygiene, skin care, and recognition and treatment of entry lesions has not been studied.

1.2.16.10 Treatment of hydrocoele

Surgery is the recommended intervention for hydrocoele, and if done properly, it is regarded as curative. Other techniques, such as aspiration of the fluid and injection of sclerosing substances, are less effective, have unacceptable side effects, and have not been adequately evaluated in filariasis-endemic areas (Addiss and Brady 2007). A variety of surgical techniques are used for hydrocoele in filariasis-endemic areas, although little is known about their relative frequency of use. Modifications of the 'eversion' technique are probably most commonly used, in which part of the tunica vaginalis is excised and the remainder is everted. While this approach may be effective for non-filarial hydrocoele or for 'pure' hydrocoele in filariasis-endemic areas, it is likely sub-optimal as a procedure for lymphocele or chylocele, because dilated, leak-prone lymphatic vessels – the source of the excess fluid – may not be removed. Thus, the risk of recurrence may be substantial. Eversion techniques have also been associated with other more serious complications, including development of the debilitating condition of lymph scrotum, for which surgical treatment is vastly

more challenging than that for hydrocoele. Thus, current WHO guidelines call for complete removal of the tunica vaginalis (WHO 2002).

Few studies have been published on the rates of complications and recurrence following hydrocoele surgery in filariasis-endemic areas. A study from Wardha, India, reported a 26.7% incidence of wound infection or haematoma in cases considered filarial in aetiology, compared with 10.9% in non-filarial hydrocelectomies (Addiss and Brady 2007). Among 950 surgeries for large hydrocoele in Orissa, India, post-operative infections and abscesses were seen in 28 (2.9%) cases, scrotal haematoma in 12 (1.3%), and reversible penile oedema in 42 (4.4%) (GAELF 2005). Ahorlu et al (1999) reported that the fear of loosing the ability to engage in sexual intercourse was one of the reasons why patients with hydrocoele in Northern Ghana did not go for surgery. The paucity of data on outcomes makes it impossible to compare cost or effectiveness of one technique over another. Surgical outcomes are currently being evaluated in several countries.

Research urgently needed according to (Addiss and Brady 2007) is to:

(1) Evaluate tools to distinguish the various forms of 'filaricele' preoperatively; and

(2) Assess costs, resource requirements (e.g. time, anaesthesia, electricity), surgery duration, post-operative quality of life, and incidence of relapse and infectious and other post-operative complications with different surgical techniques.

Impact of hydrocoele surgery on quality of life

Ahorlu et al. interviewed hydrocoele patients in Ghana 1.5 years after surgery. Patients reported that within three to six months post-surgery, they had experienced

significant improvement in self-esteem, sexual function, and capacity for work, and they participated more in community activities (Ahorlu et al., 2001).

Antifilarial drug treatment and filarial morbidity

Data on the impact of treatment with antifilarial drugs on filarial morbidity are inconsistent. Several studies have reported reductions in acute attacks, lymphoedema, and/or hydrocoele following mass drug administration, but other studies report no such association. For most of these studies, the primary outcome of interest was microfilaraemia rather than clinical morbidity. Therefore, the studies are often limited by inadequate or non-standardized case definitions, inadequate sample sizes, and intermittent or incomplete follow-up. Many studies have only evaluated the effect of drug treatment in persons with existing morbidity. Such an approach ignores the incidence of new cases, and could lead to erroneous conclusions regarding the effect of the antifilarial drugs on disease incidence or prevalence (Addiss and Brady 2007).

1.2.17 Can Nigeria Eliminate Lymphatic Filariasis by 2020?

The WHO has set the target date for the elimination of lymphatic filariasis as a public health problem at 2020. As at 1997, countries like China, India and Thailand conducted epidemiological surveillance and reported the interruption of transmission through aggressive control strategies with strong emphasis on community participation (Cao *et. al.* 1997). The question now is, will Nigeria and other countries in sub-Saharan Africa and Asia be able to meet the WHO target for elimination? To answer this question, an objective assessment and evaluation of other parasitic disease control and/or eradication programmes already being implemented in Nigeria must be made. These programmes are

- The guinea worm eradication programme (NIGEP)
- The National Onchocerciasis control programme (NOCP)
- The Roll Bank malaria programme (RBM)

The target date for elimination of guinea worm in Nigeria has been shifted forward several times; the last was by the year 2005. Nigeria is among the very few countries in the world yet reporting cases of guinea worm disease (NIGEP 2003). The major reason why guinea worm is still being reported in Nigeria is because people in endemic villages still do not have access to potable water all year round.

The National Onchocerciasis Programmes has been in existence in Nigeria for about three decades, the programme has recently been successfully integrated into the African Programme on Onchocerciasis Control (APOC). The availability and free distribution of Mectizan and the development of efficient, cheap and simple Rapid Assessment Methods (RAMs) for community diagnosis brought renewed hope that this disease will be dealt a lethal blow in Nigeria. Unfortunately however, the challenges of drug distribution in remote villages with difficult terrain have left donated drugs in stores of state and local government health departments (Omudu 2001).

The Roll Back Malaria (RBM) programme was launch at an unprecedented gathering of Africa Heads of State and international partner in Abuja; Nigeria, in 2002. A major focus of that crusade was the massive importation and sale Insecticide Treated Bednets (ITBN). The momentum with which the programme started has fizzled out, while malaria – induced mortality and morbidity continue unabated in Nigeria and elsewhere in Africa. The disease is responsible for the death of 10,000 children everyday in Africa (UNICEF 2004).

Factors responsible for the unmet expectations of these disease control programmes may vary but the more common ones are discussed below:-

- **Lack of fund to Implement Planned Interventions**: The inability of African countries to mobilize the needed financial resources to prosecute disease control programmes is a formidable obstacle. For lymphatic filariasis for instance, though the global alliance has generous donors and strong partners, many countries in Africa and Asia who have completed their mapping are unable to initiate activities due to lack of fund (GAELF, 2005). This problem may arise as a result of
  - Dwindling donor fund as a result of donor fatigue.
  - Diversion of global fund to persecute the war on terrorism
  - Failure to contribute counterpart fund by home countries
  - Lack of capacity and fundraising skills
  - Diversion and misappropriation of disease control fund by governments.
- **Lack of Political Commitment:** The unwillingness of governments to commit needed human and financial resources required to undertake disease control projects is unfortunately a growing phenomenon in Nigeria. Ransome–Kuti (1998) reported an instance where in 1984, a virologist at the University of Ibadan warned the FMOH that the county was due for an epidemic of yellow fever and that immunization against the disease be mounted throughout the country. Little was done until the disease struck in Oju Local Government. It raged in the forest for months, killing thousands of people before it came to the attention of the FMOH. The disease swept through the country over the next three years, affecting almost every state. The situation where government

abdicates its responsibility in health provision to donor agencies is an indication that the political will to follow-through filariasis elimination is just not there. The only states that have made some progress in lymphatic filariasis intervention in Nigeria is Plateau and Nasarrawa states. This is largely because of the efforts of Global 2000, an international NGO funded by President Jimmy Carter Foundation.

- **Dearth of Skilled Manpower (human capital)**: Lymphatic filariasis elimination required professional skills and competence for those who will manage the programme. Since community participation is crucial for the success of programmes of this nature, the required human capital needed must be trained to be able to implement project activities. The lack of human capacity and adequate training within countries has repeatedly been identified as a major constraint in moving forward effort to eliminate lymphatic filariasis (GAELF, 2005). Areas of expertise required include diagnosis, case management, vector control, programme management and epidemiology.
- **Civil Strife and Political Conflict**: These are major impediments to lymphatic filariasis elimination. Apart from destroying health infrastructures that may have existed, large numbers of people are often driven from their homes, becoming easy prey to mosquitoes and make them very difficult to reach for security reasons. Though Nigeria is not currently at war, occasion/eruption of political and civil conflicts in the country are known to disrupt vaccination of some sections of the population. This same situation can also be applied to lymphatic filariasis elimination activities.

CHAPTER TWO

2.0 MATERIALS AND METHODS

2.1 Description of Study Area:

Benue State is one of the 36 states in the Federal republic of Nigeria, a tropical country on the west coast of Africa. The state derives its name from River Benue the second largest river in the country and is located in the central region of the country where it lies between latitude 7^0 13 and 7^0 49 and longitude 8^0 15 and $8^0$42 (Fig. 6). The State covers an area of about 34,059 square kilometers with a population of over 4.2 million people (NPC 2006). The state is bounded by Nassarawa state to the North, Taraba to the north-east, Cross River to the south, Enugu to the south-west and Kogi to the west. Benue State also shares a small section of the nation's international boundary with the Republic Cameroon to the south-east of the state. Majorities of the inhabitants live in rural agricultural areas and engage in peasant agriculture, the State's reputation as the food basket of the nation is being seriously jeopardized by the socio-economic consequences of parasitic diseases.

2.2. Study Population

Overwhelming majority of the people is found in scattered rural settlements, which are mainly engaged in subsistence agriculture and related activities. About the beginning of the 1990s, 80 percent of this population was rural with higher densities towards the south, while 20 per cent was found in the few urban centers – mostly administrative headquarters of local governments or market centres. This situation is expected to have changed considerably by now since, according to the UN, general world trends indicate that by the year 2000 about 50 per cent of the world population will be living in towns.

Generally the present settlement pattern in Benue State can be categorized into three main groups. There are the urban settlements, the nucleated village settlements

(mainly among the Idoma-speaking rural communities) and the very highly dispersed or scattered farmsteads of the Tiv. All these communities practice shifting cultivation as a method of sustaining fertility for the production of crops. For various reasons bush burning, which has now come to be associated with shifting cultivation, has also become a common practice among the rural people.

Physical Constraints

In terms of Benue's topography, there has not been any appreciable change witnessed in the last century. In any case, Benue does not have too big an area of a difficult terrain. Apart from the hilly area along the eastern and south-eastern parts of Kwande, and a few isolated residual hills in parts of Vandeikya and Oju, most of Benue is a low-lying area which has been occupied by an agrarian community.

Because of the hilly terrain, communication in Kwande is difficult and therefore it is not surprising that eastern Kwande, for instance, had poor transportation facilities and is one of the least developed areas of the state. Another problem associated with this kind of terrain is that some of the rivers within this zone have developed rapids and a think gallery of forests; these have produced ideal conditions for the breeding of the black flies that cause river blindness. The rivers Amile-u-Tamen and Amile-u-Kiriki, both in Kwande and parts of Ushongo Local Government Areas, provide good examples to substantiate this claim. Indeed parts of Kwande and Ushongo that are found along these river courses are well known areas for river blindness.

The social Environment

A large part of the Benue population is rural. However, the growing population has now created many problems of ecological disharmony. With the rapidly decreasing ecumene per persons, loss of soil fertility, depleting natural

resources and fewer employment opportunities, rural poverty is becoming more pronounced. Different administrations have noted the problem of population drift into urban areas but the strategies to deal with this situation have not yet shown much success. This volatile environmental disharmony has created many potential areas of conflict which often become manifest at the slightest trigger event. This partly explains why politics, which deals with sharing the dwindling resources among an increasing population, has become such a cut-throat business among the people.

The urban environment too has began to manifest very serious socio-political impasses which express themselves in the form of slums, general poor housing conditions and public utilities, unemployment and the related issue of a rising crime rate, increasing environmental pollution, expensive but poor urban transportation and the apparently insensitive and helpless urban management board. Urban life in Benue has not got a long history. Makurdi, Otukpo and Gboko, which are among the earliest towns in the region, were started in the early 1930s. Today they have grown into settlements that cover a large area and population. Their most serious predicaments include problems of waste management, land-use planning, electricity and water supplies, pollution control and the provision of good roads and drainage along the roads. The second generation towns do not even see these issues as problems at all and therefore do not even think about them.

2.3 Ethical clearance and permission

Ethical clearance and permission to conduct this study was granted by the state Ministry of Health and Human Services in Makurdi, the administrative headquarter. The Postgraduate Research Board of the Department of Zoology, University of Nigeria, Nsukka, gave approval for the study after reviewing the proposal. The fieldwork commenced after the purpose of the study was explained to the village

chiefs and traditional leadership council and obtaining their permission and consent. Informed consent was obtained from all the participants after the explanation of the procedures and the likely benefits of the study. After explaining the purpose of the study to the village chief and traditional leadership council and obtaining their permission and consent, all participating adults (16 years of age and older) were asked to gather at the village Primary Health Care (PHC) Centre and randomly selected. After individual verbal consent was obtained, the patients were assigned identification numbers and their names, age, occupation and marital status were taken.

2.4 Serological Method: Filariasis Test kit Diagnosis

The Serogolical test employed for this study is based on detection of specific Wuchereria bancrofti circulating filarial/antigen (CFA) have been highly successful and a number of kits have recently become commercially available. The test is rapid and requires no equipment, which makes it suitable for use in rural areas.

After collecting the demographic data, ICT testing was performed following kit instructions (NOW, ICT filariasis kits; Binax, Portland, ME, USA). The patient's left index finger was cleaned with methylated spirit and then punctured using a sterile lancet. The initial sample of blood was removed using a cotton swab, and sufficient fresh blood was then obtained to fill a 100-ql capillary tube. The blood was then transferred from the capillary tube to the pad on the ICT test kit card and then sealed. The results of each ICT test card were read after 15 minutes. A positive result is when two pink lines appeared on the card's window, and a negative result is when a single line was seen. Test results with the individual's identification code were recorded on the patients' diagnostic data sheet. The ICT screening was conducted in seven LGAs of the State (Fig. 6).

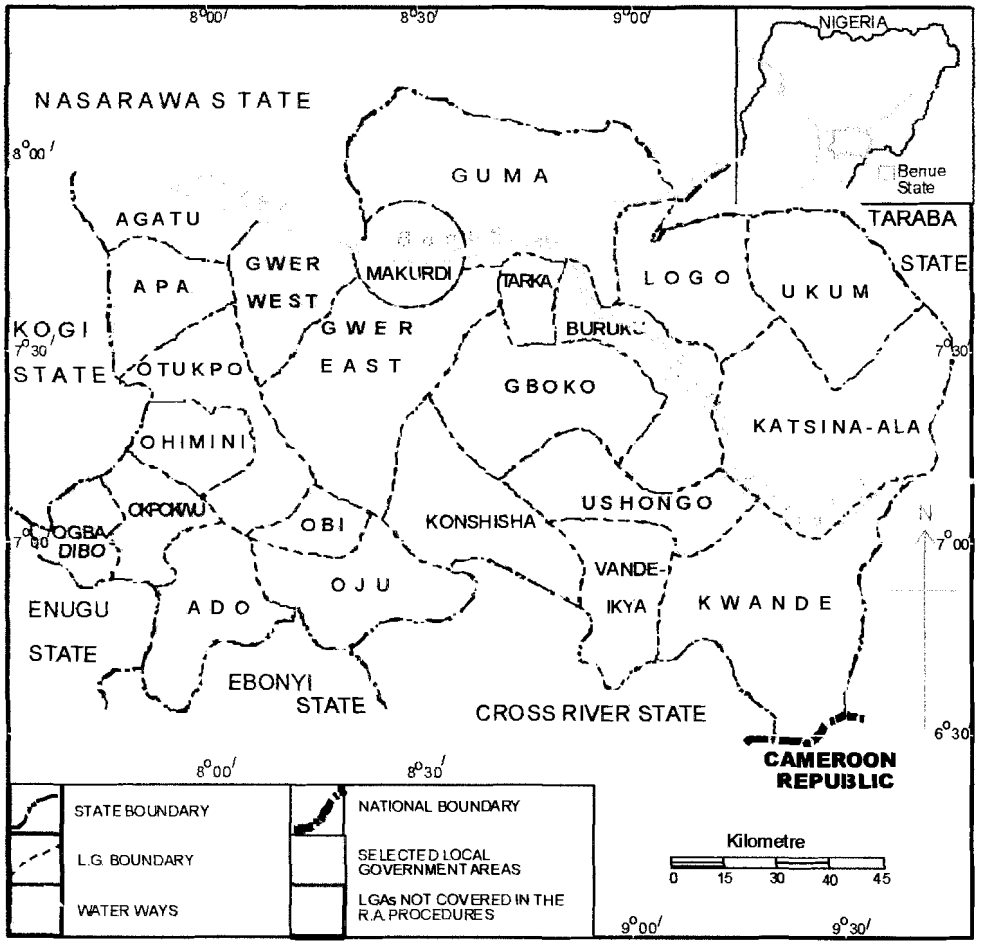


Fig. 6: LGAs where the ICT screening was conducted.

2.5 Search for Hydrocoele And Lymphoedema

This aspect of the study was conducted in 13 out of the 23 Local Government Areas (LGAs) of the State (Fig. 7). The field work commenced after the purpose of the study was explained to the village chiefs and traditional leadership council and obtaining their permission and consent, all participating adults (16 years of age and above) were asked to gather at the village Primary Health Care (PHC) Centre. Between 40 – 60 randomly selected adults who have been resident in the village for at least 10 years were clinically examined (in good light and in private consulting

rooms) for hydrocoele (Gyapong *et al.*, 1998, Schweitzer 2001, Eigege *et al.*, 2002, Nwoke *et al.*, 2006).

After obtaining demographic information (age, occupation, marital status, sex), participants were asked to partially disrobe and a local government health officer trained on the diagnosis of the various manifestations of filariasis including hydrocoele did the clinical examination. Hydrocoele was diagnosed based on the finding of a non-tender, soft, fluid-filled mass bigger than the size of an orange. Hydrocoele was distinguished from inguinal hernia (which would change with cough or straining, show an inguinal swelling at the internal ring) (Eigege *et al.*, 2002, Nwoke *et al.*, 2006). The size of the hydrocoele was classified as grade 1 (orange size) grade 2 (coconut size) and grade 3 (papaya size), this classification was adopted from Eigege *et al.* (2002).

Clinical examination also involved the search for lymphoedema, which was easier to conduct than the search for hydrocoele. Participants were simply asked to lift up their clothing to expose their legs. Swollen limbs were classified into grade 1, 2 and 3 depending on the degree of swelling (Badaki and Akogun 2001, Braide *et al.*, 2003).

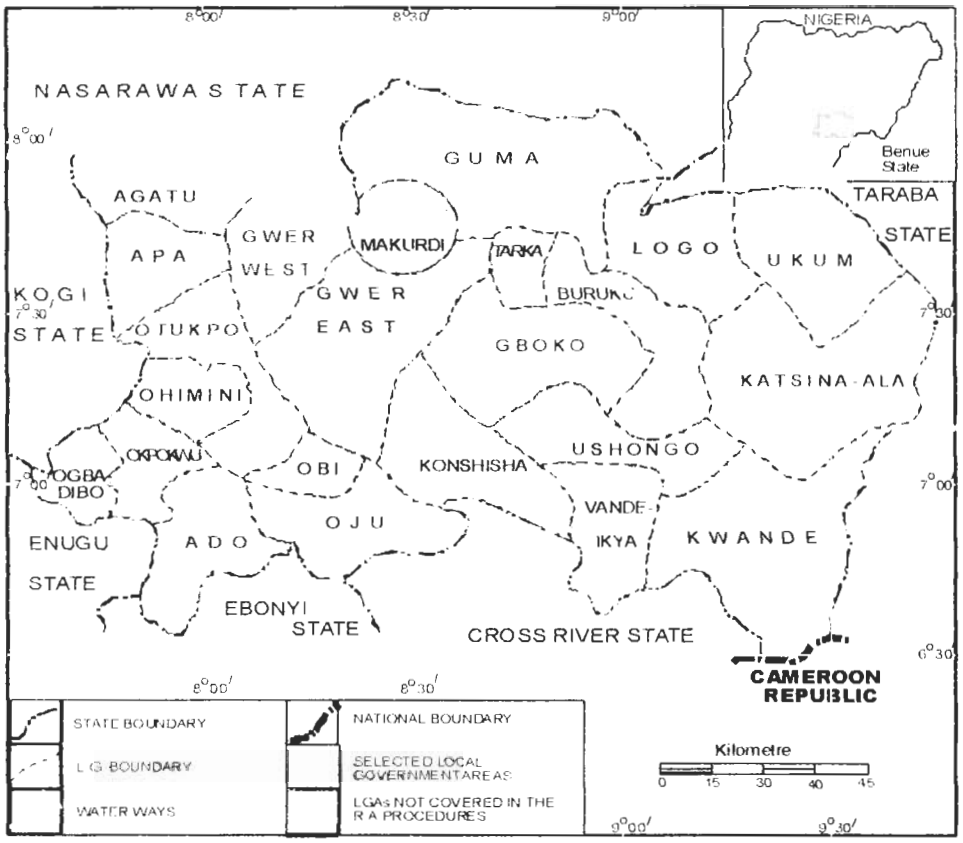


Fig. 7: LGAs where the Rapid Assessment Procedures were conducted.

2.6. Socio-cultural Methodologies

2.6.1 Recognising the value of socio-cultural insights in Lymphatic filariasis Research

While explicit acknowledgement by the wider lymphatic filariasis research and control community of the importance of socio-behavioural understandings for achieving optimal programme success is encouraging, the approach for gathering socio-cultural information from affected communities had major shortcomings. The protocol reflects a philosophy that aims to capture superficial data from a wide geographical catchment area, focusing on a limited number of data items collected from a small number of respondents in a large number of sites. The design attempts to

move towards the qualitative paradigm, but fails to make sufficient commitment to pursuing new understanding from the point of view of the local communities. It overlooks the fact that local definitions and explanations for lymphatic filariasis are completely unrelated to scientific, biophysical models of health. The protocol assumes a shared "western" understanding of health and of lymphatic filariasis, and attempts to confirm whether or not communities are compliant with bio-medically oriented local elimination programmes. This resulting hybrid of questions that appeared to be qualitatively oriented, does not actually achieve the central goal of improving understanding of the degree to which communities are actually aware that LF is present, and the manner in which they respond to the illness. For this study, the approach of Gyapong et al (2000) and Williams and Jones (2003) were adopted.

2.6.2 Quantitative Data Collection: Questionnaire Administration

This aspect of the study was conducted in eleven Tiv speaking villages in Logo and Kwande Local Government Areas (LGAs), nine Idoma speaking villages in Ado and Agatu LGAs and four Igede speaking villages in Oju LGA (Fig 8). The three ethnic groups have distinct socio-cultural and traditional norms; however, occupational and sanitary conditions that predispose them to mosquito bites are similar. The fieldwork commenced after the purpose of the study was explained to the village chiefs and traditional leadership council and obtaining their permission and consent. Community members willing to participate were administered questionnaire.

A detailed questionnaire to assess participant's knowledge, attitude and perception on lymphatic filariasis was adopted from Gyapong *et al.*, (1996, 2000). The questionnaire was pre-tested and modified to address identified needs and additional required information. Based on the findings and outcome of the semi-

structured and in-depth interviews. Structured questionnaire assessed villager's awareness, knowledge and beliefs about the cause, transmission, prevention and socio-cultural issues on lymphatic filariasis. Two sets of questionnaires were administered to affected persons and unaffected persons comprising of a total of 1610 unaffected respondents and 118 lymphatic filariasis patients as affected respondents. The latter were issues on the influence of socio-cultural beliefs on treatment seeking behaviour and practices and community and family attitude towards people with lymphatic filariasis.

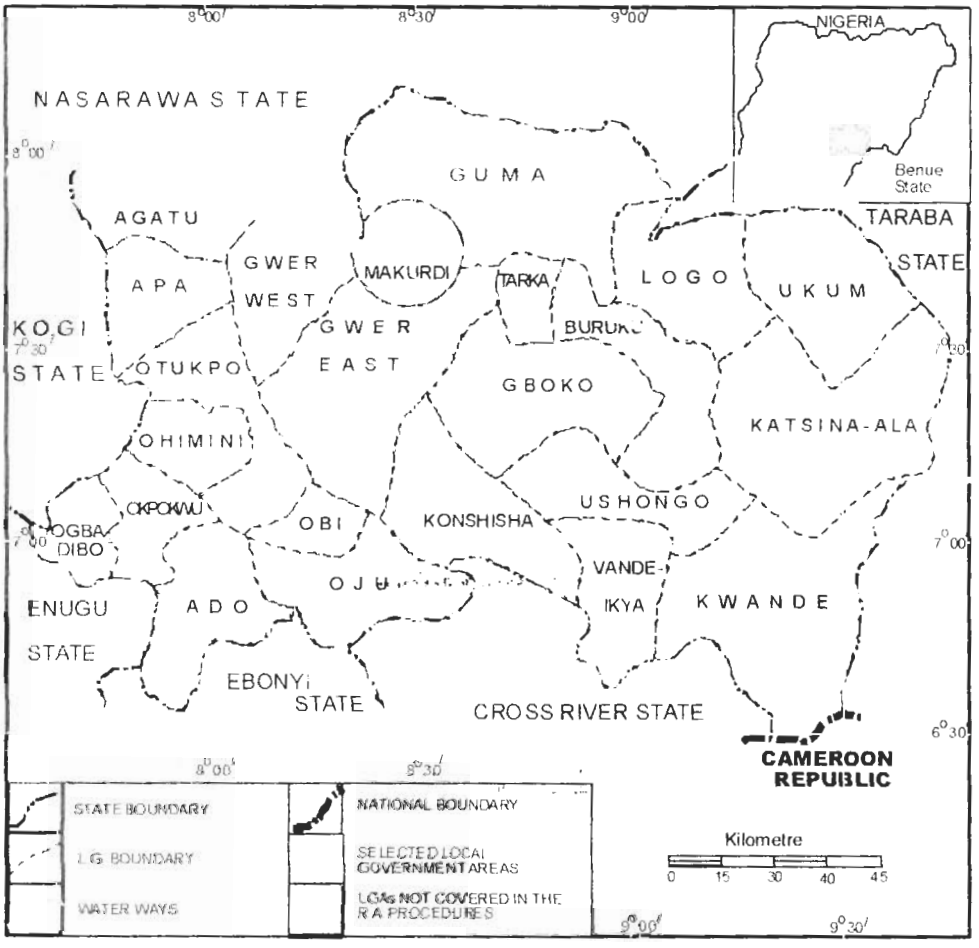


Fig. 8: LGAs where quantitative questionnaires were administered.

2.6.3 Qualitative Data Collection: In-depth Interview

Qualitative methods were also used to gather data because little is known about the beliefs, values, norms, traditions, roles, experiences, and understanding of the disease process by people with lymphoedema and hydrocoele in Nigeria. Qualitative techniques are especially relevant in areas where there has been little previous research and there is a need for discovery, descriptive accounts, and an understanding of how people interpret and explain a social phenomenon or personal experience (Patton 2002).

Two main methods were used to collect descriptive data. Initially, interviews, using a semi-structure questionnaire, were held with randomly selected individuals from selected villages to gather descriptive information on villager's knowledge and beliefs about the cause of filariasis and disease terminology in local language. Key informant interviews (Lu *et al,* 1988, Ramaiah *et al.,* 1996) were also used to obtain descriptive data. The key informant interviews were specifically targeted at Health care providers, traditional healers, community leaders and lymphatic filariasis patients.

Qualitative data were collected through in-depth and semi-structured interviews with lymphatic filariasis patients (persons with hydrocoele or lymphoedema). The purpose of employing this interactive method of collecting information was to discuss issues pertaining to their perception of psychological impact and some consequences of living and coping with clinical manifestations of lymphatic filariasis. The influences of ethnic beliefs on treatment seeking behaviour were also discussed during interview sessions. A total of 17 interviews were conducted. A semi-structured interview guide was used to encourage patients to discuss their perceptions of illness, healthcare sought from indigenous healers and

trained physicians, medical treatments, results of treatment, costs of treatments, and management of their hydrocoele and lymphoedema.

In-depth interviews were conducted to address the following research objectives:

- To ascertain the general knowledge and practice of morbidity management and self-care practices.
- Understand the importance that lymphatic filariasis patients attach to the various manifestations of the disease.
- To generate qualitative and descriptive information that could elucidate and/or explain the derived quantitative data.

2.7. Data Analysis:

Quantitative and Qualitative Data

The use of quantitative and qualitative methodologies was to provide some explanation and to triangulate information generated. Qualitative data were transcribed and analysed using Spread Sheet Analysis and categorization of responses under previously determined key issues (Dawson *et al.*, 1993, Patton 2002). Data was systematically examined for emerging codes, themes, and patterns. Themes related to the perceptions of illness, health-seeking behaviors associated with receiving care from indigenous or scientifically trained healthcare providers, treatments and treatment effects, self-management of disease, cost and cultural practices emerged as most salient to the patients. All structured questionnaires were entered and analyzed using SPSS, simple percentages and Chi-Square was employed to test significance.

Epidemiological Data

Data were entered into a computer and statistical analysis was carried out in Epi Info, version 2002 (Centre for Disease Control and Prevention, Atlanta). Chi-Square tests were used to compare and test for significance. The studies were conducted between October 2005 and November 2006.

CHAPTER THREE

3.0. RESULTS

Most participants (66.2%) were agricultural workers, self reported age ranged from 18 to 84 years and 79% of participants were within the 20 – 60 age bracket. Of the 845 participants, 264 (31.2 %) tested positive for circulating filarial antigen (CFA). Sex difference in infection revealed that male participants had significantly higher infection rate (36.3 %) than female participants (25.4 %) ($X^2 = 7.43$, df = 1, $P < 0.05$). Ado LGA recorded the highest prevalence with 53.7 % of sampled population testing positive while Ogbadibo recorded only 2.6 % prevalence (Table 1), this difference was statistically significant ($X^2 = 9.81$, df = 6, $P < 0.05$). The highest age-related prevalence was recorded in the age group 40 – 49 years (Fig.1), there was however no statistical significant difference in the prevalence of antigenaemia according to age group. Of the 21 villages where the study was conducted, ICT prevalence ranged from 0 - 57.1%. Three villages (Rijo, Ofuke and Odiapa in Ado, Apa and Obi LGAs respectively) had prevalence rate of above 30 %. 93.3 % of participants were clinically asymptomatic (showing no visible signs of lymphatic filariasis), we encountered 16 (11.4 %) participants who had lymphoedema and hydrocoele but ICT card test gave negative results.

Investigation of treatment history revealed that 68.2 % of the total sample population had taken Ivermectin for treatment of onchocerciasis and 51.1 % of those who had taken ivermectin had been on the treatment for at least 2 years. The ICT card test was easy to use in the field and was well accepted by participating communities, however 13 cases, whose cards exhibited only one pink line after 15 minutes in the field but a slight pink second line appeared during post- field analysis was observed. These cases were recorded as negative results in accordance with the manufacturer's

instructions. There is no marked difference in ecological conditions and anthropogenic factors that may act as risk factors in the areas studied.

Hydrocoele was diagnosed in 107 (6.28 %) out of 1,072 individuals that were examined and prevalence seems to increase with age (Table: 2 and 3). Lymphoedema was diagnosed in 33 (1.94 %) individuals with women accounting for 91.6% of the cases seen. The result revealed that Logo LGA had highest prevalence of infection though this was not statistically significant ($P > 0.05$) when compared with other LGAs. Grade 3 hydrocoele sizes were more common amongst older men, while grade 3 lymphoedema sizes showed no age – related pattern (Fig.2). The different grades of scrotal and limb swellings encountered during the study are shown in plates 1 and 2. The age bracket of 40 - 60 accounted for 79 % of individuals with either hydrocoele or lymphoedema (Table; 3). All cases of lymphoedema were unilateral with the right leg accounting for 67.0 % of affected limb. Interdigital bacterial and fungal infection was encountered in 38.0 % of people with lymphoedema. Pains, itching and crawling sensation were the usual accompanying complaints. Scarifications (razor cuttings) were frequently seen on affected legs, it was gathered that it was the common practice by traditional healers in an attempt to squeeze out accumulated fluid from the leg. Adults with cases of hydrocoele and lymphoedema were more willing to reveal and discuss their condition than the younger persons.

The outcome of the epidemiological studies in LGAs where all the three diagnostic procedures (ICT to detect circulating filarial antigen (CFA), the search for hydrocoele and lymphoedema) were used showed that Ado, Apa, Obi and Ushongo LGAs were most endemic for lymphatic filariasis considering the consistency of infection rates and the manifestations of the disease (Fig. 10). This observed

difference within the same bioenvironmental and ecological zone is epidemiologically significant.

3.1 Comparison of ICT, hydrocoele and lymphoedema prevalence.

The overall infection prevalence as detected by the ICT test (31.2 %) varied considerably from the actual number of persons with the manifestations of the lymphatic filariasis. The median age of those who were ICT positive was 39.7 years compared with those who had lymphoedema and hydrocoele whose median ages were 56.4 and 49.8 respectively. While ICT positivity increased rapidly for those within the age bracket of 15-39, the prevalence of hydrocoele was gradual amongst the elderly subjects (Fig. 10). The ICT rates compared with hydrocoele and lymphoedema rates fluctuated widely, correlation analysis showed a weak positive association between ICT rates and hydrocoele prevalence ($r = 0.367$, $P < 0.016$; Fig. 9, Table 10). On the other hand, correlation analysis showed a strong positive association between hydrocoele and lymphoedema rates ($r = 0.847$, $P < 0.207$; Fig. 9, Table 10). There was an observed decline in ICT positivity, hydrocoele and lymphoedema prevalence rates beyond the 50-59 age group.

Table 6: Prevalence of Lymphatic Filariasis Based on ICT Card Test according to Sex

	Male			Female			Total		
LGA	Number Examined	Number Positive	Percentage (%)	Number Examined	Number Positive	Percentage (%)	Number Examined	Number Positive	Percentage (%)
Ado	81	44	(61.7)	66	32	(48.5)	147	76	(55.8)
Apa	80	30	(37.5)	51	9	(17.6)	131	39	(29.8)
Gwer West	72	29	(40.3)	29	11	(37.9)	101	40	(39.6)
Obi	41	22	(53.6)	69	26	(37.7)	110	48	(43.6)
Ogbadibo	52	2	(3.84)	69	1	(1.45)	121	3	(2.47)
Okpokwu	52	10	(19.2)	43	7	(16.3)	95	17	(17.9)
Ushongo	75	19	(25.3)	76	22	(28.9)	151	41	(27.1)
Total	**453**	**156**	**(35.7)**	**403**	**108**	**(26.8)**	**856**	**264**	**(31.2)**

Table 7: Prevalence of Hydrocoele and Lymphoedema Among Subjects in the Study Area.

L.G.A	Number Examined	Number with Hydrocoele (%)	Number with lymphoedema (%)	Total (%)
Agatu	151	9 (5.96)	2 (1.32)	11 (7.28)
Ado	150	13 (8.66)	2 (1.33)	15 (10.00)
Apa	131	11 (8.39)	4 (3.05)	15 (11.45)
Oju	141	9 (6.38)	2 (1.42)	11 (7.80)
Obi	110	7 (6.36)	3 (2.72)	10 (9.09)
Ohimini	98	6 (6.12)	2 (2.4)	8 (8.16)
Logo	162	16 (9.87)	3 (1.85)	19 (11.73)
Kwande	210	11 (5.24)	3 (1.85)	14 (6.66)
Ushongo	151	8 (5.30)	3 (1.98)	11 (7.28)
Gwer west	101	3 (2.97)	2 (1.98)	5 (4.95)
Makurdi	81	4 (4.94)	1 (1.23)	5 (6.17)
Okpokwu	95	7 (7.37)	6 (6.31)	13 (13.68)
Ogbadibo	121	3 (2.48)	- (0.00)	3 (2.47)
Total	**1,702**	**107 (6.28)**	**33 (1.94)**	**140 (8.22)**

Table 8: Age-related Prevalence of Hydrocoele and Lymphoedema Among Subjects in the Study Area

	Male			**Female**			**Total**		
Age Group	Number Examined	Number with Hydrocoele	Number with Lymphoedema	Number Examined	Number with Hydrocoele	Number with Lymphoedema	Number Examined	Percentage with hydrocoele	Percentage with Lymphoedema
10-19	42	-	-	26	-	-	68	-	-
20-29	73	2	-	44	-	2	117	(1.71)	(1.71)
30-39	263	9	-	156	-	7	419	(2.15)	(1.67)
30-49	284	21	1	168	-	8	452	(4.64)	(1.99)
50-59	149	28	1	89	-	7	238	(11.76)	(3.36)
60-69	139	31	-	82	-	4	221	(14.03)	(1.81)
70-above	117	16	-	70	-	3	187	(8.55)	(1.60)
Total	**1067**	**107**	**2**	**635**	**-**	**31**	**1702**	**(6.28)**	**(1.94)**

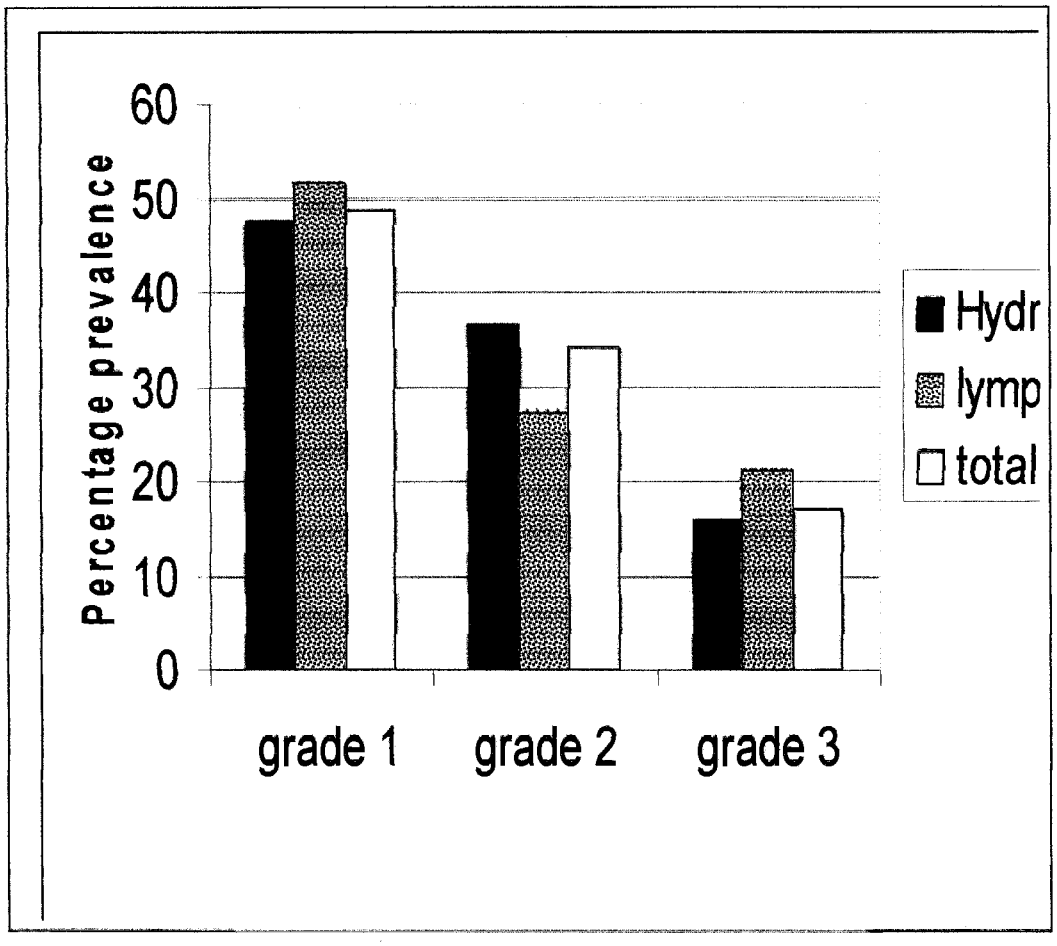


Fig 9: Severity of limb and scrotal swelling in patients with visible manifestations of lymphatic filariasis.

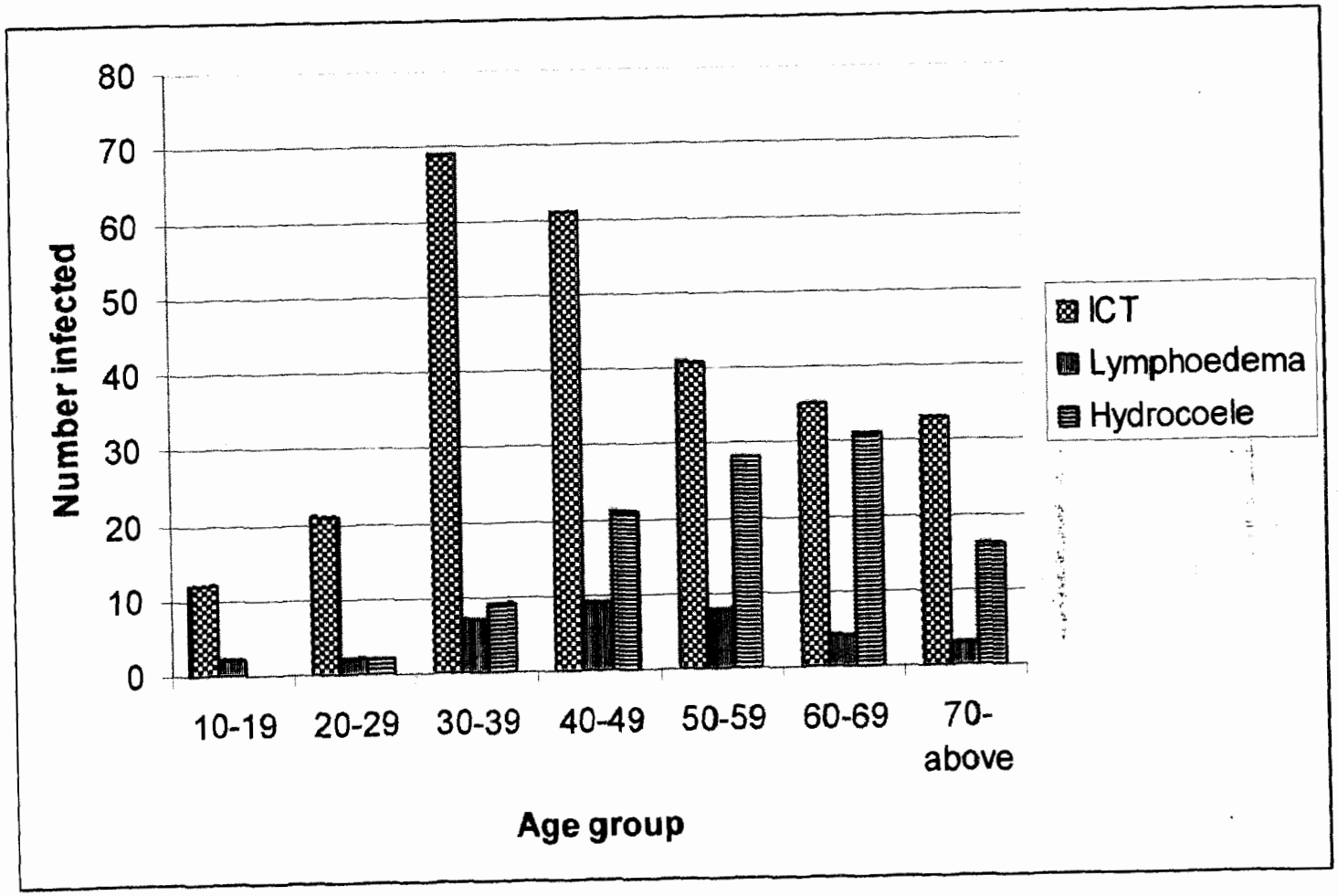


Fig. 10 : Age-specific comparison of ICT, hydrocoele and lymphoedema prevalence amongst study population.

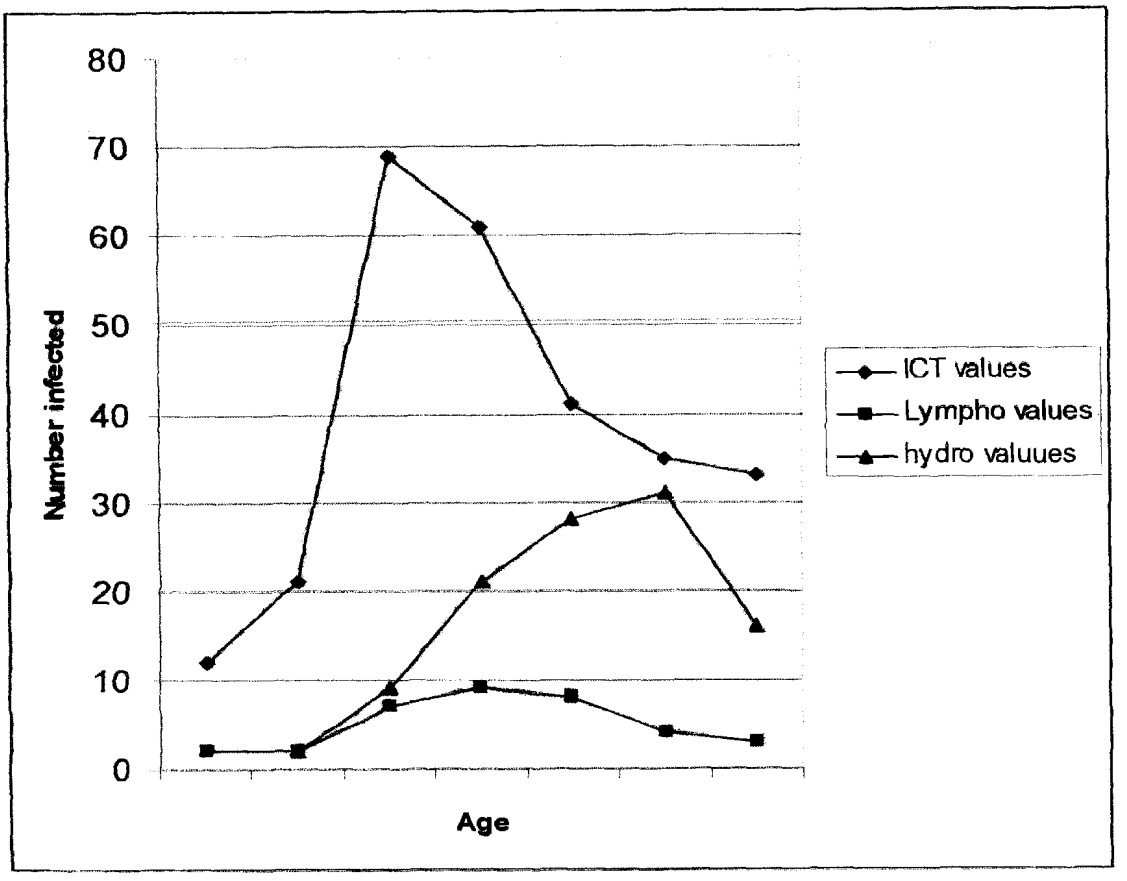


Fig.11: ICT positivity level in comparison to manifestations of lymphatic filariasis.

Table 9: Output of Pearson correlation analysis for different diagnostic procedures

		ICT Values	Hydrocoele Values	Lymphoedema Values
r = (Pearson correlation)	ICT Values	1.000	.367	.847*
	Hydrocoele Values	.367	1.000	.543
	Lymphoedema Val.	.847*	.543	1.000
P (Sig.2-tailed)	ICT Values	.	.418	.016
	Hydrocoele Values	.418	.	.207
	Lymphoedema Val.	.016	.207	.
N	ICT Values	7	7	7
	Hydrocoele Values	7	7	7
	Lymphoedema Val.	7	7	7

* Correlation significant at the 0.05 (2-tailed)

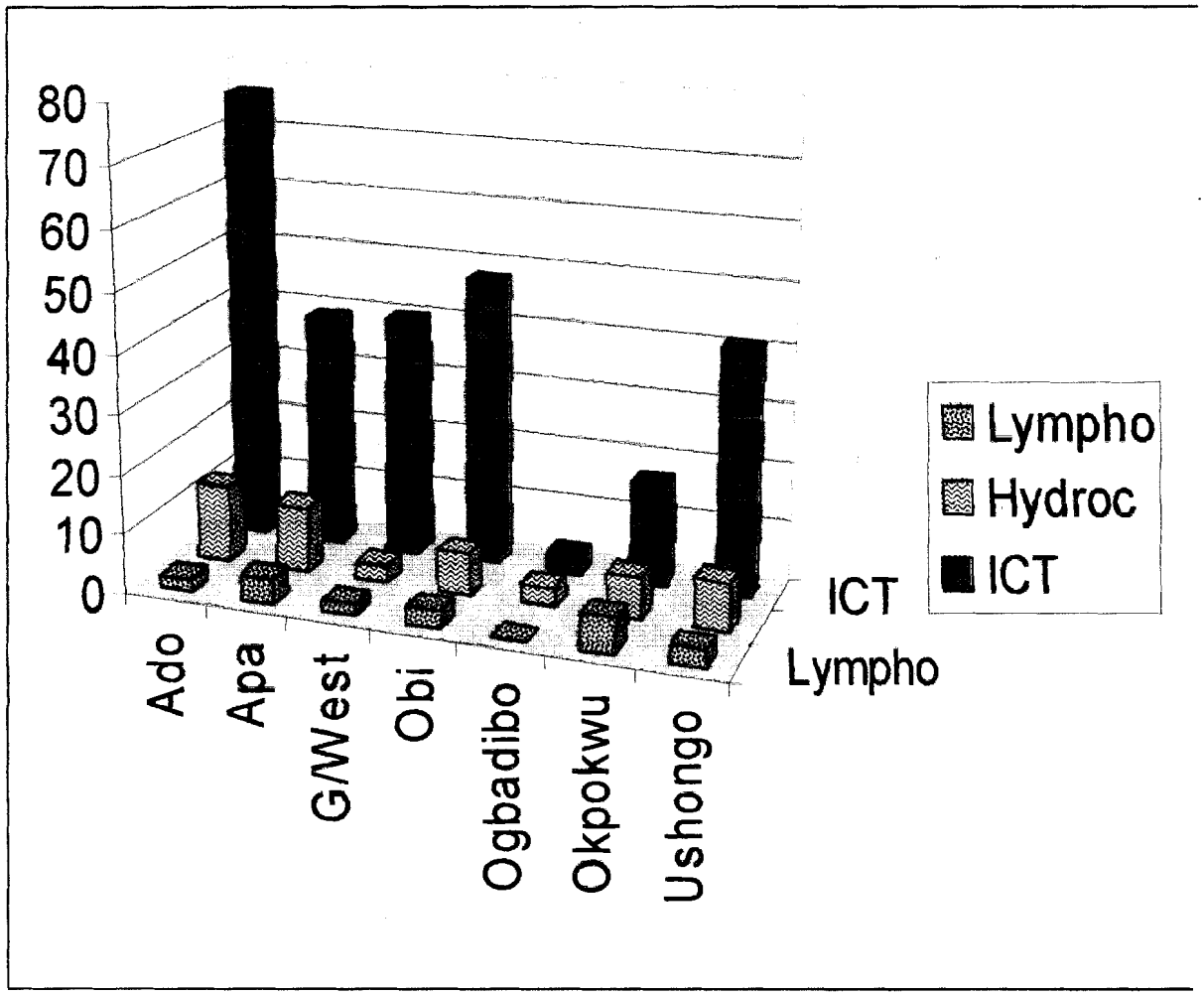


Fig. 12: Prevalence of Lymphoedema, hydrocoele and ICT rates in selected LGAs

Plate 1: Grade 1 lymphoedema in 45 years old woman in Okpokwu LGA

Plate 2: Grade 3 lymphoedema in 22 years old girl in Agatu LGA (front view)

Plate 3: Grade 2 lymphoedema in 55 years old woman in Apa LGA

Plate 4: Grade 2 lymphoedema in 55 years old woman in Apa LGA

Plate 5: Grade 2 lymphoedema in 61 years old woman in Apa LGA

Plate 6: Grade 2 lymphoedema in 55 years old woman in Apa LGA showing secondary interdigital fungal infection

Plate 7: Grade 3 lymphoedema in 22 years old girl in Agatu LGA (side view)

Plate 8: Grade 3 lymphoedema in 22 years old girl in Agatu LGA (back view)

Plate 9: Grade 3 lymphoedema in 38 years old women in Obi LGA (front view)

Plate 10: Grade 3 lymphoedema in 38 years old women in Obi LGA (back view)

Plate 11: Grade 3 lymphoedema in 38 years old women in Obi LGA (side view)

Plate 12: Grade 3 lymphoedema in 18 years old girl in Agatu LGA (siting position)

Plate 13: Grade 1 hydrocoele 38 years old man in Ushongo LGA (front view)

Plate 14: Grade 1 hydrocoele 41 years old man in Ado LGA (front view)

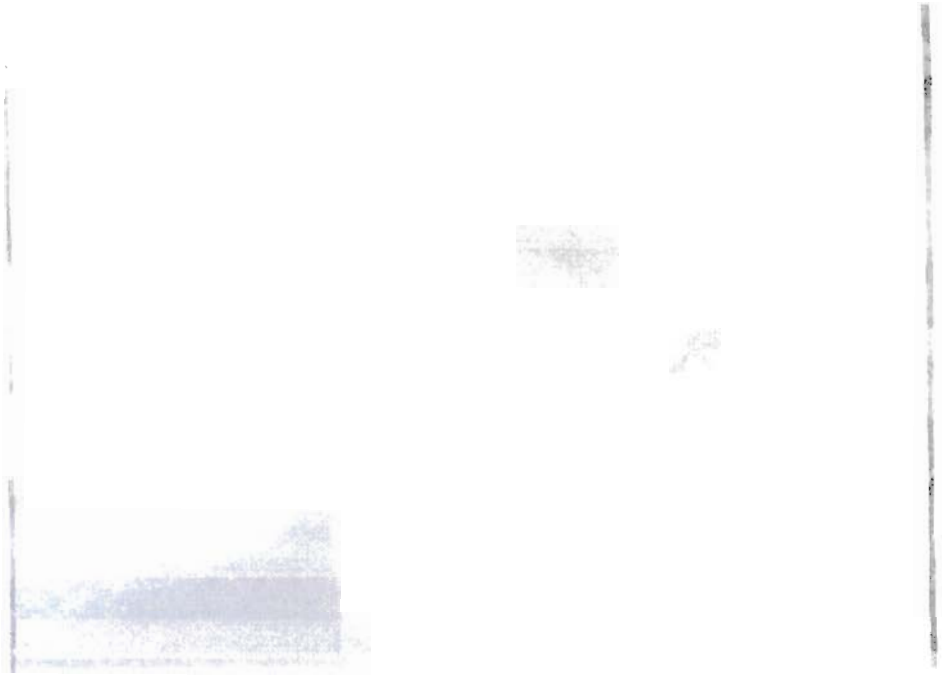


Plate 15. Grade 1 hydrocoele 24 years old man in Okpokwu LGA (front view)

Plate 16: Grade 2 hydrocoele 57 years old man in Ushongo LGA (side view)

Plate 17: Grade 1 hydrocoele 38 years old man in Ushongo LGA (front view)

Plate 18: Grade 3 hydrocoele 69 years old man in Ushongo LGA (front view)

Plate 19: Grade 3 hydrocoele 69 years old man in Ushongo LGA (front view)

Plate 20: Grade 3 hydrocoele 69 years old man in Ushongo LGA (side view)

Plate 21: Grade 3 hydrocoele 61 years old man in Ushongo LGA (side view)

Plate 22: Grade 3 hydrocoele 71 years old man in Agatu LGA (front view)

Plate 23: Grade 3 hydrocoele 69 years old man in Ushongo LGA (side view)

3.2. Knowledge, Attitude and Perception of Lymphatic Filariasis

The study population comprised of two groups, the respondents who had either hydrocoele or lymphoedema were grouped as affected persons, while those who had no visible clinical manifestations of the disease were grouped as unaffected persons. A total of 118 questionnaires were analysed from the affected persons comprising of 78 (66.1%) males and 40 (33.9%) female. The unaffected respondents were 1,610 comprising 772 (47.9%) Tivs, 597 (37.0%) Idomas and 214 (14.9%) Igedes. The male respondents were 1,014 (62.9%) while the female respondents were 596 (37.1%). Most respondents (69.9%) were agricultural workers and have resided within the study communities for over 10 years. Self-reported age of respondents ranged from 16 – 91 years. The analysis was were based on the overall respondents' knowledge, belief and perception on lymphatic filariasis cause, signs and symptoms, mode of transmission, prevention, health seeking behaviour, socio-economic impact and matrimonial consequences.

3.2.1 Perceived Causes of Lymphatic Filariasis

The Benue people have developed through many years of exposure to lymphatic filariasis and its representation in traditional folklores, a system of belief, perception and practices surrounding the disease. The knowledge about the causes of lymphatic filariasis was highly influenced by socio-cultural experiences that differ from one locality to another. On the whole, the cause of the disease was attributed to supernatural and hygienic issues with only 41.3% of unaffected respondents identifying mosquitoes as the cause of the disease (Table 10a). There was a significant difference in the ethnic perception of causes, with 61.8% of the Igede ethnic group attributing the cause of the disease to stepping of charm compared to

47.1% and 36.8% of the Tiv and Idoma groups respectively (x^2 = 6.71, df = 2, P < 0.05). It was also significant that only 19.5% of the Igede population correctly ticked mosquitoes as the cause of the diseases compared to 36.2% and 56.6% of the Tiv and Idoma people respectively (Table 10a).

Sex-related comparison of knowledge on causes of lymphatic filariasis showed no significant gender differences (P>0.05). However, the female respondents were slightly more superstitious than their male counterpart with 29.2% of female respondents attributing the causes of the disease to sexual activities compare to 26.3% of male, while 43.9% of female respondents ascribing the cause of the disease to stepping on charms compared to 38.9% of male respondents (Table 10b).

The comparison of the knowledge on causes of lymphatic filariasis between the affected and unaffected respondents revealed that those with clinical manifestations of the disease where more knowledgeable that the unaffected respondents. While 45.5% of the unaffected respondents attributed the cause of the disease to stepping on charms, only 39.8% of the affected respondents thought likewise (x^2 = 3.91, df = 1, P<0.05) (Table 10c). It is however important to observe that a significant proportion of people with disease do not know the scientifically correct cause of their condition, with only 44.0% identifying mosquitoes and 37.3%, 39.8% and 44.9% blaming working in the sun, walking long distances and lack of personal hygiene respectively for their illness (Table 10c).

The respondents' educational status did not significantly influence their knowledge on the true causes of lymphatic filariasis. However, respondents with at least primary education had better understanding of disease etiology. While only 32.7% of respondents without any education identified mosquitoes as the cause of the disease compared to 51.6% of respondents with primary education (Table 10d). On

the other hand, while 49.0% of respondents without any education indicated that stepping on charm is a cause of lymphatic filariasis, 51.6% of those with primary education also indicated the same. This is an indication of the conflict of scientific knowledge and traditional beliefs. Respondents that are civil servants, were more knowledgeable than their counterparts in the other professions (Farming, students and business men and women. 55.0% of civil servants correctly identified mosquitoes as cause of the disease compared with 35.6%), 39.8% and 38.8% of farmers, students and business people respectively (Table 10e).

Table 10a: Respondents' knowledge on causes of lymphatic filariasis

	Tiv (n=772)		Idoma(n=597)		Igede (n=241)		Total (n=1610)	
Causes	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Working in the sun	232	(30.0)	168	(28.1)	45	(18.6)	445	(27.6)
Walking long distance	279	(36.1)	200	(33.5)	84	(84.8)	563	(34.9)
Sexual intercourse	246	(31.8)	223	(37.3)	39	(16.2)	508	(31.5)
Stepping on charm	364	(37.1)	220	(36.8)	149	(61.8)	733	(45.5)
Contaminated food	241	(31.2)	216	(36.2)	39	(16.2)	496	(30.8)
Lack of personal hygiene	300	(38.8)	321	(53.7)	123	(51.0)	744	(46.6)
Fever	375	(48.5)	161	(26.9)	82	(13.3)	568	(35.2)
Mosquito bite	280	(36.2)	338	(56.6)	47	(19.5)	665	(41.3)

Table 10b: Sex-related knowledge on causes of lymphatic filariasis

	Male (n=1014)		Female (n=596)		Total (n=1610)	
Causes	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Working in the sun	260	(25.6)	147	(24.6)	407	(25.2)
Walking long distance	131	(30.8)	179	(30.0)	492	(30.5)
Sexual intercourse	267	(26.3)	174	(29.2)	441	(27.4)
Stepping on charm	395	(38.9)	262	(43.9)	657	(40.8)
Contaminated food	286	(28.2)	145	(24.3)	431	(26.7)
Lack of personal hygiene	418	(41.2)	235	(39.4)	653	(40.5)
Fever	309	(30.4)	191	(32.0)	500	(31.0)
Mosquito bite	369	(36.4)	213	(35.7)	582	(36.1)

Table 10c: Comparison of perceived causes of lymphatic filariasis by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Causes	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Working in the sun	44	(37.3)	445	(27.6)	489	(28.3)
Walking long distance	47	(39.8)	563	(34.9)	610	(35.3)
Sexual intercourse	32	(27.1)	508	(31.5)	540	(31.5)
Stepping on charm	47	(39.8)	733	(45.5)	780	(41.1)
Contaminated food	34	(38.8)	496	(30.8)	530	(30.6)
Lack of personal hygiene	53	(44.9)	744	(46.2)	797	(46.1)
Fever	51	(43.2)	568	(35.3)	619	(35.8)
Mosquito bite	52	(44.0)	665	(41.3)	717	(41.5)

Table 10d: Comparison of perceived causes of lymphatic based on the educational status of respondents.

Causes	No education n = 569 yes (%)	Primary n = 300 yes (%)	SSS n = 514 yes (%)	Tertiary n = 227 yes (%)
Working in the sun	154 (27.0)	105 (35.0)	138 (26.8)	34 (14.9)
Walking long distance	199 (34.9	151 (50.3)	153 (29.7)	40 (17.6)
Sexual intercourse	152 (26.7)	153 (51.0)	150 (29.2)	41 (18.1)
Stepping on charm	279 (49.0)	155 (51.60	195 (40.0)	74 (32.6)
Contaminated food	150 (26.3)	152 (50.6)	134 (26.1)	43 (18.9)
Lack of personal hygiene	227 (39.9)	186 (62.0)	200 (40.0)	110 (48.4)
Fever	178 (31.3)	122 (40.6)	177 (34.4)	67 (29.5)
Mosquito bite	186 (32.7)	155 (51.6)	188 (36.5)	109 (48.0)

Table 10e: Comparison of perceived causes of lymphatic based on the occupation of respondents.

.Causes	farmers n = 573 yes (%)	Civil servants n = 229 yes (%)	students n = 628 yes (%)	business n = 180 yes (%)
Working in the sun	114 (19.9)	32 (13.9)	242 (38.5)	45 (25.0)
Walking long distance	207 (36.1)	52 (22.7)	228 (36.3)	64 (35.5)
Sexual intercourse	146 (25.4)	45 (19.6)	244 (38.8)	55 (30.5)
Stepping on charm	272 (47.4)	80 (34.9)	261 (41.5)	103 (57.2)
Contaminated food	167 (29.1)	45 (18.6)	225 (35.8)	45 (25.0)
Lack of personal hygiene	236 (41.2)	105 (45.8)	284 (46.8)	90 (50.0)
Fever	167 (29.1)	67 (29.2)	267 (42.5)	49 (27.2)
Mosquito bite	204 (35.6)	126 (55.0)	250 (39.8)	70 (38.8)

3.2.2 Perceived mode of Transmission of Lymphatic Filariasis

The respondents' perception on the mode of transmission of lymphatic filariasis though not scientifically correct in most instances yet follows a logical interpretation of their knowledge on the causes of the disease. The disease is not considered contagious especially amongst the Igede ethnic group, with only 14.1% believing that the disease could be passed from one person to another compared to 44.1% and 35.8% of Tiv and Idoma ethnic groups respectively (X^2 = 4.71, df = 2, P<0.05). Sex-related comparison of whether the disease can be passed on to another again showed no gender difference. There was also no significant difference between affected and unaffected respondents on the contagious nature of the disease.

Witchcraft, food poisoning and stepping on charm were generally considered as means through which one could contract the disease from an infected individual. However, majority of the respondents do not subscribe to these thought. (Table 11a). Ethnic comparison of knowledge of mode of transmission showed that only 18.2% of the Igede respondents correctly identified mosquitoes as the vector of the disease compared to 40.8% and 51.1% of Tiv and Idoma groups respectively (x^2 = 7.01, df = 2, P<0.05). Sex-based comparison of knowledge on the mode of transmission of lymphatic filariasis showed no significant gender variation (Table 11b). Affected and unaffected respondents also show no significant difference in their perception on how the disease is transmitted (Table 11c). The educational status of respondents did not significantly influence their knowledge on the transmission of infection (Table 11d). On the other hand, civil servants and students demonstrated better understanding on the transmission of lymphatic filariasis. 48.4% of civil servants identified mosquito bites as route of transmission compared to only 36.3% of farmers (Table 11e).

Table 11a: Respondents' knowledge on mode of transmission of lymphatic filariasis

	Tiv (n=772)		Idoma(n=597)		Igede (n=241		Total (n=1610)	
Mode of Transmission	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Sexual intercourse with infected person.	203	(26.3)	191	(31.9)	26	(10.8)	420	(26.1)
Body contact	191	(24.7)	137	(22.9)	24	(10.0)	352	(21.8)
Witchcraft	283	(36.6)	158	(26.4)	116	(48.1)	557	(34.6)
Food poisoning	292	(37.8)	185	(30.9)	36	(14.9)	513	(31.8)
Mosquito bites	319	(40.8)	305	(51.1)	44	(18.2)	664	(41.2)
Stepping on charms	306	(39.6)	147	(24.6)	112	(46.4)	565	(35.1)

Table 11b: Sex-related knowledge on mode of transmission of lymphatic filariasis

	Male (n=1014)		Female (n=596)		Total (n=1610)	
Mode of Transmission	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Sexual intercourse with infected person.	245	(24.1)	120	(20.1)	365	(22.6)
Body contact	205	(20.2)	108	(18.1)	313	(19.4)
Witchcraft	320	(31.5)	178	(29.8)	498	(30.9)
Food poisoning	299	(29.5)	148	(24.8)	447	(27.7)
Mosquito bites	383	(37.7)	204	(34.2)	587	(36.4)
Stepping on charms	320	(31.5)	189	(31.7)	509	(31.6)

Table 11c: Comparison of mode of transmission of lymphatic filariasis by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Mode of Transmission	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Sexual intercourse with infected person.	36	(30.5)	420	(26.1)	456	(26.4)
Body contact	39	(33.0)	352	(21.8)	391	(22.6)
Witchcraft	42	(35.6)	557	(34.6)	599	(34.6)
Food poisoning	41	(34.7)	513	(31.8)	554	(32.0)
Mosquito bites	49	(41.5)	663	(41.2)	712	(41.2)
Stepping on charms	45	(38.1)	565	(35.1)	608	(35.2)

Table 11d: Comparison of perceived mode of transmission of lymphatic based on the educational status of respondents.

Mode of transmission	No education n = 569 yes (%)	Primary n = 300 yes (%)	SSS n = 514 yes (%)	Tertiary n = 227 yes (%)
Sexual intercourse with infected person	125 (21.9)	124 (41.3)	124 (24.1)	34 (14.9)
Body contact	122 (21.4)	106 (35.3)	96 (18.6)	22 (9.7)
Witchcraft	220 (38.6)	126 (42.0)	128 (24.9)	57 (25.1)
Food poisoning	161 (28.3)	140 (46.6)	143 (27.9)	51 (22.4)
Mosquito bites	194 (34.1)	149 (49.6)	195 (40.0)	100 (44.0)
Stepping on charms	204 (35.8)	120 (40.0)	143 (27.8)	77 (33.9)

Table 11e: Comparison of perceived mode of transmission of lymphatic based on the occupation of respondents.

Mode of transmission	farmers n = 569 yes (%)	Civil servants n = 300 yes (%)	Students n = 514 yes (%)	Business n = 227 yes (%)
Sexual intercourse with infected person	125 (2189)	35 (15.3)	211 (3.6)	36 (20.0)
Body contact	111 (19.3)	24 (10.5)	184 (29.3)	24 (13.3)
Witchcraft	207 (36.1)	56 (24.4)	213 (33.9)	68 (37.7)
Food poisoning	163 (28.4)	56 (24.4)	227 (36.1)	51 (28.3)
Mosquito bites	208 (36.3)	111 (48.40	259 (41.2)	62 (34.4)
Stepping on charms	200 (34.9)	59 (27.5)	235 (37.4)	57 (31.6)

3.2.3 Perceptions of Lymphatic Filariasis Prevention

The respondents' perception on prevention is highly influenced by the prevailing knowledge on causation and transmission, though some of these may not be scientifically correct yet it follow logical interpretation of perceived causes and avoidance of the perceived mode of transmission. While 51.0% of Tiv and 48.9% of Idoma respondents are of the opinion that the disease can be prevented, only 16.2% of Igede respondents thought so. Adhering to good personal and community hygiene standards and avoidance of mosquito bite were generally seen as preventive measures. There was however, an ethnic variance in respondents' perception of avoiding mosquito bites. Only 22.4% of Igede respondents thought that avoiding mosquito bites was a means of preventing the disease compared to 42.7% and 57.9% of Tiv and Idoma ethnic groups respectively (Table 12a). This difference was statistically significant ($x^2 = 6.17$, df = 2, $P<0.05$).

Sex-related beliefs on prevention of lymphatic filariasis shows that though the male respondents were more knowledgeable on the true means of prevention, with

41.9% of males compared to 37.7% of female ticking avoidance of mosquito bites option, this was however not statically significant (P>0.05) (table 12b). There was a relatively high awareness on other mentioned preventive measures that could lead to stigmatization of patients with hydrocoele and lymphoedema. Over 75% of all respondents were aware that lymphatic filariasis cannot be prevented by avoiding sexual, and/or body contact, eating with infected persons nor making sacrifice to appease gods (Table 12b). People affected with lymphatic filariasis again were consistently more knowledgeable on how to correctly prevent the disease than the unaffected respondents. While 53.4% of affected respondents correctly identified avoidance of mosquito bites, only 45.3% of unaffected shared that opinion (Table 12c), this difference was however, not statistically significant (P>0.05).

More of the respondents with at least primary school education were able to cite protection from mosquito bites as prevention from lymphatic filariasis. This difference when compared with respondents with no education was statistically significant ($X^2 = 7.09$, df = 1, $P < 0.05$) (Table 12d). Occupational differences in respondents' knowledge and perception of lymphatic filariasis prevention corroborates their response on cause ad transmission (Table 12e). The general belief that improved personal hygiene is a means of protection from the lymphatic filariasis cuts across all classes of respondents (Table 10d, 10e, 12d, and 12e).

Table 12a: Respondents belief on prevention of lymphatic filariasis

	Tiv (n=772)		Idoma (n=597)		Igede (n=241)		Total (n=1610)	
Prevention	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Avoiding sexual contact with affected person.	200	(25.9)	215	(30.6)	39	(16.2)	454	(28.2)
Avoiding body contact	174	(22.5)	153	(25.6)	37	(15.3)	364	(22.6)
Sacrifice to appease gods	268	(34.7)	84	(14.0)	38	(15.7)	390	(24.2)
Good personal hygiene	337	(43.6)	300	(50.2)	125	(51.8)	762	(47.3)
Avoid mosquito bites	330	(42.7)	346	(57.9)	54	(22.4)	730	(45.3)
Avoid eating with infected person.	204	(26.4)	140	(23.4)	26	(10.7)	370	(22.9)

Table 12b: Sex-related belief on prevention of lymphatic filariasis

	Male (n=1014)		Female (n=596)		Total (n=1610)	
Prevention	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Avoiding sexual contact with affected person.	273	(29.6)	130	(21.8)	403	(25.0)
Avoiding body contact	225	(22.2)	97	(16.2)	322	(20.0)
Sacrifice to appease gods	227	(22.4)	128	(21.4)	355	(22.0)
Good personal hygiene	468	(46.1)	212	(35.5)	680	(42.2)
Avoid mosquito bites	425	(41.9)	225	(37.7)	650	(40.3)
Avoid eating with infected person.	226	(22.3)	110	(18.4)	336	(20.8)

Table 12c:Comparison of perceived ways preventing lymphatic filariasis by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Prevention	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Avoiding sexual contact with affected person.	41	(34.7)	454	(28.2)	495	(28.6)
Avoiding body contact	43	(36.4)	364	(22.6)	407	(23.5)
Sacrifice to appease gods	31	(26.2)	390	(24.2)	421	(24.3)
Good personal hygiene	56	(47.4)	762	(47.3)	818	(47.3)
Avoid mosquito bites	63	(53.4)	730	(45.3)	793	(45.9)
Avoid eating with infected person.	37	(31.3)	370	(23.0)	407	(23.5)

Table 12d: Comparison of respondents' beliefs on prevention of lymphatic based on their educational status.

Prevention	No education n = 569 yes (%)	Primary n = 300 yes (%)	SSS n = 514 yes (%)	Tertiary n = 227 yes (%)
Avoiding sexual contact with affected person	137 (24.0)	124 (41.3)	127 (24.7)	51 (22.4)
Avoiding body contact	122 (21.4)	105 (35.0)	88 (17.1)	38 (16.7)
Sacrifice to appease gods	150 (26.3)	86 (28.6)	107 (20.8)	31 (13.6)
Good personal hygiene	230 (40.4)	184 (61.3)	202 (39.3)	111 (48.9)
Avoid mosquito bites	209 (36.7)	152 (50.6)	223 (43.4)	112 (49.3)
Avoid eating with infected person	116 (20.3)	103 (34.3)	109 (21.2)	29 912.3)

Table 12e: Comparison of respondents' beliefs on prevention of lymphatic based on their occupation.

Prevention	Farmers n = 573 yes (%)	Civil servants n = 229 yes (%)	Students n = 628 yes (%)	Business n = 180 yes (%)
Avoiding sexual contact with affected person	136 (23.7)	46 (20.1)	210 (33.4)	47 (26.1)
Avoiding body contact	108 (18.8)	37 (16.1)	172 (27.4)	35 (19.4)
Sacrifice to appease gods	111 (19.3)	26 (11.3)	206 (32.8)	33 (18.3)
Good personal hygiene	243 (42.4)	117 (51.1)	271 (43.1)	105 (58.3)
Avoid mosquito bites	237 (41.3)	127 (55.4)	269 (42.8)	72 (40.0)
Avoid eating with infected person	90 (15.7)	30 (13.1)	196 (31.2)	39 (21.6)

3.2.4 Beliefs on the Socio-economic and Psychological Consequences of Lymphatic Filariasis

The economic burden of lymphatic filariasis can be categorized in terms of loss of work, absenteeism from work and cost of treatment. Loss of productivity of infected individuals reduces the overall community productivity and exacerbates local socio-economic conditions. Consequently, respondents demonstrated relatively high awareness of the socio-economic implications of the disease (Table 13a, 13b). There was no significant difference in the ethnic and gender perception of the socio-economic consequences of lymphatic filariasis ($P>0.05$). There were however, areas of differences in perception between affected and unaffected respondents. While 63.6% and 68.6% of unaffected respondents were of the belief that the disease could result to loss of source of income and absenteeism from work compared 38.1% and 32.2% by affected respondents respectively (Table 13c). These differences were statically significant ($P<0.05$).

Respondent's educational status and occupation did not influence their knowledge on perceived socio-economic and psychological consequences of lymphatic filariasis (Table 13d, 13e). it is however important note that only 29.7% of respondents with no education were of the opinion that the disease could lead to absenteeism from school and work, this opinion is also held by farmers, only 24.2% of farmers thought that the disease should prevent schooling or work.

Table 13a: Respondents perception on socio-economic and psychological consequences of lymphatic filariasis.

	Tiv (n=772)		Idoma(n=592)		Igede(n=241)		Total (n=1610)	
Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder daily income	428	(55.4)	365	(61.1)	82	(34.0)	875	(54.3)
Loss of source of income	435	(56.3)	424	(71.0)	165	(68.4)	1024	(63.6)
Absenteeism from work/school	438	(56.7)	447	(74.8)	220	(91.3)	1105	(68.6)
Increase spending on health	416	(53.8)	419	(70.2)	187	(77.6)	1022	(63.4)
Increase dependence on others for care.	336	(43.5)	458	(76.7)	144	(59.7)	938	(58.2)
Avoid social gathering	268	(34.7)	328	(54.9)	119	(49.3)	715	(44.4)
Loss of self-esteem.	387	(50.1)	447	(74.8)	92	(38.2)	926	(57.5)

Table 13b: Sex-related perception on socio-economic consequences of lymphatic filariasis

	Male (n=1014)		Female (n=596)		Total (n=1610)	
Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder daily income	496	(48.9)	277	(46.4)	773	(48.0)
Loss of source of income	569	(56.1)	326	(54.7)	895	(55.6)
Absenteeism from work/school	633	(62.4)	344	(57.7)	977	(60.6)
Increase spending on health	556	(54.8)	339	(56.8)	895	(55.6)
Increase dependence on others for care.	612	(60.3)	318	(53.3)	930	(57.7)
Avoid social gathering	651	(64.2)	327	(54.0)	973	(60.4)
Loss of self-esteem.	695	(68.5)	404	(67.7)	1099	(68.2)

Table 13c: Comparison perceived socio-economic consequences of lf by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder daily income	71	(60.1)	1204	(74.8)	1275	(73.7)
Loss of source of income	45	(38.1)	1024	(63.6)	1069	(61.8)
Absenteeism from work/school	38	(32.2)	1105	(68.6)	1143	(66.1)
Increase spending on health	71	(60.1)	1022	(63.4)	1093	(63.2)
Increase dependence on others for care.	64	(54.2)	1042	(64.7)	1106	(64.0)
Avoid social gathering	83	(70.3)	1364	(84.7)	1447	(83.7)
Loss of self-esteem.	91	(77.1)	1232	(76.5)	1323	(76.5)

Table 13d: Comparison of perceived socio-economic and psychological consequences of lymphatic filariasis based on educational status of respondents.

Consequences	No education $n = 569$ yes (%)	Primary $n = 300$ yes (%)	SSS $n = 514$ yes (%)	Tertiary $n = 227$ yes (%)
Hinder daily income	251 (44.1)	171(57.0)	311 (60.5)	110 (48.4)
Loss of source of income	317 (55.7)	189 (63.0)	314 (61.1)	157 (69.1)
Absenteeism from work/school	169 (29.7)	139 (46.3)	254 (49.4)	99 (43.6)
Increase spending on health	261 (45.8)	127 (42.3)	319 (62.0)	129 (56.8)
Increase dependence on others for care	195 (34.2)	118 (39.3)	292 (56.8)	102 (44.9)
Avoid social gathering	234 (41.1)	156 (52.0)	232 (45.1)	117 (51.5)
Loss of self esteem	200 (35.1)	166 (55.3)	205 (40.0)	115 (50.6)

Table 13e: Comparison of perceived socio-economic and psychological consequences of lymphatic filariasis based on respondents of occupation.

Consequences	farmers $n = 573$ yes (%)	Civil servants n = 229 yes (%)	Students $n = 628$ yes (%)	Business $n = 180$ yes (%)
Hinder daily income	287 (50.1)	117 (51.1)	353 (56.2)	77 (42.7)
Loss of source of income	312 (54.4)	107 (46.7)	227 (52.0)	91 (50.5)
Absenteeism from work/school	139 (24.2)	99 (43.2)	357 (56.8)	62 (34.4)
Increase spending on health	279 (48.7)	201 (87.7)	361 (57.5)	103 (57.2)
Increase dependence on others for care	314 (54.8)	111 (48.4)	371 (59.0)	89 (49.4)
Avoid social gathering	305 (53.2)	122 (53.2)	235 (37.4)	88 (48.8)
Loss of self esteem	234 (40.8)	69 (30.1)	167 (26.6)	49 (27.2)

3.2.5 Beliefs on the consequences of lymphatic filariasis on family and marriage

In the past, little attention has been paid to the important, but hidden, disability associated with the genital manifestations of lymphatic filariasis especially that of sexual disability. The study population demonstrated high level of awareness on the consequences of the disease on family, marriage and sexual dysfunction (Table 14a). The overall percentage scores of the listed consequences were high with difficulty in sexual relation with spouse (74.8) and difficulty in finding spouse (73.1%) being highest. There was no significant difference in the ethnic and gender perception of the consequences of the disease on matrimonial harmony (Table 14a, 14b). The perceived consequences of lymphatic filariasis by those who do not have the visible signs of the disease were different from those who were affected. While the unaffected respondents thought that the disease could lead to spouse desertion (53.85), suspicion of infidelity (43.4%), and divorce (54.1%), the affected respondents

rated these low in their experience (Table 14c). On the other hand while 49.1% of affected respondents were of the opinion that marriage prospects of family members is hinder, only 21.2% of the unaffected respondents shared that belief. These differences in perceived consequences and impact of lymphatic filariasis on marriage and family were significant ($P<0.05$).

Respondents without education generally did not place a lot of importance on marriage and matrimonial consequences of lymphatic filariasis. Their responses were consistently lower when compared with those who had at least primary education (Table 14d). Fewer students also were of the opinion that the disease could lead to spouse desertion, suspicion of infidelity, divorce and hinder sexual activities (Table 14e). When compared with other occupations like farmers and civil servants, these differences were statistically significant ($X^2 = 7.71$, $df = 2$, $P < 0.05$).

Table 14a: Respondents perception on the consequences of lymphatic filariasis on marriage

	Tiv (n=772)		Idoma (n=592)		Igede (n=241)		Total (n=1610)	
Matrimonial Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder marriage prospects of family members	413	(53.5)	371	(62.1)	131	(54.3)	915	(56.8)
Spouse desertion	407	(52.7)	311	(52.1)	181	(75.1)	899	(55.8)
Suspicion of infidelity	567	(73.4)	411	(68.8)	177	(73.4)	1095	(68.0)
Couple may divorce	461	(59.7)	409	(68.5)	108	(44.8)	978	(60.7)
Affect sexual relation with spouse	541	(70.0)	471	(78.9)	193	(80.0)	1208	(74.8)
Difficult to find a spouse	553	(71.6)	437	(73.2)	187	(77.6)	1177	(73.1)

Table 14b: Sex-related perception on marriage consequences of lymphatic filariasis

	Male (n=1014)		Female (n=596)		Total (n=1610)	
Matrimonial Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder marriage prospects of family members	615	(60.6)	311	(52.2)	926	(57.5)
Spouse desertion	701	(69.1)	472	(79.2)	1173	(72.8)
Suspicion of infidelity	819	(80.7)	431	(72.3)	1250	(77.6)
Couple may divorce	757	(74.6)	398	(66.7)	1155	(71.7)
Affect sexual relation with spouse	879	(86.7)	441	(74.0)	1320	(81.9)
Difficult to find a spouse	837	(82.5)	418	(70.1)	1255	(77.9)

Table 14c: Comparison of perceived consequences of lymphatic filariasis on marriage by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Matrimonial Consequences	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Hinder marriage prospects of family members	58	(49.1)	341	(21.2)	399	(23.1)
Spouse desertion	28	(23.7)	866	(53.8)	894	(51.7)
Suspicion of infidelity	34	(28.8)	699	(43.4)	733	(42.4)
Couple may divorce	29	(21.2)	855	(53.1)	880	(50.9)
Affect sexual relation with spouse	70	(59.3)	780	(48.4)	850	(49.2)
Difficult to find a spouse	58	(49.1)	1220	(75.7)	1278	(73.9)

Table 14d: Comparison of perceived consequences of lymphatic filariasis on marriage based on respondents' educational status.

Matrimonial consequences	No education n = 569 yes (%)	Primary n = 300 yes (%)	SSS n = 514 yes (%)	Tertiary n = 227 yes (%)
Hinder marriage prospects of family members	145 (25.5)	134 (44.6)	156 (30.3)	77 (33.9)
Spouse desertion	200 (35.1)	166 (55.3)	205 (39.9)	115 (50.6)
Suspicion of infidelity	211 (37.1)	147 (49.0)	204 (39.7)	81 (35.7)
Couple may divorce	131 (23.0)	92 (30.6)	189 (36.7)	72 (31.7)
Affect sexual relation with spouse	134 (25.1)	147 (49.0)	127 (24.7)	99 (43.6)
Difficult to find spouse	251 (44.1)	152 (50.6)	200 (38.9)	103 (45.4)

Table 14e: Comparison of perceived consequences of lymphatic filariasis on marriage based on respondents' occupation.

Matrimonial consequences	Farmers n = 573 yes (%)	Civil servants n = 229 yes (%)	Students n = 628 yes (%)	Business n = 180 yes (%)
Hinder marriage prospects of family members	234 (40.8)	69 (30.1)	167 (26.6)	49 (27.2)
Spouse desertion	302 (52.7)	126 (55.0)	191 (30.4)	78 (34.3)
Suspicion of infidelity	191 (33.3)	71 (31.0)	121 (19.2)	53 (29.4)
Couple may divorce	173 (30.2)	53 (23.1)	107 (17.0)	47 (26.1)
Affect sexual relation with spouse	253 (44.1)	106 (46.3)	103 (16.4)	66 (36.6)
Difficult to find spouse	271 (47.3)	121 (52.8)	291 (46.3)	83 (46.1)

3.2.6 Severity of Signs, Symptoms and Health Seeking Practices

The most distressing aspect of lymphatic filariasis is the attack of acute adenolymphangitis (ADL), which cause considerable short-term and also long-term disability by worsening the lymphoedema and hydrocoele. The severity of these series of signs and symptoms collectively known as adenolymphangitis influence the choice of health providers to patronize. Both affected and unaffected respondents were aware of seriousness of these lymphatic filariasis – related manifestations (Table 15). There were few areas where the perceptions of affected and unaffected respondents varied, for instance, while 59.5% of unaffected respondents thought that the functional impairment and incapacitation associated with the disease is severe, only 33.9% of those who had the disease thought likewise. An overall comparative appraisal showed no significant difference in the perception of signs and symptoms by both affected and unaffected respondents.

The matrix ranking of available lymphatic filariasis health providers against listed comparison factors showed an overwhelming preference for traditional medicine over the modern practitioners. The cost of treatment and healers' reputation were considered as important factors to consider in deciding which health provider to patronize (Table 16a, 16b). 40.5% of all respondents were of the opinion that people affected with the disease spend between N1, 000 – N2, 000 monthly and lymphatic filariasis – related health care. Only 22.4% of respondents thought that affected persons spent less than N500 monthly on health care.

Table 15: Comparison of seriousness/severity lymphatic filariasis sign and symptom by affected and unaffected respondents.

	Affected (n=118)		Unaffected (n=1610)		Total (n=1729)	
Signs and Symptoms	**Yes**	**(%)**	**Yes**	**(%)**	**Yes**	**(%)**
Fever	60	(50.8)	938	(58.2)	998	(57.7)
Chills	44	(37.3)	999	(62.0)	1043	(60.3)
Pain	78	(66.1)	1164	(72.3)	1242	(71.8)
Swelling	111	(94.0)	1233	(82.1)	1433	(82.9)
Functional impairment	40	(33.9)	959	(59.5)	999	(57.8)
Appearance	78	(66.1)	1129	(70.1)	1207	(69.8)
Physical discomfort	66	(55.9)	1134	(70.4)	1200	(69.4)

Table 16a: Matrix ranking of sources of lymphatic filariasis related health providers by unaffected person

Comparison Factors	**Drug store**	**Primary Health Centre**	**General Hospital**	**Private hospital**	**Traditional healers.**
Convenience	+++	+++	++	+	++++
Affordability (cost of treatment)	+++	++++	++	+	+++++
Family choice	+	+++	+++++	++	++++
Providers reputation	+	++	++++	+++	+++++
Confidentiality	+++	++	+	+++	+++++
Proximity to residence	++++	+++	+	++	+++
Efficacy of treatment	++	+	+++++	++++	+++++

+ = lowest, +++++ = highest.

Table 16b: Matrix ranking of sources of lymphatic filariasis related health providers by affected person

Comparison Factors	Drug store	Primary Health Centre	General Hospital	Private hospital	Traditional healers.
Convenience	+++	+++++	++	+	++++
Affordability (cost of treatment)	+++	++++	++	+	+++++
Family choice	+	++	++++	+++	+++++
Providers reputation	+	++	+++++	+++	++++
Confidentiality	+++	+	++	++++	+++++
Proximity to residence	+++	++++	++	+	+++++
Efficacy of treatment	+	++	+++++	+++	++++

+ = Lowest, +++++ = highest.

3.3. Findings Form In-depth-Interviews

Qualitative data collected through in-depth interview with lymphatic filariasis patients indicate that many patients continue to link the causes and transmission of the disease to cultural and tradition interpretations and beliefs and emphasize remedies to spiritual and supernatural concepts. While the patients with grade 3 swelling of scrotum or limb were open in discussing their conditions, those with lower level of swelling were not, until they were convinced that absolute confidentiality will be maintained.

3.3.1 Health-seeking behaviour, treatment and self-care

All patients with lymphoedema or hydrocoele had at one time or the other sought and received treatment for their condition. The treatment-seeking pattern follow a consistent trend for majority of the patients interviewed. At the onset of the disease (which is usually accompanied with fever, pains, and musculoskeletal pain), patients patronize drug store (chemist) and Primary Health Care (PHC) clinics close to their residences. At this point palliative remedies that are intended to eliminate pain are

administered. The onset of swelling brings with it new challenges, it is often at this point that patients resort to hospitals or traditional healers. The choice of which these options to use is dependent on cost of treatment, healers' reputation and distance of the facility (Table 16a).

Physical management for lymphoedema by traditional healers often involved scarification of affected limb, which is intended to drain accumulated fluid from the affected leg. The manifestations were most often treated with herbal preparations, which were used orally, smeared on affected parts. In some cases the affected parts were scarified before herbal preparations were applied. Traditional healers where highly favoured over modern medicine as providing the best service, this is because apart from scoring high in the comparison factors listed in Table 16a and 16b, they also use supernatural means by conducting spiritual cleansing and fortification exercises to prevent other family members from attack. In addition to these perceived advantages, the mode of payment of treatment received from traditional healers may be in cash or kind when there is no money to pay for treatment, some traditional healers were ready to wait for the harvest period when farm produce are sold or receive food stuff in place of cash.

Self-care practice by patients with lymphoedema is mainly to keep the affected leg clean and prevent secondary bacteria and mycotic infections. These secondary infections were prevalent amongst patients especially those whose with grade 3 swelling who find it very difficult to use foot wear. Patients sought care for acute swelling, high fever, headaches, nausea, and pain, as well as the more chronic manifestations of the condition such as irreversible swelling and disfigurement, open wounds and boils, large skin folds, fungal infections and disagreeable odor. Despite the high prevalence of psychological distress described by most patients, with a few

women even having contemplated suicide at some point in their lives, no one described seeking care specifically for their psychological distress.

3.3.2 Impact of lymphatic filariasis on socio-economic life, and family and marriageability

Advance chronic cases of lymphatic filariasis hinder manual work, and this constitute a serious cause for concern for affected people. Patients complain of quick exhaustion, especially those who have hydrocoele and elephantiasis of the leg. Some patients had to resort to backyard farming rather than engage in the more energy sapping farming practices. A twenty years old girl with grade 3 lymphoedema revealed that she stopped school for two reasons:

> *Because of my leg I couldn't continue my school, I was in JSS III then. I found it difficult to trek to school and I was very shy. I always feel people are looking at me. Even though the school authority didn't say anything to me, I just couldn't cope.*
>
> Female Patients; Agatu LGA.

Some other psychological issues raised by male patients with hydrocoele were centered around inability to engage in fulfilling sexual intercourse with spouses and how the disease damage the male identity in the community. A 68 years old patient with hydrocoele narrates his experience and concluded that his condition has made him a laughing stock.

> *I was a very successful farmer; I had five wives but now only the first one is with me, the others all left. They are many of us with this condition in this village but are hiding it because of shame. I was told it can be operated in the hospitals, but where will I get that kind of money from in this village.*
>
> Male patients; Ushongo LGA.

The above statement indicates that lymphatic filariasis patients face some level of stigma. Instances of spouse desertion and divorce were frequently cited in interviews with patients. The beliefs in some communities that the disease is hereditary also make it difficult from unaffected family member to get married. This 58 years old woman with grade 2 lymphoedema captures the consequence of the disease on the family in a statement.

> *My condition stated 14 years ago, but the swelling became serious in the last five years. The doctor said it is filaria and gave me medicine but there was no improvement. I went to traditional healer; he cut parts of my leg with razor and squeezed very black blood and water from my leg. I don't live with my husband anymore but I come here from time to time to visit him. Our children are all grown up and working elsewhere. I don't what actually started the swelling of the leg, but people said I must have stepped on something.*
>
> Female Patient; Apa LGA.

The patients' perception of the severity, socio-economic and psychological consequences of their condition is generally assessed by the size of scrotal and limb enlargement and the degree of physical incapacitation experienced. All patients with grade III lymphoedema were of the opinion that their altered appearance elicited various reactions ranging from sympathy to fear and ridicule from the community.

Table 17: Local terms for clinical manifestations of lymphatic filariasis

Ethic group	Local name	Meaning of local name	Perceived causes	Psychological consequences
Tiv	Ikyur [H]	Swollen scrotum	Sexual intercourse witchcraft hereditary	Spouse desertion Avoid social gathering
	Awo [L]	-	Stepping on charm Witchcraft	Loss of self esteem
Idoma	Ukpalube [H]	-	Hereditary	Hinder marriage prospects
	Ologologo [H]	extremely large	Extra-marital sex	Face public ridicule
	Etse [H]	-	Bad food	shyness
	Ngblewei [H]	-	Hard work on farm witchcraft	
Igede	Ikpa adagba [L]	Elephant leg	Stepping on charm	Avoid social gathering
	Iyi [H]	Swollen scrotum	Witchcraft Consequences of extra-marital sex Hereditary	Isolation and withdrawal
Etulo	Ipwe [H]	Enlarged scrotum	Stepping on charm Sexually transmitted Witchcraft	Hinder marriage prospects Lack self confidence.

H = hydrocoele, L = lymphoedema

CHAPTER FOUR

4.0. DISCUSSION

4.1. Circulating Filarial Antigen Prevalence

Assessment of the filariasis burden in a community is a pre-requisite for planning, implementing and evaluation of intervention strategies. Sensitivity, specificity, speed and simplicity are important factors considered in assuring efficiency of screening for bancroftian filariasis. Assessment of the field performance and field applicability of new diagnostic methods in Africa is an important step towards elimination of transmission. Our findings are similar to others reported in Africa (Ramzy et al., 1999, Eigege et al., 2002, Terranella et al., 2006) and elsewhere in Brazil, Sri Lanka and India (Pani et al., 2000, Braga et al., 2003, Weerasooriya et al., 2003). The overall prevalence of filarial antigenaemia was very high (31.2 %), this is much higher than earlier reported by Targema et al., (2006) and far exceeds the World Health Organization's threshold of 1 % positivity, for Mass Drug Administration (MDA) in a given community (WHO 1998). High CFA prevalence is an indication of intense transmission of the disease within the population. These findings are in keeping with Jung (1980), which had indicated a prevalence of 25% in a small sample of the population and had identified *Culex (cx) quinquefasciatus* as the main vector in the survey area. The high endemicity of the disease in Benue State may be as result of the deteriorating sanitary conditions which create breeding sites for mosquitoes, the slow and ineffective pace of the distribution and availability of Insecticide Treated Bednets (ITBN) in the Roll Back Malaria programme and difficulties in diagnosis and treatment of the disease in many rural health centres.

Sherchand et al (2003) reported significantly higher ICT rates in household not using bednet, this observation underscore the need for possible interactions and cross-benefits between different national disease intervention programmes.

The gender difference in ICT positivity and by implication the prevalence of lymphatic filariasis observed in this study agrees with other findings in North Central Nigeria and Brazil (Eigege et al., 2002, Targema et al., 2006, Braga et al., 2006). The reasons for this difference should generate a lot of research interest because both sexes are equally exposed to mosquito bites and other risk factors in a given community. The higher ICT positive results obtained within the age bracket of 40 – 49 also agrees with age-related findings from Nigeria and elsewhere (Udonsi 1986, Meyrowitsch et al., 1995, Surendran et al., 1996, Eigege et al., 2002, Targema et al., 2006). The age-related prevalence of lymphatic filariasis in endemic areas appears to be highest among subjects between 30 – 49 years of age. This may be due to increased contact between older subjects and the mosquito vectors, as a result of long exposure during outdoor activities such as farming and fishing.

The performance of ICT card test has been found to be comparable to that of the conventional finger prick night blood thick smear examination (Pani et al., 2000, Braga et al., 2003). Among its several advantages over the conventional technique is that it can be performed on the whole blood sample collected by finger prick at any time of the day and results are instant. The ICT cards can also be stored after use and then later used to evaluate treatment progression. The ICT card test has also performed considerably better than many immunological techniques including immunoradiometric assay and enzyme linked immunosorbent assay (ELISA) (Weil et al., 1997, Simonsen and Dunyo, 1999, Ramzy et al., 1999, Weerasooriya et al., 2003). Since the detection of circulating filarial antigens is a useful non-microscopic method for diagnosis of bancroftian filariasis that is currently making the transition from the research laboratory to the field, the ICT card test surpasses these other immunological techniques in field application and simplicity. Gyapong et al., (1998), Eigege et al.

(2002) and Ajero et al., (2006) have all reported positive correlation between ICT card test results and community hydrocoele rates in Africa.

This brilliant performance of the ICT card test notwithstanding, its large-scale field use in control programmes in endemic countries (especially in poor African and Southeast Asian countries) will require a downward review of its cost. As at the end of 2006, only very few countries in Africa have been able to conduct their lymphatic filariasis mapping exercise, a crucial component of national eradication programmes. The slow pace of mapping filariasis is as a result of the high cost of the ICT cards, ICT survey in just one village in Nigeria is estimated to cost well over US$ 100,000 (Eigege et al., 2002). In India, the cost of an ICT card alone is between US$ 1.05 and US$ 1.29, it is estimated that 500 tests will cost US$ 120 (Pani *et al.*, 2000). In Sri Lanka, cost analysis of the ICT card test showed that the ICT cost US$ 2.75 per unit compared to thick blood film that is US$ 0.30 (Braga et al., 2003). The World Health Organization may consider subsidizing the cost of the ICT test kits and facilitate improved access to the technology for poor countries where the disease is most endemic. The other area of challenge is the storage requirement, the ICT cards need to be stored at 2^0C to 8^0C, and this may be difficult in many rural areas in the tropics.

Despite these challenges, the features of the ICT card test proved to be extremely advantageous: high sensitivity, the ability to offer prompt diagnosis, no need for complicated laboratory procedures and no need for specialized technicians. Its usage in other parts of Nigeria will help generate the much-needed epidemiological information on the distribution and prevalence of lymphatic filariasis in the country.

Such studies will help define the precise geographical limits of the endemic zone and whether transmission occurs in urban areas as well as rural areas. Others have suggested that an increased prevalence of the disease may be a consequence of

changes in the demographic characteristics of at-risk countries. Crowded living conditions, housing quality, and inadequate waste disposal and sanitation facilities combined with seasonal migration between endemic rural areas and non-endemic urban areas have all been shown to contribute to the growing "urbanization|" of the disease (Terranella et al, 2006, Sherchand et al, 2003).

4.2 Implications for the prevalence of hydrocoele and lymphoedema

Clinical examination and data collection procedures were easy, convenient, non- invasive, relatively simple, cheap and acceptable to the communities. The study provided reliable estimates of the burden of lymphatic filariasis in the LGAs and demonstrates further that the disease is endemic in Benue State. When compared with data from standard epidemiological surveys, our findings corroborate those of Adonis (1987) and Mba and Njoku (2000). Hydrocoele prevalence observed in this study is similar to those observed in other state in Nigeria (Eigege *et al.*, 2002, Nwoke *et al.*, 2006) and elsewhere in Africa (Gyapong *et al.*, 1996, 1998, Ahorlu et al., 1999, Ivoke , 2000). The difference in the prevalence of hydrocoele observed in the LGAs may be due to different ecological and sanitary conditions that might influence mosquito population dynamics and biting habit thereby increasing the risk factors of lymphatic filariasis. The prevalence of hydrocoele increases with age and this corroborates Gyapong et al., (1998), Eigege *et al.*, (2002), Nwoke *et al.*,(2006). As the chronic manifestations of lymphatic filariasis appear most frequently later in life, clinical and pathological investigations focused on adult population. Findings indicates that the prevalence of chronic forms of lymphatic filariasis especially hydrocoele is age-dependent and generally higher in males. This observation is in keeping with similar studies of chronic filarial conditions in South India (Pani et al, 1991, Ramaiah et al, 1996) and Varanasi, North India (Sharma et al, 1999, Babu et al, 2001). Hydrocoele

was the most frequent clinical sign, while elephantiasis of the leg were comparatively rare. The additional benefits of hydrocoele is the positive association that exist between the prevalence of this manifestation and the prevalence of microfilaraemia in many parts of Africa (Gyapong et al 1998, Ivoke, 2000). It has therefore been suggested that in studies using rapid assessment methods, hydrocoele prevalence are better indicator for endemicity of lymphatic filariasis.

The use of these clinical manifestations of lymphatic filariasis as rapid assessment procedure for community diagnosis will facilitate and ease the mapping of communities where the status of the disease is unknown. The other options like collecting night blood samples and use of serological antigen detection procedures like the ICT card test are difficult and very expensive. Since the reason for the rapid diagnosis is to identify communities with active cases of lymphatic filariasis rather than individuals, the presence of hydrocoele and lymphoedema qualifies the community for Mass Drug Administration and other intervention activities. Furthermore the prevalence of hydrocoele appears to be strongly associated with intensity of parasite transmission. In this study, correlation analysis gave a weak association between CFA as detected by ICT test kits and hydrocoele prevalence ($r = 0.367$), however the association between hydrocoele and lymphoedema prevalence showed strong association ($r = 0.847$). Eigege et al. (2002) in a comparative study of hydrocoele prevalence and ICT card test survey reported that villages that have hydrocoele rates of greater than 20 % were also ICT positive. Their study also reported poor correlation of hydrocoele and ICT village prevalence below 20 %, other studies by Gyapong et al. (1998), Mwobabia et al. (2000) and Ajero et al. (2006) documented a robust association at the community level between hydrocoele prevalence and microfilaraemia prevalence in Ghana and elsewhere.

The comparison of hydrocoele and lymphoedema as diagnostic indicators of choice for community diagnosis reveals that scrotal hydrocoele which is the most common chronic clinical manifestation of lymphatic filariasis is a better indicator of prevalence of the disease than lymphoedema. Though lymphoedema seems to be widespread in Nigeria (Mbah and Njoku 2000, Badaki and Akogun 2001, Briade et al. 2003), they are less prevalent than hydrocoele. Little is known about what triggers the onset of clinical lymphoedema in filariasis-endemic areas, or about what factors cause lymphoedema, once triggered, to persist. After lymphoedema is established, recurrent episodes of ADLA are thought to be the major factor associated with disease progression, although the role of other factors remains largely unexplored. Scarification of the skin, a traditional practice in many filariasis-endemic communities as observed in this study, is considered a risk factor for rapid progression of filarial elephantiasis because of the increased risk of ADLA (Dunyo et al., 1997, Addiss and Brady 2007).

Another characteristic feature seen amongst lymphoedema patients was interdigital fungal infection, previous investigators have remarked that the close approximation of toes leads to loss of skin integrity and increased risk of interdigital fungal infections and as lymphoedema progresses and toes become more oedematous, occlusion worsens (Dreyer et al., 2003)..

Many studies therefore seem to recommend the use of hydrocoele only as rapid community indicator for lymphatic filariasis (Gyapong et al.1996, 1998, Nwoke et .al. 2006), our findings suggest that the search for hydrocoele and lymphoedema can be conveniently combined and may provide a broader evidence of the disease in the community. There is however a need for a universally accepted standardation for

lymphoedema and hydrocoele severity, the grading system used in this study adopted procedures used by Akogun and Badaki (1998) and Braide et al. (2003) who classified lymphatic filariasis related swelling into three broad categories (Grade 1, 2 and 3). Dreyer *et al.* (2002) recommended a different staging criteria Based on the degree of swelling and depth of folds on the limb. Stage 1 if shallow skin folds are present; Stage 2 if there are protrusions or "knobs"; Stage 3 if deep skin folds are present; Stage 4, if "mossy lesions" are present; and Stage 5, inability of patient to perform activities of daily living. This is the commonly utilized grading criterion in the Pacific region (Person *et al.*, 2006). The lack of standardization limits the understanding of the epidemiology, prevalence, and severity of lymphoedema. An urgent need exists for standardization of terms and common case definitions, and for improved knowledge about lymphoedema diagnosis, morbidity and its effect on recommended treatment practices.

Key informant interviews generated vital information on case search and broad perspective of the burden of the disease in the community. Combination of these procedures were the key areas of intervention during surveillance activities in China (Duan *et al.*, 1996)

This study demonstrate that lymphatic filariasis is endemic in Benue state and that hydrocoele and lymphoedema are good indicators of community endemicity. Nigeria has just commenced lymphatic filariasis elimination activities and may not have the financial resources to conduct a countrywide mapping using ICT filariasis card test because of its obvious cost. A combination of clinical examination (search for hydrocoele and lymphoedema) and key informant interviews with health providers and community leaders are therefore being recommended.

In recent years increasing numbers of studies about community knowledge, beliefs and practices related to lymphatic filariasis have been reported (Lu et al., 1988, Gyapong *et al.*, 1996, Eberhand *et al.*, 1996, Ahorlu *et al.*, 1999, Braide *et al.*,2003). The challenge for epidemiologists and public health workers is to translate this information into practical ways of promoting and improving lymphatic filariasis prevention and control at both individual and community level. To accomplish this, those areas where community misconceptions, lack of knowledge or erroneous beliefs and practices pose obstacles to control as well as areas that are amenable to change need to be identified. In our studies in both ethnic groups, we have found several such areas that could be targeted for, and benefit from health education intervention.

Awareness level of lymphatic filariasis causation, treatment and prevention were highly influenced by socio-cultural norms and though not scientifically correct, follows a logical interpretation of ethnic beliefs and superstition. Similar belief systems where the true causes and prevention of the diseases are replaced with supernatural reasons were also reported in Nigeria (Braide *et al.*, 2003) and elsewhere (Lu et al.,1988, Gyapong 1997, Ahorlu et al 1999, Ramaiah et el,1996, Person et al., 2006). For most of the research questions, there were significant differences in responses by the three ethnic groups; the responses from the Igede group appear to be more influenced by superstition and witchcraft beliefs. Misconceptions can adversely affect personal protection measures against mosquito bites and the use of appropriate health facilities and recommended treatment.

4.3. Psychological impact lymphoedema and hydrocoele

The findings from KABP investigation revealed that they is stigma surrounding lymphoedema, diminished marriage prospects and/or threat of divorce due to diminished economic productivity and attractiveness are often cited as

problems for persons with lymphoedema, both by the patients themselves and by other community members, this belief is widespread in endemic countries worldwide (Rauyajin et al., 1995, Gyapong et al., 1996, Coreil et al., 1998, Kumari et al., 2005, Person et al., 2006). This effect appears to be dependent on age of lymphoedema onset and disease stage. In Haiti, patients reported that their children had the most difficulty coping, as they were often teased or embarrassed about the mothers' lymphoedema (Coreil et al., 1998). Stigma also leads to withdrawal tendencies with serious consequences for treatment seeking behaviour.

Hydrocoele patients also reported being stigmatized as a result of teasing, problems with marrying, divorce and sex and were ashamed to be part of community activities (Ahorlu et al., 1999, Gyapong et al., 2000, Ahorlu et al., 2001, Richens 2004, Okafor and Omudu 2005). Men with hydrocoele were less likely to admit that they avoided social events or suffered teasing than were unaffected people to report that they ill-treated men with hydrocoele. In Kenya, 36% of men with hydrocoele interviewed responded that they were laughed at, while 29%, mostly patients with small hydrocoele, reported no reaction from the community (Amuyunzu et al., 1997). When community members were asked about their reactions to men with hydrocoele, those who had family members with hydrocoele expressed understanding and sympathy, while others tended to joke about it. In non-endemic villages in Ghana, considerable stigma was associated with hydrocoele and lymphoedema, much more than in hyper-endemic villages (Hunter 1992).

The impact of hydrocoele on male identity and sexual function is beginning to generate research interest in Africa and elsewhere. This study revealed that both patients and unaffected members of the community demonstrate awareness on several

perceived or felt sexual and matrimonial implications of hydrocoele. Previously, the limited literature on hydrocoele in filariasis-endemic areas suggested that hydrocoele had little impact on sexual activity or fertility. More recently, hydrocoele patients in India reported that hydrocoele adversely affected their sexual functioning and caused 'moderate problems' with anxiety/depression (Kumari et al., 2005) In Ghana, both community members and men with hydrocoele reported that hydrocoele impeded sexual intercourse, sometimes leading to divorce (Arhorlu et al., 1999, Gyapong et al., 2000). Qualitative research in Ghana found that men "whose hydrocoele interfered with (this) concept of male identity were deeply frustrated"; they felt as if they were a burden to their families because of difficulties in providing for them. In Brazil, Dreyer et al. (1997) reported several concerns of men with urogenital disease, including genital elephantiasis, which ranged from lack of intimacy in marriage to thoughts of suicide.

Lymphatic filariasis causes disability due to its acute manifestations as well as its chronic forms. Unlike the physical disabilities that are visible, the psychosocial disabilities caused by LF tend to be unrecognized (Krishna et al., 2005). There is growing interest in the role of mental and social health in promoting positive health and good quality of life (Wijesinghe *et al.*, 2007). Previous studies have shown that LF causes severe disability and considerable treatment costs due to acute and chronic disease in India (Ramaiah *et al.*, 1999, 2000, Pani *et al.*, 2005, Addiss and Brady 2007) and Ghana (Gyapong *et al.*, 1996). Such information is scarce in Sri Lanka.

It has been shown that medical experts assigned lower severity levels to patients' physical and psychosocial disability than the sufferers, indicating that experts are able to perceive the extent of disability to a certain extent only (Wijesinghe *et al.*, 2007,

Addiss and Brady 2007). As only patients can assess the exact extent of disability, their perceptions are important in planning and implementing morbidity control programmes for LF (Krishna et al., 2005). This study demonstrates the significant physical disability and psychosocial problems as perceived by patients affected by chronic filarial lymphoedema in an endemic urban area of Sri Lanka.

Difficulties were reported in all activities inquired about, mostly in walking which was significantly associated with lower limb oedema and also in carrying out household chores. Similar results have been reported from rural India, where domestic activities of affected females were seen to be impaired due to chronic and/or acute manifestations of the disease (Ramaiah *et al.*, 1999, 2000, Pani *et al.*, 2005, Addiss and Brady 2007). Many patients in our study population were using toilets of the squatting type, which posed problems for many of them, with two patients not being able to use the toilet at all without help from others.

These physical difficulties arose in spite of the majority of patients interviewed suffering from a relatively early stage of lymphoedema of Grade II, which shows that even at lower grades, lymphoedema causes physical disability. The higher the grades of lymphoedema, the difficulty in doing activities such as standing, using the toilet and bathing were more. Therefore, it is important to manage the lymphoedema at very early stages, preferably at grade I, to prevent progression and increase of disability.

The impact on social activities such as attending social gatherings and leisure activities as seen in our study were more in higher grades of lymphoedema. This trend is to be expected as the more severe the lymphoedema is, the more the accompanying complications and disability.

Almost one fourth of patients had problems interacting with the community. This resulted in patients, especially those with advanced stages of lymphoedema/elephantiasis, becoming isolated and withdrawn from society, avoiding social gatherings and activities and becoming angry, bitter and depressed about their situation. Even within their own families, about 6 % reported problems arising due to their swollen limbs.

Similar results were reported from the Gampaha district of Sri Lanka (Chandrasena *et al.*, 2004) where 18.2% of patients experienced feelings of being rejected by society. In India too, chronic brugian filariasis prevented people from gaining a standing in the community including claims that they did not receive any support from their community (Suma *et al.*, 2003).

Approximately 37% of patients in this study felt the swollen limb was a major problem affecting their lives, causing shyness, depression and intense worry about progression of disease to elephantiasis. A few had been suicidal as well at some point of their disease. Similar negative feelings have been reported in studies done in other areas of Sri Lanka (Wijesinhge *et al.*, 2007), India (Ramaiah *et al.*, 1997, 2000) and Ghana (Ahorlu *et al.*, 1999).

Approximately six percent of married persons experienced sexual and marital problems with the cause of the marital problems probably being sexual problems arising due to the swollen limb/s ($p < 0.001$). The patients view was that these problems were either solely or mainly due to their swollen limb/s. It was seen that more females than males reported marital and sexual problems in our study. This was not surprising as males are generally less reluctant to admit and discuss their problems, while females are more responsive towards admitting these issues and

discussing them. Similar problems such as unsuitability for marriage, sexual dysfunction and divorce attributed to the lymphoedema have been reported in a study in Ghana (Ahorlu *et al.*, 1999).

Due to the fact that the disabling psycho-social impact of chronic lymphoedema often go unnoticed, more emphasis is given to treating the patient's visible physical problems, often resulting in irrational continuous prescription of anti filariasis drugs. This was clearly seen in our study population, the majority of whom were treated with DEC for very long periods of time, the maximum being 43 years.

The WHO *recommended morbidity control strategy in the form of a Community* Home Based Care (CHBC) programme is still in its infancy in Sri Lanka. The CHBC programme deals with alleviating the physical disability of already affected patients by motivating and training patients and their carers to adhere to simple, yet effective strategies involving the affected areas – washing, elevation, prevention and treating entry lesions and using foot wear(Dreyer *et al.*, 2002). While fully appreciating the importance of this and further reiterating the importance of focusing on new strategies in the management of lymphoedema to alleviate physical morbidity, we strongly recommend that the psychosocial problems of patients be addressed at the same time, adopting a holistic approach. Counselling, formation of support groups and rehabilitation of affected patients should be done. Finding them less strenuous, preferably home based jobs would reduce patients' economic problems and give them self-confidence and a feeling of independence and worth. The community should be educated on the cause and transmission of the disease to dispel misconceptions, myths and stigma attached to the disease. The patients too should be educated to adjust to the effects of the illness and treatment.

4.4. Beliefs and traditional practices

Endemic communities in Benue state, Nigeria; attribute lymphatic filariasis causes and transmission to cultural and superstitious factors and resort to supernatural remedies for treatment and prevention. Beliefs about the cause of lymphoedema include heredity, supernatural and spiritual causes, and natural causes such as working in the sun, sexual intercourse, stepping on charm, witchcraft and ingesting unhygienic food or drinks. These beliefs are widespread in other parts of Africa and other endemic areas of the world as documented in (Gyapong *et al.*, 1996, Eberhard *et al.*, 1996, Coreil *et al.*, 1998, Ahorlu *et al.*, 1999, Babu *et al.*, 2003, Onwuliri, *et al* 2005, Person *et al.*, 2006). As people's awareness of the cause and transmission of lymphatic filariasis is poor, their ideas on prevention also have no basis, which is evident from descriptive as well as quantitative data. Many people stated that generally hygiene in the locality, good nourishment and herbal medicine can prevent filariasis. Many of these beliefs are regardless of gender and educational status.

In filariasis-endemic areas, people with lymphoedema seek help from traditional healers, herbalists, and pharmacies, or they self-treat. Traditional treatment for lymphoedema includes herbal preparations, burial of the leg, scrubbing the surface of the foot with herbal preparations, bloodletting, and scarification, spiritual fortification activities to protect unaffected family members among others (Rauyajin *et al.*, 1995, Dunyo *et al.*, 1997, Ahorlu *et al.*, 1999, Person *et al.*, 2006). Even in areas with established clinics for lymphoedema management, patients and unaffected persons still believe that traditional healers provided better services for this disease.

Beliefs about the causes of hydrocoele vary by culture and geography, but can be grouped into supernatural causes (including witchcraft and stepping on charms),

heredity, exposure to extreme hot weather, excessive sexuality or infidelity, and consumption of certain foods or drinks (Gyapong et al., 1996, Lu et al., 1998, Ahorlu et al., 1999, Onwuliri, *et al* 2005, Addiss and Brady 2007), few mention mosquitoes. Knowledge of the true cause of the disease was a debatable subject even amongst patients who have attended hospitals and clinics. Only 2.5% of hydrocoele patients in a study in rural South India believed that filariasis was transmissible (Ramaiah *et al.*, 1996). And the link between filarial infection, hydrocoele and lymphoedema is often not understood. Only 1%–4% of people interviewed in an Indian study knew that filarial infection was a major cause of hydrocoele (Ramaiah et al., 2005). Traditional remedies used to treat hydrocoele include herbal preparations, performance of traditional rites and modern pharmaceutical remedies. Perceptions of treatment efficacy vary greatly by region, with a majority of people naming surgery as a cure (Gyapong et al., 1996, Ahorlu et al., 1999, Babu et al., 2004). However, 90% of persons with lymphoedema and/or hydrocoele interviewed on the Kenyan coast believed their disease was incurable (Amuyunzu 1997).

These findings may be used in the development of group-specific health education programmes to change health behaviour and to achieve higher involvement of the community. Such community educational programme may be especially beneficial as it would also involve the family members of the affected population who are often the caregivers of patients affected with severer grades of lymphoedema and hydrocoele. Involving the family in the care of patient will also help to reduce the feelings of stigma, isolation and neglect experienced by some of the patients.

4.5. Health-seeking behaviour

These misconceptions as to the cause, mode of transmission and prevention of the disease together with cultural limitations and human behavioural patterns militate

against prevention, treatment and control measures. Findings from this study indicate that family, friends, and strong cultural beliefs influence the perception of people affected and/or unaffected by lymphatic filariasis. The way a person or the general community perceives, mentally represents and culturally defines the episode of illness including the cause, symptoms and explanations for illness, diagnosis, treatments, and cultural role of the ill person significantly influence their health seeking behaviour (Person et al., 2006, Addiss and Brady 2007). Lymphatic filariasis patients' concept of the disease etiology and socio-cultural interpretations often guides their treatment expectation and coping strategies and this can change over time as well as in different communities and socio-cultural settings as observed in this study. The reality that lymphoedema and hydrocoele are culturally ingrained in the Benue communities investigated is evident by the many references made to them in many traditional folklores and how local traditional healers have better understanding of its remedies

Essential to any successful lymphatic filariasis morbidity management programme is the understanding of the specific factors by which patients and community members interpret and place their illness experiences. Ahorlu et al. (1999) reported that the current cultural paradigm of seeking indigenous healers as a first-line treatment often resulted in not only a significant delay in appropriate medical treatment but also potentially harmful treatments that could exacerbate the condition.

The nature and impact of local beliefs and some traditional practices seriously influence the choice of health provider to patronize or whether to seek help at all. Studies in India and Ghana show that 46%–100% of persons with lymphoedema sought treatment from health care centres, local healers, or pharmacies during the previous year (Hunter 1992, Ahorlu et al., 1999, Babu et al., 2002). The studies in

Ghana show that modern medical care often is avoided due to lack of interest from health care workers and a belief by patients that lymphoedema treatment requires spiritual interventions. This belief is the reason for the high ranking scored by traditional healers in the ranking exercises. Although many patients believe lymphoedema progression cannot be prevented, they continue to consult spiritualists and treat themselves with herbal preparations or analgesics.

Patients with hydrocoele seek treatment from local health centres, traditional healers, and through self-medication. The belief that hydrocoele has a supernatural cause leads people to seek out traditional healers instead of modern medical care. Gyapong et al. (1996) reported that patients who may have tried various remedies in the past stopped seeking care after the treatments were ineffective. Other reasons for not seeking treatment include problems with access, such as cost of surgery or medical treatment, distance from the health centre, inability to take time off work for recovery, and cultural issues such as fear of anaesthesia during surgery and stigma associated with having hydrocoele and possibilities of loosing penile function (Lu et al., 1998, Ahorlu et al., 1999, Addiss and Brady 2007).

Some gender difference in patients' perception and assessment of coping with lymphatic filariasis manifestations was observed in this study, the experience of the disease is significantly influenced by gender (Hartigan 1999, Vlassoff and Bonilla, 1994). In many communities where the disease is endemic, hydrocoele is associated with sexual disability and/or as a consequence of marital unfaithfulness and lowers the productivity and wage earning capacity of those afflicted. Lymphatic filariasis patients therefore endure significant psychosocial burden and damage to male and female socio-cultural and traditional identity (Gyapong *et al,* 2000, Ahorlu *et al* 2001, Coriel *et al,* 1998, Dreyer *et al,* 1997, Hartigan 1999, Person et al., 2006). Further

studies are however needed to quantify the social, economic and psychological implications of lymphoedema and hydrocoele for male and female patients respectively.

The finding that the education status of the respondents has some effect on their knowledge is in agreement with that of others (Lu et al, 1988, Ramaiah et al, 1996). Most respondents, irrespective of their educational status find it difficult to believe that mosquitoes are the cause of lymphatic filariasis. During the qualitative interviews, many people wondered why only some are afflicted by the disease although everybody in the village is exposed to mosquito bites. The reasons for this has been explained as host immunological mechanism (Dreyer, 2000). Studies in other endemic countries such as the Philippines (Lu et al, 1988), Tanzania (Muhondwa, 1983), Ghana Ahorlu et al, 1999) and India (Ramaiah et al, 1996) also showed that not more than 15% of the people are aware of the role of mosquitoes in transmission of filariasis.

Nigeria has just commenced lymphatic filariasis eradication activities and has just concluded a country wide epidemiological mapping (Nwoke *et al.*, 2006). The need for community participation in elimination activities is very crucial if set targets must be met. This study further justifies this need because in order to get local populations to contribute their knowledge and resources to planning and implementation of intervention activities, they must be adequately informed about the true causes, mode of transmission and the socio-economic repercussions of the disease. Community participation especially in vector control, case detection and reporting were vital components of successful control activities in China, India and Brazil (Caq *et el.*, 1997, Albuquerque *et al.*, 1996). Previous national disease control programmes in Nigeria were seriously challenged with bureaucratic and

organizational operations with a lot of activities at the top but little impact at the community level. Such programmes have traditionally tended to underestimate the importance of communities' beliefs, attitudes and behaviour to the success or failure of their intervention. The result was that even though human and material resources were available, there was little community compliance and this seriously affected the sustainability of such interventions.

While different studies concluded that people's knowledge of filariasis is poor, the present study reveals the rationale for people's misconceptions of the disease transmission. This may help in the development of health education programme. Ignorance and incorrect beliefs about the cause of disease may lead to neglect of personal protection measures. As people's misconceptions are deep-rooted and based on observation, it is necessary to develop a very convincing health education programme. Ramaiah et al (1996) has suggested the demonstrations using visual media of parasite development in mosquitoes, transmission through their bites and presence of microfilariae in the peripheral blood may prove to be an effective tool. This has been known to enable people to protect themselves against mosquito bites in both rural and urban communities.

The outcome of this study confirms the need and logic of integrating community health education into the intended mass drug administration (MDA) being considered for lymphatic filariasis elimination activities. Health education is a key factor in erasing negative beliefs, cultural practices as well as behavioural patterns, which may jeopardize patients and community acceptance and compliance to prevention and control measures. Health education strategies that take cognizance of prevailing socio-cultural traditions have been suggested (Lu *et al*, 1988, Gyapong *et al* 1996, Ahorlu *et al* 1999, Mba and Njoku 2000, Hopkins *et al* 2002, Braide *et al*

2003, Onwuliri *et al* 2005). In addition, community participation in needs assessment, intervention design and implementation is being suggested. Strategies that emphasize participatory learning and action techniques have been reported to enhance community compliance, patronage and sustainability of the intervention programmes (Vlassoff 1992, Briade *et al* 1990). In other to save cost, there are existing disease control programmes currently being executed in Nigeria; lymphatic filariasis elimination activities could be integrated into these programmes.

Information gathered during studies such as this can be extremely helpful when planning or evaluating control activities especially when dealing with populations that are socially and culturally heterogeneous. Since the perceived causes and prevention of the disease do not align with scientific interpretation, developing appropriate health education document should take into account the socio-economic and cultural differences and emphasize participatory learning and action methodologies (Vlassoff 1992).

Health seeking practices are highly influenced by personal and community perception of causation and prevention. There is so much confidence on traditional medicine within the endemic communities in Benue State and the procedure for treating the disease with herbal preparations (which were either orally administered or smeared on affected parts after scarification or both) seem to be widespread in Africa and Asia (Gyapong *et al.*, 1997; Ahorlu *et al.*, 1999; Lu *et al.*, 1988; Eberhard *et al.*, 1996 and Ramaiah *et al.*, 1996, Person et al., 2006). This confidence in traditional medicine can be exploited by greater involvement of traditional healers in management of patients with lymphoedema and hydrocoele. When adequately trained this group of practitioners could become key service providers not only treating cases but also becoming community mobilizers and educators.

Informed by the serious health, social and economic burden of lymphatic filariasis and considering the recent remarkable advances in the disease diagnosis and clinical understanding, the World Health Organization (WHO) set the year 2015 as the target date for eliminating the disease as a public health problem (WHO 2002). New technologies are becoming available for diagnosis and community mapping and the drug combination regimens for mass drug administration (MDA). Despite these global efforts, endemic communities in Nigeria continue to attribute lymphatic filariasis causes and transmission to cultural and superstitious factors and resort to supernatural remedies for treatment and prevention. Intensive community health education with serious emphasis on participatory learning and action methodologies like community drama and the development of appropriate information, education and communication (IEC) materials that are culturally sensitive and specific are therefore being recommended. The need to train traditional healers already providing key services to adopt positive clinical practices should be a critical component in the overall campaign. Active community participation in planning, implementation and evaluation of intervention activities will greatly encourage community compliance and sustainability of the elimination efforts.

4.6 Conclusion and Recommendation

Lymphatic filariasis is commonly seen among the poorest of the poor and for many years has a very low public health rating in the health priorities in African countries where it is prevalent. Clinical manifestations range from periodic reoccurring attack of localized inflammation, tenderness and pain, often accompanied by fever, nausea and vomiting, known as acute adenolymphangitis (ADL) to chronic symptoms including lymphoedema, hydrocoele and elephantiasis. As many as 27 million men are believed to have filarial hydrocoele and 16 million people have

lymphoedema or elephantiasis (Addiss and Brady 2007). These manifestations are very severe and disfiguring and result from a complex interplay of the pathogenic potential of the parasite, the immune response of the host, and external ("complicating") bacterial and fungal infection (GAELF, 2005).

The extent of human suffering resulting from lymphatic filariasis and its socio-economic implications are enormous. Elimination of the disease is good investment in health and poverty reduction. Increases in productivity and earning potential are important outcomes realized in areas where lymphatic filariasis has been eliminated. Gains in labour productivity come directly from the prevention of acute attacks, hydrocoele and lymphoedema, conditions that severely decrease worker productivity. Savings on medical treatment following the elimination of lymphatic filariasis represent another significant gain for individuals and health systems.

4.6.1 Major Research Findings and Contribution to Knowledge

- The outcome of this study shows that lymphatic filariasis is endemic in Benue State and classical clinical manifestations of the disease (elephantiasis of the limb and scrotum) exist in communities within the state.
- This study also demonstrate the feasibility of utilizing the presence and prevalence of hydrocoele and lymphoedema as rapid assessment method for community diagnosis since there is a good correlation between circulating filarial antigen and disease manifestation.
- This study revealed that knowledge about the causation, symptoms, treatment and prevention of lymphatic filariasis are not scientifically sound but highly influenced by existing socio-cultural norms within the community. These

erroneous beliefs lead to practices that are unhygienic and could influence disease progression and increase morbidity.

- This study showed that lymphatic filariasis manifestations are highly stigmatized leading to non-patronage of health facilities contributing to dearth of epidemiological information and the belief amongst health workers that the disease is no longer prevalent.
- The psychological and physical burden of the disease on individuals and communities imposes a significant reduction in quality of life.

Since a feasible, effective and inexpensive prevention strategy is already in place, the country should as a matter of urgency mainstream lymphatic filariasis elimination into the National health agenda. Additional health benefits of MDA in controlling intestinal parasites are good incentives for lymphatic filariasis elimination.

4.6.2 Recommendations

The following are strongly recommended to provide much needed information on the distribution of the disease and mitigate the impact of lymphatic filariasis in Nigeria and to facilitate its elimination.

4.6.2.1 Individuals and Communities

- Personal protection from mosquito bites
- Environmental sanitation with emphasis on elimination of mosquito breeding containers
- Seek treatment and ensure proper personal hygiene if already infected.
- Organize social support structures for patients to provide home based care and counselling and education services. Family-oriented interventions, support

groups for patients with lymphoedema and hydrocoele and their families, community education and training on simple, low cost lymphoedema and hydrocoele management techniques for indigenous healers are viable ways to influence the early detection, diagnosis and treatment of women with lymphoedema. These can be divided into two broad activities: - (1) Education of patients and family members on the principles and practice of lymphoedema self-care. (2) Encouragement and support to sustain daily self-care (this support may include improved access to supplies such as clean water, soap, antiseptics, topical antibacterial and antifungal agents, and oral antibiotics)

4.6.2.2 Universities and Medical Research Institutes

Universities, medical and other allied institutions should initiate and fund research in:

- Quantifying productivity loss due to lymphatic filariasis in Nigeria
- Measuring and calculating financial burden and cost of treatment for individuals and health care system
- Social and psychological implications of the disease and its implications on treatment seeking behaviour. Public health workers require training on the methodology of inquiry into local cultural practices and beliefs and how outcomes of such studies can guide intervention activities.
- Mapping of university catchment areas using ICT and RAP to fill gaps identified in the national survey.

- Develop cost effective procedures for mass drug administration and integrating the lymphatic filariasis elimination into existing national disease control programmes.

4.6.2.3 Ministries and FMOH

- Integration of lymphatic filariasis elimination with public health programmes like RBM and NOCP to reduce costs.
- Procurement of ICT test kits for distribution to institutions involved in lymphatic filariasis research.
- Integration of albendazole distribution with the current nation-wide Mectizan mass treatment.
- Provision of consistent funding for lymphatic filariasis elimination activities.
- Establish referral networks for management of ADLA and for patients with advanced lymphoedema or hydrocoele.
- Conduct extensive and comprehensive community health education using participatory methodologies with emphasis on community participation to create awareness of disease etiology and methods of morbidity management.
- Facilitate the establishment of support groups for patients of lymphatic filariasis and their family members and provide training for caregivers and counsellors.

4.6.3. Recommendations for Further Studies

- Further studies assessing the efficacy and safety of albendazole and ivermectin combination is required especially in communities endemic for other filarial worms like *Onchocerca vulvulus* and *Loa loa*.

- Further investigations are required in the development of sustainable strategies for the management of lymphoedema and genitor-urinary complications and effect if any of local management practices on disease progression.
- Social and behavioural constraints that will pose serious challenges for lymphatic filariasis elimination in Nigeria needs to be investigated in order to develop a convincing community education strategy that will encourage community participation in intervention efforts.

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APPENDIX 1

SOCIAL ASPECTS OF LYMPHATIC FILARIASIS

Questionnaire for Affected Persons

Identification Number: #_____Date: _____

Disease stage and Pathology Group_____

LL12 = Lower Limb Stage 1 and 2, LL 3=Lower Limb Stage 3, ADL=Acute Attack

HT=Hydrocoele Tennis Ball size, HM=Hydrocoele Medium, HL=Hydrocoele Large.

DEMOGRAPHIC DATA

Community_____Ethnicity_____

1.2 Age---------- 1.3 Sex 1. Male, 2. Female

1.4 Marital status 1. Single 2. Married 3. Divorced 4. Widowed

1.5. Number of children [----------]

1.6. Educational status 1. No education, 2. Primary, 3. JSS, 4. SSS, 5. Tertiary

1.6. Others (specify)----------

1.7. Occupation----------

INSTRUCTION: We would like to ask you some questions about lymphatic filariasis. Please draw a circle around the applicable/correct option as it applies to you.

2. What is it about your condition that concerns you most?

2.1.	Fever	Yes	No	NA
2.2.	Chills	Yes	No	NA
2.3.	Pain	Yes	No	NA
2.4.	Swelling	Yes	No	NA
2.5.	Functional impairment	Yes	No	NA
2.6.	Appearance	Yes	No	NA
2.7.	Physical discomfort	Yes	No	NA
2.8.	No problem	Yes	No	NA
2.9.	Others specify			

3. For how long have you had condition [ ] yrs [ ] mths

4. Have you done anything to seek relief for your condition? 2. Yes 0. No.

5. People seek help from many different sources. We are interested in all the different kinds of help that you might have sought for your condition

Place				
5.1.	Relative/friends	Yes	No	NA
5.2.	Health worker	Yes	No	NA
5.3.	Traditional Healer	Yes	No	NA
5.4.	Drug store/chemist	Yes	No	NA
5.5.	Health Center	Yes	No	NA
5.6.	Hospital	Yes	No	NA
5.7.	Private practitioner	Yes	No	NA
5.8.	Cannot say	Yes	No	NA
5.9.	Other specify----------			

6. Which of these places did you go to first?

Place				
6.1.	Relative/friends	Yes	No	NA
6.2	Health worker	Yes	No	NA
6.3.	Traditional Healer	Yes	No	NA
6.4.	Drug store/chemist	Yes	No	NA
6.5.	Health Center	Yes	No	NA
6.6.	Hospital	Yes	No	NA
6.7.	Private practitioner	Yes	No	NA
6.8.	Cannot say	Yes	No	NA
6.9.	Other specify----------			

7. What were your reasons for choosing this kind of help?

Reasons				
7.1	Convenience	Yes	No	NA
7.2	Affordability	Yes	No	NA
7.3.	Family's choice	Yes	No	NA
7.4.	Healers reputation	Yes	No	NA
7.5.	Other specify----------			

8. What kind of treatment did you receive?

Treatment received				
8.1.	Home based	Yes	No	NA
8.2.	Traditional	Yes	No	NA
8.3.	Modern	Yes	No	NA
8.4.	Other specify----------			

9. Who paid for this treatment?

9.1.	Self	Yes	No	NA
9.2.	Family/relative	Yes	No	NA
9.3.	Other specify ----------			

10. Now let's talk about the last time you sought help for this kind of condition. What kind of help have you sought recently for your condition?

10.1.	Relative/friends	Yes	No	NA
10.2	Health worker	Yes	No	NA
10.3.	Traditional Healer	Yes	No	NA
10.4.	Drug store/chemist	Yes	No	NA

10.5.	Health Center	Yes	No	NA
10.6.	Hospital	Yes	No	NA
10.7.	Private practitioner	Yes	No	NA
10.8.	Cannot say	Yes	No	NA
10.9.	Other specify----------			

11. What were your reasons for choosing this kind of help?

Reasons

11.1	Convenience	Yes	No	NA
11.2	Affordability	Yes	No	NA
11.3.	Family's choice	Yes	No	NA
11.4.	Healers reputation	Yes	No	NA
11.5.	Other specify----------			

12. What kind of treatment did you receive?

Treatment received

12.1.	Home based	Yes	No	NA
12.2.	Traditional	Yes	No	NA
12.3.	Modern	Yes	No	NA
12.4.	Other specify----------			

13. Who paid for this treatment?

13.1.	Self	Yes	No	NA
13.2.	Family/relative	Yes	No	NA
13.3.	Other specify ----------			

14. Did you also make use of any home remedies while you were seeking help from these sources?

2. Yes
0 No
3. Other specify----------

15. Among the different kinds of help that you received, which did you like best?

Help received

15.1	Home based	Yes	No	NA
15.2.	Traditional	Yes	No	NA
15.3.	Modern	Yes	No	NA
15.4.	Others specify----------			

16. Why did you like it best?

Reason

16.1	Convenience	Yes	No	NA
16.2	Affordability	Yes	No	NA
16.3.	Family's choice	Yes	No	NA
16.4	Healers reputation	Yes	No	NA
16.5.	Others specify----------			

17. If there was anything you could do, what would you do for your condition?

---

18. Do you think this condition can be helped? Possibly Yes No NA

19. Do you think this condition can be cured completely? Possibly Yes No NA

20. People have many different ideas about what causes a condition like this. What do you think has caused you condition?

20.1.	Walking in the sun	Yes	No	NA
20.2.	Walking long hours	Yes	No	NA
20.3.	Sexual activity	Yes	No	NA
20.4.	Spiritual	Yes	No	NA
20.5.	Food related	Yes	No	NA
20.6.	Poor personal hygiene	Yes	No	NA
20.7	Fever	Yes	No	NA
20.8	Mosquitoes	Yes	No	NA
20.9	Others specify----------			

21. Do you thin this condition can be passed from you to another persons?

Possibly Yes No Uncertain

22. How can this condition be passed from you to other persons?

22.1.	Sexual intercourse	Yes	No	NA
22.2.	Body contact	Yes	No	NA
22.3.	Witchcraft	Yes	No	NA
22.4.	Food poisoning	Yes	No	NA
22.5.	Mosquito bite	Yes	No	NA
22.6.	Stepping on charm	Yes	No	NA
22.7	Others specify----------			

23. Do you know of any ways to prevent this condition?

Possibly Yes No Uncertain NA

24. How can you prevent this condition?

24.1.	Avoid sexual contact with infected person	Yes	No	NA
24.2.	Avoid body contact with infected person	Yes	No	NA
24.3.	Sacrifice to appease gods	Yes	No	NA
24.4.	Good personal hygiene	Yes	No	NA
24.5.	Avoid mosquito bites	Yes	No	NA
24.6	Avoid eating with infected person	Yes	No	NA
24.7	Others specify----------			

25. Do you know of any other people in this community with this condition?

Yes No

26. Do they ever help or advise you? Yes No

27. Does this condition keep you from going out and about?

Yes Sometimes No

28. Has this condition affected your daily work?

Sometimes Yes No

29. How has this condition affected your daily work?

29.1.	Stopped work	Yes	No	NA
29.2	Changed jobs	Yes	No	NA
29.3	Altered activity	Yes	No	NA
29.4.	Work fewer hours	Yes	No	NA
29.5	No change	Yes	No	NA
29.6	Others specify----------			

30. Has this condition affected you schooling or educational opportunities?

Possibly Yes No Uncertain

31. How has this condition affected your schooling?

Place

31.1.	Stopped school	Yes	No	NA	
31.2	Frequent absence from school	Yes	No	NA	
31.3.	Failure in School	Yes	No	NA	NK
31.4	Impaired performance	Yes	No	NA	
31.5	Admission refused	Yes	No	NA	
31.6.	Forced to leave school	Yes	No	NA	
31.7	Changed schools	Yes	No	NA	
31.8.	Cannot say	Yes	No	NA	
31.9	Others specify----------				

--

32. Does this condition keep you from taking proper care of yourself; eating, washing toilet etc?

Possibly Yes No Uncertain NA

33. How will this keep you from taking proper care of yourself?

Effect on daily care

33.1.	Eating	Yes	No	NA	NK
33.2	Washing	Yes	No	NA	NK
33.3.	Toilet	Yes	No	NA	NK
33.4.	Others specify----------				

34. Some people feel okay about this condition and others are concerned. How do you feel about your conditions?

Feeling about condition

34.1	Feel good	Yes	No	NA
34.2.	Feel bad	Yes	No	NA
34.3.	Mixed feelings	Yes	No	NA
34.4	Cannot say	Yes	No	NA

35. Are there any particular feelings that describe your reaction to this condition?

Description about feelings

35.1	Pride	Yes	No	NA
35.2	Worry	Yes	No	NA
35.3	Sadness	Yes	No	NA
35.4	Fear	Yes	No	NA
35.5.	Diminished self worth	Yes	No	NA
35.6.	Others specify----------			

36. Some people feel like a burden to others because of this condition. Do you feel that way too?

Possibly Yes No Uncertain NA

37. What kind of burden do you mean?

Type of burden

37.1	Lowers family income	Yes	No	NA
37.2	Cost of health care	Yes	No	NA
37.3	Domestic chores	Yes	No	NA
37.4	Others specify----------			

38. Do you stay away from social functions, such as weddings, festivals, and so forth?

Sometimes Yes No Uncertain.

39. Why would you stay away from social functions?

Reasons for staying away

39.1	Personally uncomfortable	Yes	No	NA
39.2	Others uncomfortable	Yes	No	NA
39.3	Family decision	Yes	No	NA
39.4	Unrelated to filariasis	Yes	No	NA
39.5.	Others specify----------			

40. Do you try to conceal this condition by the way you dress or in some other way?

Possibly Yes No Uncertain NA

41. Do people make fun of you because of this condition?

Possibly Yes No Uncertain NA

42. Will they make fun of you in your presence or behind your back?

42.1. In your presence Possibly Yes Uncertain NA

42.2 Behind your back Possibly Yes Uncertain NA

43. Is there anything in particular that you do for yourself that helps you forget abut your problem?----------

If "married", go to 44, if "unmarried", skip to 48

44. Do you think this condition has affected your marriage?

Possibly Yes No Uncertain NA

45. How has it affected your marriage?

45.1 Quarrels Yes No NA

45.2 Infidelity Yes No NA

45.3 Spouse desertion Yes No NA

45.4 Divorce Yes No NA

45.5 Others specify----------

46. Has this condition affected sexual relations with you spouse, or any other aspects of your sexual life?

Possibly Yes No Uncertain NA

47. How has it affected your relations with your spouse?

---

48. Do you think this condition would make it hard for you to find a spouse?

Possibly Yes No Uncertain NA

49. Do you thin that this condition could make it difficult for others in your family to find a spouse? Possibly Yes No Uncertain NA

50. What do you do to earn money?

50.1 Farming Yes No NA

50.2 Animal husbandry Yes No NA

50.3. Fishing Yes No NA

50.4. Teaching Yes No NA

50.5. Others (specify)----------

51. Has this condition affected your money-making activities?

Possibly Yes No Uncertain NA

52. How much do you spend on treatment of this condition monthly?

52.1 Below # 500 Yes No

52.2 Between # 500 - #1000 Yes No

52.3 Between #1000 - # 2000 Yes No

52.4 Between # 2000 - # 3000 Yes No

52.5. Others specify----------

APPENDIX II

Social Aspects of Lymphatic Filariasis

Questionnaire for Unaffected Persons

DEMOGRAPHIC DATA

Community_____Ethnicity_____

—

1.1 Age---------- 1.2 Sex 1. Male, 2. Female

1.3 Marital status 1. Single , 2 Married, 3 Divorced, 4 Widowed.

1.4. Number of children [----------]

1.5. Educational status 1. No education, 2. Primary, 3. JSS, 4. SSS, 5. Tertiary

1.6. Others (specify)----------

1.7. Occupation----------

INSTRUCTION. We would like to ask you some questions about lymphatic filariasis. Please draw a circle around the applicable/correct option as it applies to you.

2. What do you think concerns him/her most about this condition?

2.1.	Fever	Yes	No	NA
2.2.	Chills	Yes	No	NA
2.3.	Pain	Yes	No	NA
2.4.	Swelling	Yes	No	NA
2.5.	Functional impairment	Yes	No	NA
2.6.	Appearance	Yes	No	NA
2.7.	Physical discomfort	Yes	No	NA
2.8.	No problem	Yes	No	NA
2.9.	Others specify			

3. Where would he/she go for treatment?

Place

3.1.	Relative/friends	Yes	No	NA
3.2.	Health worker	Yes	No	NA
3.3.	Traditional Healer	Yes	No	NA
3.4.	Drug store/chemist	Yes	No	NA
3.5.	Health Center	Yes	No	NA
3.6.	Hospital	Yes	No	NA
3.7.	Private practitioner	Yes	No	NA
3.8.	Cannot say	Yes	No	NA
3.9.	Other specify----------			

4. Which of these places did you think is most effective?

Place

4.1.	Relative/friends	Yes	No	NA
4.2	Health worker	Yes	No	NA
4.3.	Traditional Healer	Yes	No	NA
4.4.	Drug store/chemist	Yes	No	NA
4.5.	Health Center	Yes	No	NA
4.6.	Hospital	Yes	No	NA
4.7.	Private practitioner	Yes	No	NA
4.8.	Cannot say	Yes	No	NA
4.9.	Other specify----------			

5. Do you think this condition can he helped?
Possibly Yes No Uncertain NA

6. Do you think this condition can be cured completely?
Possibly Yes No Uncertain NA

7. People have many different ideas about what causes a condition like this. What do you think has caused his/her condition?

7.1	Working in the sun	Yes	No	NA
7.2.	Walking long hours	Yes	No	NA
7.3.	Sexual activity	Yes	No	NA
7.4.	Spiritual	Yes	No	NA
7.5	Food related	Yes	No	NA
7.6.	Poor personal hygiene	Yes	No	NA
7.7.	Fever	Yes	No	NA
7.8.	Mosquitoes	Yes	No	NA

8. Do you thin this condition can be passed from him/her to another person?
Possible Yes No Uncertain NA

9. How can this condition be passed from one person to another

9.1.	Sexual intercourse	Yes	No	NA
9.2	Body contact	Yes	No	NA
9.3	Witchcraft	Yes	No	NA
9.4	Food poisoning	Yes	No	NA
9.5.	Mosquito bite	Yes	No	NA
9.6.	Stepping on charm	Yes	No	NA

10. Do you know of any ways to prevent this condition?
Possibly Yes No Uncertain NA

11. How can you prevent this condition?

11.1.	Avoid sexual contact with infected person	Yes	No	NA
11.2.	Avoid body contact with infected person	Yes	No	NA
11.3.	Sacrifice to appease gods	Yes	No	NA
11.4.	Good personal hygiene	Yes	No	NA
11.5.	Avoid mosquito bites	Yes	No	NA
11.6.	Avoid eating with infected person	Yes	No	NA
11.7.	Others specify----------			

12. Do you think this condition will affect his/her daily work?
Sometimes Yes No Uncertain NA

13. How can this affect his/her daily work?
Effect on daily life

13.1.	Stopped work	Yes	No	NA
13.2.	Changed jobs	Yes	No	NA
13.3.	Altered activity	Yes	No	NA
13.4.	Work fewer hours	Yes	No	NA
13.5.	No change	Yes	No	NA
13.6.	Others specify----------			

--

14. Do you think this condition will affect his/her schooling or educational opportunities? Possibly Yes No Uncertain NA

15. How will this affect his/her schooling?
Place

15.1.	Stopped school	Yes	No	NA
15.2	Frequent absence from school	Yes	No	NA
15.3.	Failure in School	Yes	No	NA
15.4	Impaired performance	Yes	No	NA
15.5	Admission refused	Yes	No	NA
15.6.	Forced to leave school	Yes	No	NA
15.7	Changed schools	Yes	No	NA
15.8.	Cannot say	Yes	No	NA
15.9	Others specify----------			

--

16. Do you think this condition will keep him/her from taking proper care of himself/herself, eating, washing toilet etc?
Possibly Yes No Uncertain NA

17. How will this keep him/her from taking proper care of him/her self?
Effect on daily care

17.1.	Eating	Yes	No	NA	NK
17.2	Washing	Yes	No	NA	NK
17.3.	Toilet	Yes	No	NA	NK
17.4.	Others specify----------				

18. Do you thin this condition will ever keep him/her from going out and about?
Possibly Yes No Uncertain NA

19. Do you think he/she less of himself/herself because of his/her condition?
Possibly Yes No Uncertain NA

20. Do you think he/she feels like a burden to others because of this condition?
Possibly Yes No Uncertain NA

21. What kind of burden do you mean?

Type of burden

21.1. Lowers family income Yes No NA

21.2 Cost of health care Yes No NA

21.3 Domestic chores Yes No NA

21.4 Others specify----------

22. Do you think he/she would stay away from social functions, such as weddings, Festivals, and so forth? Sometimes Yes No Uncertain NA

23. Why would he/she stay away from social functions?

Reason for staying away

23.1 Personally uncomfortable Yes No NA

23.2. Others Uncomfortable Yes No NA

23.3. Family decision Yes No NA

23.4 Unrelated to filariasis Yes No NA

23.5. Others specify----------

24. Do you think he/she will try to conceal his/her condition by the way he/she dresses or in some other way?

Possibly Yes No Uncertain NA

25. Do you think people make fun of him/her because of this condition?

Possibly Yes No Uncertain NA

26. Will they make fun of him/her that in his/her presence or behind his/her back?

26.1. In his/her presence: Possibly Yes No Uncertain NA

26.2 Behind his/her back: Possibly Yes No Uncertain NA

27. What do you think he/she does to overcome this condition?

---

28. Do you think this condition will affect his/her marriage?

Possibly Yes No Uncertain NA

29 How will it affect his/her marriage?

29.1 Quarrels Yes No NA

29.2 Infidelity Yes No NA

29.3 Spouse desertion Yes No NA

29.4 Divorce Yes No NA

29.5 Others specify----------

30. Do you think his/her condition will make it difficult for others in his/her family to get married?

Possibly Yes No Uncertain NA

31. Do you thin this condition will affect sexual relations with his/her spouse, or any other aspects of sexual life?

Possibly Yes No Uncertain NA

32. How will it affect his relations with his spouse?
Possibly Yes No Uncertain NA

33. If this person were not married, do you think this condition would make it hard for him/her to find a spouse?
Possibly Yes No Uncertain NA

34. Do you think that this condition could make it difficult for others in his/her family to find a spouse?
1. Possibly 2. Yes 0 No 99. Uncertain, 8. NA

35. Do you think condition could make it difficult for affected persons to engage in income generating activities?
1. Possibly, 2. Yes 0 No 99. Uncertain, 8. NA

36. Can you estimate how much you think people with this condition spend on treatment monthly?

36.1	Below # 500	Yes	No
36.2	Between # 500 - #1000	Yes	No
36.3	Between #1000 - # 2000	Yes	No
36.4	Between # 2000 - # 3000	Yes	No

36.5. Others specify----------

APPENDIX III

DEPARTMENT OF BIOLOGICAL SCIENCES
BENUE STATE UNIVERSITY, MAKURDI

Benue State Lymphatic Filariasis Project

Diagnostic Sheet

LGA.....Community/village.....
.....
Identification code----------Name (if necessary)----------
--
Ethnicity----------

1. Demographic Data
1.2. Age----------1.3. Sex: 1. Male [ ] 2. Female [ ]
1.4. Marital Status: 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Widowed [ ]
1.5. Number of children----------
1.6. Occupation----------
1.7. Educational status: 1. No Education [ ] 2. Primary [ ] 3. Secondary 4. Tertiary [ ]

---

2. Physical Examination

Swollen Limb

1	No	
2	Small	
3	Medium	
4	Large	

Swollen Scrotum

1	No	
2	Small	
3.	Medium	
4	Large	

Nodules

1	No	
1	Yes	

Leopard Skin

1	No	
2	yes	

Skin Rashes

1	No	
2	Yes	

Body Itching

1	No	
2	Yes	

---

3. Symptoms and Treatment

Musculo-Skeletal Pain

1	No	
2	Yes	

Ivermectin

1	No	
2	Yes	

No of times	No of years

ICT Filariasis Test

1	Negative	
2	Positive	

Remarks

.....
.....Date.....

APPENDIX IV

DEMOGRAPHIC INFORMATION ON UNAFFECTED RESPONDENTS

Community

Community/LGAs	Frequency	Percent
Agatu	255	15.8
Ado	342	21.2
Oju	241	15.0
Logo	262	16.3
Kwande	510	31.7
Total	**1610**	**100.0**

Sex

	Frequency	Percent
Male	1014	63.0
Female	596	37.0
Total	**1610**	**100.0**

Marital status

	Frequency	Percent
Single	548	34.0
Married	852	52.9
Divorced	52	3.2
Widowed	70	4.3
Total	**1522**	**94.5**
Missing system	88	5.5
Total	1610	100.0

Educational status

	Frequency	Percent
No Education	569	35.3
Primary	300	18.6
SSS	514	31.9
Tertiary	227	14.2
Total	**1610**	**100.0**

DEMOGRAPHIC INFORMATION ON AFFECTED RESPONDENTS

Community

Community/LGAs	Frequency	Percent
Agatu	10	8.5
Ado	26	22.0
Oju	20	16.9
Logo	50	42.4
Kwande	11	9.3
Total	**118**	**99.2**
Missing system	1	0.8

Sex

	Frequency	Percent
Male	78	63.0
Female	35	37.0
Total	**113**	**95.8**
Missing system	5	4.2
Total	118	100.0

Marital status

	Frequency	Percent
Single	21	17.8
Married	78	66.1
Divorced	4	3.4
Widowed	4	3.4
Total	**107**	90.7
Missing system	11	9.3
Total	118	100.0

Educational status

	Frequency	Percent
No Education	61	51.7
Primary	20	16.9
SSS	15	12.7
Tertiary	9	7.6
Total	**105**	**89.0**
Missing system	13	11.0
total	118	100.0

DEMOGRAPHIC INFORMATION ON PARTICIPANTS SCREENED FOR CIRCULATING FILARIAL ANTIGEN USING ICT CARD TEST

Community

Community/LGAs	Frequency	Percent
Ado	150	17.5
Apa	129	15.1
Gwer West	101	11.8
Obi	111	13.0
Ogbadibo	120	14.0
Okpokwu	95	11.1
Ushongo	151	17.6
Total	**857**	**100.0**

Ethnicity

Ethnicity	Frequency	Percent
Idoma	479	55.9
Igede	115	13.4
Tiv	251	29.3
Others	12	1.4
Total	**857**	**100.0**

Sex

	Frequency	Percent
Male	444	51.8
Female	395	46.1
Total	**839**	**97.9**
Missing system	18	2.1
Total	857	100.0

Marital status

	Frequency	Percent
Single	69	8.0
Married	674	78.6
Divorced	18	2.1
Widowed	88	10.2
Total	**849**	**99.0**
Missing system	8	1.0
Total	857	100.0

Educational status

	Frequency	Percent
No Education	404	47.1
Primary	186	21.7
SSS	130	15.1
Tertiary	111	12.9
Total	**831**	**96.9**
Missing system	26	3.0
total	857	100.0

Occupation

	Frequency	Percent
Business	91	10.6
Civil servant	145	16.9
Farming	541	63.1
Students	36	4.2
Others	44	5.1
Total	**857**	**100.0**