Factors Influencing Compliance with Mass Treatment in the National Programme for the Elimination of Lymphatic Filariasis in Kenya

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A Thesis Submitted in Partial Fulfillment for the Degree of Doctor of Philosophy in Public Health in the Jomo Kenyatta University of Agriculture and Technology

2011

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

This thesis is dedicated to my daughter, Cynthia and sons, Jonathan and Francis who are very proud of my achievements. It is also dedicated to my husband, Joseph, for all the support and endurance and to my mother, Justina and my late father, Francis who facilitated my going to school right from the beginning.

ACKNOWLEDGEMENTS

I would like to acknowledge and thank my supervisors, Dr. Mary Amuyunzu-Nyamongo, Prof. Japheth K. Magambo and Dr. Sammy M. Njenga for their valuable advice and guidance throughout the project. Thank you Dr. Amuyunzu-Nyamongo also for the support you gave me during the qualitative data collection activities, Dr. Njenga for support during the initial field visits, selection of study sites and recruitment and training of field workers and Prof. Magambo for finding time to accompany me to the field during the data collection activities. Without your support things would not have worked so well.

I am particularly indebted to UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) which provided the financial resources required at the start of the implementation of the project and also for tuition for the coursework that was a partial requirement for the degree course. My acknowledgement is also extended to The African Doctoral Dissertation Research Fellowship (ADDRF) through The African Population and Health Research Centre (APHRC) in partnership with International Development Research Centre (IDRC) and Ford Foundation which also provided the funding that facilitated the completion of the study.

I thank the Director KEMRI for allowing me time to pursue my studies and also facilitating my travel to very interior places to access remote villages from where the data were gathered.

I am grateful to Dr. Charles S. Mwandawiro formerly of Eastern and Southern Africa Centre of International Parasite Control, KEMRI for his technical input and advice during the initial stages of the study.

I also sincerely thank Mr. Erastus Muniu of Centre for Public Health Research (CPHR), KEMRI for his statistical input and also Dr. Dunstan Mukoko of the Division of Vector Borne and Neglected Tropical Diseases Control who was available for consultation throughout.

In a special way, I would like to thank the Provincial Director of Public Health and Sanitation, Coast Province, the District Medical Officers of Health and Staff of Kwale, Malindi and Kinango District Hospitals for embracing and supporting the data collection activities. I also acknowledge the local leaders at the division, location and village levels from where the data were collected as well as the field assistants who facilitated data collection and transcription.

Thank you and God bless you.

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LIST OF ABBREVIATIONS

ADDRF	-	African Doctoral Dissertation Research Fellowship
ADLA	-	Acute Adenolymphangitis Attacks
AIDS	-	Acquired Immune Deficiency Syndrome
AIHD	-	African Institute for Health and Development
APHRC	-	African Population and Health Research Center
BCC	-	Behavior Change Communication
CDD	-	Community Drug Distributor
CDTI	-	Community Directed Treatment with Ivermectin
CHW	-	Community Health Worker
ComDT	-	Community Directed Treatment
COMBI	-	Communication- for- Behavioral- Impact
DALYs	-	Disability Adjusted Life Years
DEC	-	Diethylcarbamazine
DHMT	-	District Health Management Team
DOT	-	Directly Observed Treatment
ESACIPAC	-	Eastern & Southern Africa Centre of International Parasite Control
FGDs	-	Focus Group Discussions
GAELF	-	Global Alliance to Eliminate Lymphatic Filariasis

GPELF	-	Global Programme for Elimination of Lymphatic Filariasis
HIV	-	Human Immunodeficiency Virus
HST	-	Health System Treatment
IBQs	-	Interviewer-based Questionnaires
ICDS	-	Integrated Child Development Scheme
IDRC	-	International Development Research Centre
IEC	-	Information Education Communication
IU	-	Implementation Unit
ITFDE	-	International Taskforce for Disease Eradication
ITROMID	-	Institute of Tropical Medicine and Infectious Diseases
KEMRI	-	Kenya Medical Research Institute
LF	-	Lymphatic Filariasis
MDA	-	Mass Drug Administration
Mf	-	Microfilaria
NPELF	-	National Programme for Elimination of Lymphatic Filariasis
SAQs	-	Self -Administered Questionnaires
SPSS	-	Statistical Package for Social Scientists
SSIs	-	Semi -Structured Interviews
TDR	-	Tropical Diseases Research
UNDP	-	United Nations Development Programme

WHA - World Health Assembly

WHO - World Health Organization

DEFINITION OF OPERATIONAL TERMS

Adherence: This refers to how closely one follows a prescribed treatment regimen, the obedience of the patient to the medical advice.

Behaviour: The actions or reactions of a person or animal in response to external or internal stimuli. In this study, it referred to reaction towards MDA drugs and perception of need, modern medicine, side effects, disease stage, drug distribution method, social support and alcohol/substance use and the drug distributors.

Community: This refers to two main qualities: 1) populations grouped by age, gender, race/ethnicity; and 2) a geographically defined area occupied by a population that shares common interests based on location. In this case, community is related to the style or way of complying with treatment.

Compliance: This refers to acting in accordance with a wish, request, or demand. In medicine it is the willingness to follow a prescribed course of treatment. It also refers to a patient's continuous loyalty to a recommended course of treatment or the accuracy with which a patient follows an agreed treatment plan. In this

study it referred to the proportion of eligible people who receive and ingest the drugs.

Coverage: This refers to the proportion of eligible people who received the drugs.

Geographic Coverage: This refers to the proportion of villages or urban areas covered by MDA in the targeted Implementation Unit (IU).

Incentives: Refers to any factor (financial or non-financial) that provided a motivation for a particular course of action in this case to distribute drugs to all eligible members of the community that one is assigned to.

Individual Level: This refers to the single person's manner, style or way of complying with treatment.

Mass Drug Administration: Refers to distribution of one or multiple drugs to an eligible population within the framework of the control/ elimination programme. In this study it was used synonymously with mass treatment.

MDA coverage: This is the proportion of a targeted population which is recorded as having ingested antifilarial drugs during MDA.

Socio-economic characteristics: This is derived from several indicators including household income, education level, main occupation, type of housing materials, ownership of assets, presence of latrine in the homestead, source of drinking water, and social status.

Social mobilization: This involves planned actions and processes to reach, influence, and involve all relevant segments of society across all sectors in order to create an enabling environment and effect positive behaviour and social change.

Stigma: A mark or token of infamy, disgrace, or reproach towards people with a certain condition. In this case, the focus is on those with signs and symptoms of LF.

Surveyed Coverage: Is a measure that complements and verifies the reported coverage by using active, population-based cluster survey methods. Thirty clusters of 30 individuals per cluster are used.

Treatment refusal: This is in relation to refusal to take the drugs due to various reasons including fear of side effects, forgetfulness, absence during the MDA, being sick and a lack of agency to take the drugs.

ABSTRACT

Lymphatic Filariasis (LF), a neglected tropical disease (NTD) is targeted by the WHO for elimination by the year 2020. The principal strategy of elimination is by interruption of transmission of infection through annual mass treatment using antifilarial drugs. For elimination to occur the drugs should be administered to all at risk population annually for 4-6 years with treatment coverage of at least 65%-80% in each round. In Kenya, mass treatment using diethylcarbamazine (DEC) and albendazole has been conducted thrice (2003, 2005 and 2008) in Kwale and Malindi districts. Data for the three rounds of treatment show declining compliance levels.

To determine the factors that influence community compliance with mass treatment, a retrospective cross-sectional study based on 2008 treatment round was conducted in the two districts. Treatment coverage data from the programme was used to select 2 high (80% and above) and 2 low (below 60%) coverage locations for each district. Through simple random sampling, 9 villages were selected from the four locations and systematic random sampling used to select 965 household heads who were interviewed for quantitative data. For the qualitative data, semi-structured interviews (SSIs) were conducted with 80 opinion leaders, 80 LF patients with clinical manifestations, 15 community drug distributors, 5 health workers, 4 district programme coordinators and the National Programme Manager all purposively selected. Sixteen focus group discussions (FGDs) were conducted with single-sex adult and youth male and female

groups. The quantitative data were analyzed using SPSS version 15.0 and the statistical significance of differences was assessed by χ^2 test and a *P* value of ≤ 0.05 was considered significant. The qualitative data were analyzed manually according to the core themes of the study.

The results showed that religion influenced compliance with treatment. Compliance among Christians was higher compared to Muslims ($P< 0.001$). Age, sex and marital status did not influence compliance with treatment ($P> 0.05$). There was a significant difference in compliance with treatment among community members with high income levels and those with low income levels ($P< 0.05$). Compliance was higher among community members who had knowledge of signs, cause of LF and those who considered themselves to be at risk of LF infection compared to those who did not ($P< 0.001$). There was a significant difference in compliance with treatment among the community members who had experienced side effects and those who had not ($P< 0.001$). Social support, alcohol taking and substance use were not associated with compliance. Compliance was higher among community members who received information that the drugs were given to treat and control LF than those who did not ($P< 0.001$).

In conclusion, the results indicate a need for alternative methods of drug distribution to be explored in order to capture non-compliers focusing on the differentials observed above. There is need to invest more in health education and to explore alternative

methods of information dissemination so as to create awareness of the treatment. Policy makers need to give priority to LF in budgetary allocations and to show commitment for consistent programme implementation.

CHAPTER ONE:

1.0 INTRODUCTION

1.1 Background Information

Lymphatic Filariasis (LF) also known as 'elephantiasis' caused by filarial worms and transmitted by mosquitoes is ranked as the second largest cause of disability in the world (WHO, 1995). Over a billion people worldwide live in areas where they are at risk of infection with LF due to continuous exposure to infected mosquito vectors (WHO, 2002c). It affects over 120 million people in five endemic regions: Southeast Asia; Africa; the Eastern Mediterranean; the western Pacific; and the Americas (Micheal *et al.*, 1996; Zagari and Savioli, 2002; Ottesen, 2006).

Despite being one of the most debilitating conditions in the world, LF has escaped the attention of mainstream health policy because it is not generally fatal and is restricted to tropical and subtropical countries, where it mainly affects poor people (Durrheim *et al*., 2004). It is estimated that about 41 million people have visible symptoms of LF which include lymphoedema, genital pathology (especially hydroceles), and elephantiasis (WHO, 2004). A further 76 million have hidden infections, most often with microfilariae in their blood and hidden internal damage to their lymphatic and renal systems. In addition, another 44 million infected patients have recurrent infections and abnormalities of renal functions (Bockarie and Molyneux, 2009). It is "a disease of

poverty" which is painful and disfiguring, and which undermines health, economic opportunities and social interaction (WHO, 1995).

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 hydrocele. These represent about 40% of the global burden of the disease (Michael *et al*., 1996).

In Kenya, it is estimated that at least 2.5 million people living in 12 endemic districts (Kaloleni, Kilifi, Msambweni, Kinango, Kwale, Malindi, Lamu, Tana River, Tana Delta, Taita, Taveta and Mombasa) along the coastal region are at risk of infection. A study conducted in a community near Vanga at the south-eastern part of Kwale District near the border with Tanzania (Estambale *et al*., 1994) showed that microfilaria prevalence was 13.7% and hydrocele among males 15 years or older and elephantiasis prevalence rates were 16.5% and 2.4%, respectively. Another study conducted in two adjacent communities in Muhaka area, Kwale District (Wamae *et al*., 1998) underscored the highly focal distribution of bancroftian filariasis in the area. The transmission intensities between the two communities, which were in close proximity, were significantly different.

A cross-sectional survey in three villages of Kinango location, Kwale district reported 16.4% microfilaria prevalence and 10.4% hydrocele prevalence among males 5 years or more old (Njenga *et al*., 2000). An epidemiological survey in 12 villages selected for a

study to determine the effects of permethrin-impregnated bed nets (Mukoko *et al.*, 2004) found the overall microfilaria prevalence mean to be 16% and the range to be 8.1% - 27.4%. The study further emphasized the highly focal nature of the distribution of filariasis. Recent data collected pre-2008 mass treatment in three sentinel sites of Malindi District, showed that the average microfilaria prevalence was 1.2%, 0.9% and 1.2% in Masindeni, Mikuyuni and Singwaya sentinel sites respectively (unpublished data from Ministry of Public Health and Sanitation, Kenya, 2009).

The recognition that two-drug single dose treatment strategies (albendazole and diethylcarbamazine (DEC) or ivermectin) are significantly more effective than treatment with either drug alone, has been a major advancement in the development of control regimens for LF (Moulia-Pelat *et al.*, 1995; Ottesen and Ramachandran, 1995; Ismail *et al.*, 1998; Wamae *et al.*, 2004). However, a recent Cochrane review reports that there is insufficient evidence to confirm or refute that albendazole co-administered with DEC is more effective than DEC alone in clearing microfilariae or killing adult worms (Addiss *et al.*, 2004).

In 1997, WHO passed a resolution urging member states to strengthen activities towards eliminating LF as a public health problem and requested the Director-General to mobilize support for global and national elimination activities. The principal objective of the Global Programme to Eliminate Lymphatic Filariasis (GPELF) is to interrupt transmission of infection by decreasing the parasite population in human hosts

through annual mass administration of single-dose DEC or ivermectin in combination with albendazole (Ottesen, 2000). The drugs should be administered for 4 to 6 years with treatment coverage of at least 65% to 80% of all at risk in each round for LF elimination to be achieved (Plaisier *et. al,* 1998). The goal of GPELF is to eliminate the disease by the year 2020. It is important for the programmes to ensure that no group of persons misses all rounds of treatment otherwise the missed individuals who are infected, form reservoirs of microfilaria (mf), which contribute to recrudescence of the infection (Plaisier *et al*., 2000).

Kenya joined the GPELF in August 2001. The first MDA using DEC and albendazole was successfully conducted in September 2002 in Kilifi District as the first Implementation Unit (IU). The treatment coverage achieved was 81%. In October 2003, two additional districts, Kwale and Malindi undertook mass treatment in addition to Kilifi, which was undergoing its second round. In the 2003 round of treatment the coverage for the three districts was Kwale 85%, Kilifi 75% and Malindi 77%. In March 2005, Kwale and Malindi received the second and Kilifi the third round of treatment and in December 2008, Kwale and Malindi received the third and Kilifi the fourth round of treatment. Data compiled by the National Programme for the three rounds of treatment, 2003, 2005 and 2008 for Kwale and Malindi districts show a decline in the coverage from 85% to 71% to 64.3% and 77% to 76% to 62.8% respectively (unpublished data from the Ministry of Public Health and Sanitation, Kenya, 2009).

Investigations on the locations within the divisions of Kwale District showed a coverage of as low as 45.5%, in 2005 and 59.5% in 2008 for Gadini location of Kinango division, 55.2% in Mwereni and 59.7% in Vanga locations of Lunga Lunga division. On the other hand, some locations of Matuga division, Kwale District recorded high coverage levels: Golini 89%: Tiwi 82%: and Ng'ombeni 80.4%. In Malindi district, further investigations showed that Malindi division recorded high coverage with Watamu location achieving 88.6%, Ganda 98.6%, Jilore 83.5% and Chakama 94.5% in 2005. Goshi location achieved high (84.3%) treatment coverage in 2008. Adu location of Marafa division achieved the lowest coverage at 59.6% in 2005 whereas Gongoni location achieved low (35.2%) treatment coverage in 2008 (unpublished data from the Ministry of Public Health and Sanitation, Kenya, 2009). The reasons for these declines in treatment coverage and compliance are yet to be established.

1.2 Problem Statement

Compliance is a key element in the elimination of LF. Inversely, persons who consistently absent themselves from the treatment have the potential to become the reservoir for the LF parasite and facilitate recrudescence of infection posing a challenge to the elimination efforts by the year 2020. This study therefore sought to determine the factors that influence compliance with mass treatment during the lymphatic filariasis elimination programme in selected sites of Kenya.

1.3 Justification for the Study

Low compliance has negative implications to the success of the LF elimination programme. Therefore assessment of factors influencing compliance during MDA is essential in informing strategies for increased treatment coverage during NPELF to acceptable and recommended levels (65% and above). It is therefore important to determine the factors that contribute to low treatment compliance in order to inform the design of responsive approaches and make recommendations to the programme. The recommendations thus derived would help address the issues contributing to low compliance and raise the numbers of those treated during every MDA round. The recommendations could also help to sustain high compliance and coverage which will contribute to the achievement of LF elimination within the given timeframe.

1.4 Research Questions

1. What socio-economic factors influence community compliance with treatment for lymphatic filariasis elimination?
2. How do individual preferences and behavioral factors influence compliance with mass treatment?
3. What factors influence the community drug distributors' motivation to participate in the lymphatic filariasis elimination programme?
4. What is the role of behavior change communication in mass drug administration uptake?

1.5 Hypothesis

Alternative hypothesis: Socio-economic and behavioural factors influence community compliance with treatment for lymphatic filariasis elimination.

1.6 Objectives of the Study

1.6.1 General Objective

To determine the factors that influence compliance with mass drug administration in the National Programme for Elimination of Lymphatic Filariasis (NPELF) in Kenya.

1.6.2 Specific Objectives

1. To determine the socio-economic factors that influence compliance with mass treatment for lymphatic filariasis elimination.
2. To determine the influence of individual preferences and behavioural factors on compliance with mass treatment for lymphatic filariasis elimination.
3. To establish factors that influence community drug distributors' motivation to participate in the lymphatic filariasis elimination programme.
4. To establish the role of behavior change communication in mass drug administration uptake.

1.7 Limitations of the Study

The study results should be interpreted with caution due to a potential recall bias. Although three months have been used as a standard period of recall, the qualitative data were collected five months after the MDA. Inconsistency in implementation of the

LF programme may possibly have contributed to lack of awareness of the MDA programme. This is mainly due to the presence of other Ministry of Health programmes such as malaria control and childhood immunization campaigns which are more regular and thus more recognized by the community members.

1.8 Expected Application of Results

The results of this study will be disseminated to the local, district, provincial and national levels through meetings and workshops. The study results will also be shared with the NPELF Manager and District Programme Officers as well as the health workers with the aim of influencing the planning, implementation and evaluation systems especially in scaling up to other Kenyan districts not yet covered by the NPELF. Integrating the study results would help achieve higher compliance levels and thus improve the health outcomes of the interventions. Meetings (*barazas*) will be held at the community level to disseminate the results and to discuss improvements in MDA coverage. The findings will also be disseminated to the annual Regional Programme Managers' meeting in 2011 to inform other country programmes. The findings will also be disseminated to the GPELF which emphasizes on coverage and compliance surveys as critical to the programme's success. The results have been submitted for publication to peer reviewed journals for broader readership and application.

1.9 Conceptual Framework

This study was based on a conceptual model postulated by Ickovics and Meilser (1997), which outlined a multi-variable framework for clinical HIV and AIDS research and care to organize the factors that impact medication adherence. Factors that impact on treatment adherence are: patient-based; provider-based; and treatment-related. In this study, a fourth factor, community-based was added as a consideration of the community issues since treatment for LF is conducted through MDA and requires community involvement in deciding on when and how to implement the programme. The factors presented in figure 1 were considered.

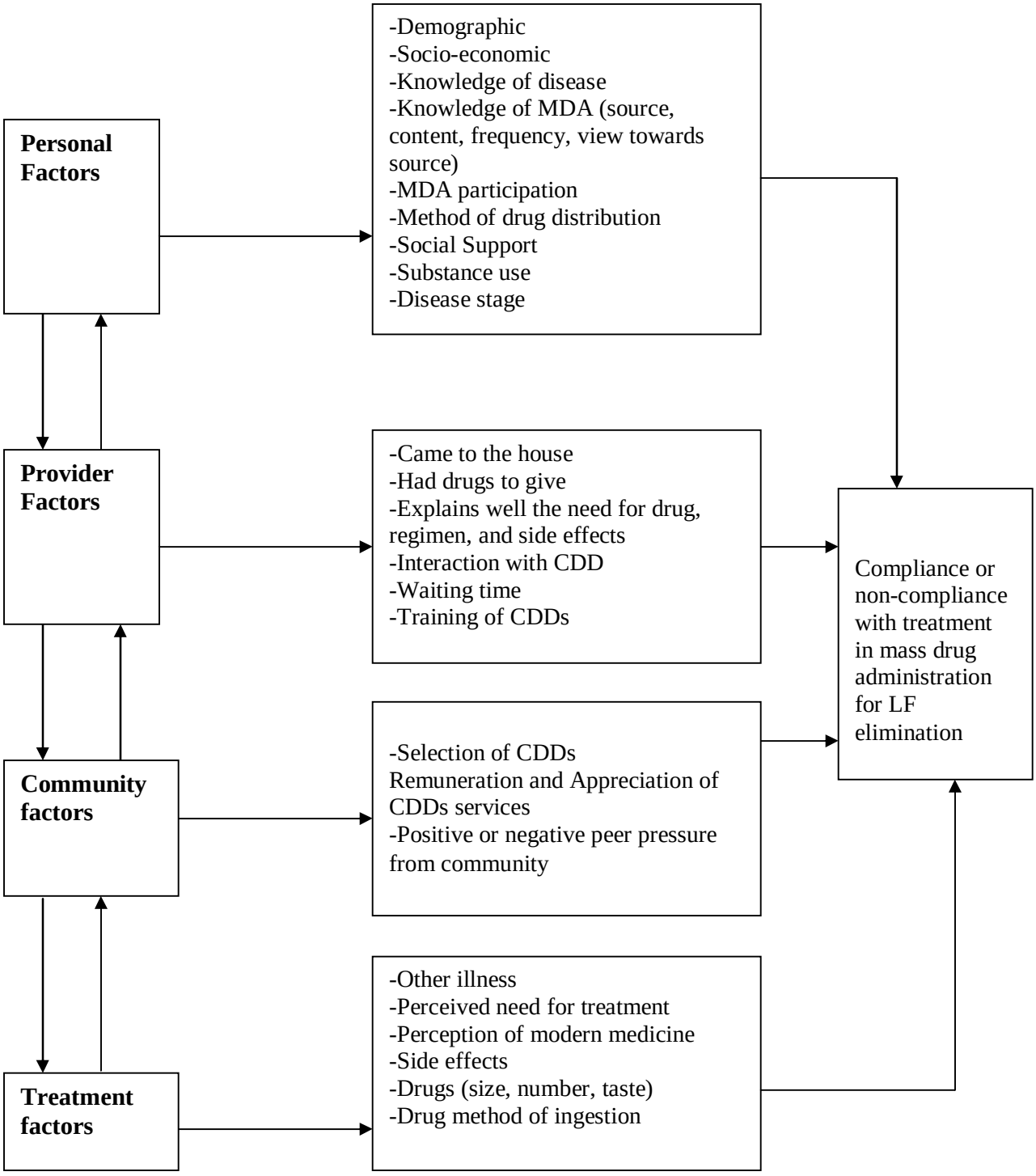

Figure 2.1: Conceptual Model of Factors Impacting on Treatment Compliance.

Source: Njomo, (2008).

CHAPTER TWO:

2.0 LITERATURE REVIEW

2.1 History of Lymphatic Filariasis

Lymphatic filariasis is one of the oldest known diseases affecting humans in various regions of the world. Its clinical manifestations have been described since the beginning of the recorded human history (Rajan, 2000). An Indian medical textbook completed in about 70 AD described symptoms similar to LF whilst an Arabic description of the condition was recorded around the 10^{th} century. Lymphatic filariasis, commonly known as elephantiasis, was associated with many myths; for instance, it was believed that the person who martyred St. Thomas developed the disease (Routh and Bhowmik, 1993).

The western world became aware of the disease in Africa through colonialism during the 18^{th} and 19^{th} centuries. The earliest western description of the disease was by a French physician, Jean-Nicolas Demarquay who discovered microfilariae (Demarquay, 1863). In 1868, Otto E.H. Wucherer further described the microfilariae from urine and in 1872 the parasite was identified in blood by Thomas Lewis (Routh and Bhowmik, 1993). Joseph Bancroft is honoured to have first described the adult form in human tissue in 1877 (Cobbold, 1877). The mosquito vector of LF and the periodicity of microfilariae were reported by Sir Patrick Manson in 1878 and the full life cycle of the parasite was determined by Thomas Bancroft in 1899 (Rajan, 2000).

The distinction between bancroftian and brugian filariasis was not made until 1958. This followed observation by Brug that microfilariae from patients in North Sumatra had distinctive features which distinguished them from those that caused bancroftian filariasis (Buckley, 1960). *Brugia timori* was identified as a separate species by David & Edeson in 1965 from restricted areas of Asia - East Timor, Timor Leste and neighbouring islands of Indonesia -Flores, Alor, Sumba, Lembata and Pantar (Fischer et *al.*, 2004).

2.2 The Parasite and its Life Cycle

Wuchereria bancrofti, *Brugia malayi* and *Brugia timori* have a similar life cycle. The adult parasites causing LF live in the lymphatic system of the human body. The female worm produces offspring known as microfilariae, which leave the lymphatic system to enter the blood where they may be taken up by mosquitoes in a blood meal. The microfilariae undergo about 14 days of development in the mosquito to become infective, third-stage larvae, which migrate to the mosquito's mouthparts. These larvae may be transmitted to humans at the time the mosquito takes its next blood meal. Once transmitted to humans, the larvae take approximately 6-12 months to mature into adult worms. The adult female has the capacity to produce several million microfilariae in its approximate 4-6 years reproductive lifespan (Addiss, 1998). The complete life cycle is shown in Figure 2.

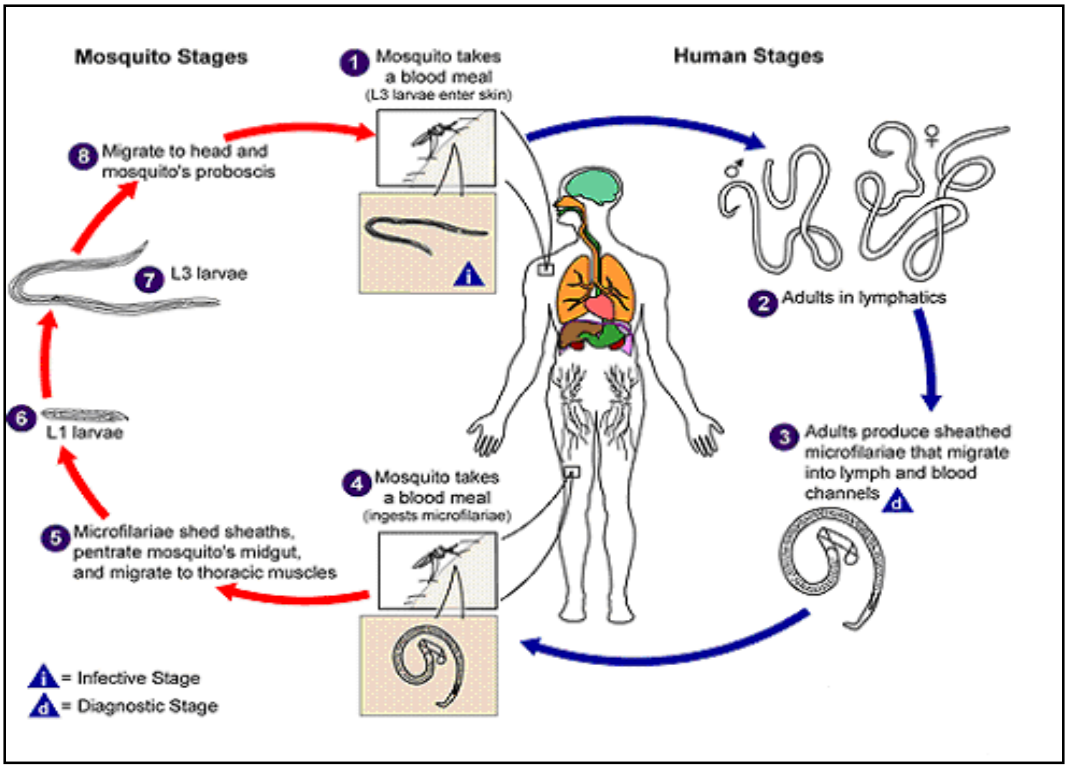

Figure 2.2: The Life Cycle of Filarial Nematodes in the Human and Mosquito Hosts (Source: www.dpd.cdc.gov/dpdx/HTML/Filariasis.htm).

2.3 The Burden of Lymphatic Filariasis

2.3.1 At Global Level

Lymphatic filariasis is caused by filarial parasites that are transmitted by mosquitoes. The disease caused by *Wuchereria bancrofti* is strictly in humans and is therefore distributed according to the breeding sites of the vector. Lymphatic filariasis is an important cause of morbidity in the tropics and subtropics. Bancroftian filariasis is the most prevalent and is believed to have been introduced into the Americas from Africa through slave trade. Brugian filariasis is spread in South and South East Asia, with

Brugia timori infection having a focal distribution in Timor and eastern Indonesia (Kyelem, 2007).

Although some countries such as China have eliminated LF, a large number are still endemic without active control programmes (Anonymous, 2005; Zagaria and Savioli, 2002). In addition, LF has been found to be spreading in some places in Africa (Mak, 1986; Michael et *al.*, 1996). According to WHO (2000c) eighty-three countries in Africa, the south Americas, Asia and the Pacific are estimated to be endemic for LF. About 1.3 billion people are at risk of infection and 120 million are infected by the parasite. The public health disability adjusted life years lost (DALYs) was estimated to be about five million in 1999 (Haddix and Kestler, 2000; WHO, 2000b). *Wuchereria bancrofti* is the cause of 90% of LF cases worldwide and the other two species *Brugia malayi* and *Brugia timori* account for the remaining 10% (Michael and Bundy, 1997).

2.3.2 Lymphatic Filariasis in Africa

It is estimated that out of the 120 million individuals infected worldwide, about one-third live in sub-Saharan Africa. The population at risk in this region is some 500 million and LF may cause US$1 billion in losses each year (Haddix, 1999; Lindsay and Thomas, 2000; Ramaiah *et al.*, 2000; WHO, 2009).

Africa represents the second largest number of people at risk (478 million) and 39 (47%) of the 83 LF-endemic countries are in this region (WHO, 2005). Nigeria has the largest population at risk (80 million people) on the African continent, and ranks second worldwide (WHO, 2002c). The proportion of the burden of LF estimated as the number of DALYs lost in Africa is about 37% of the total LF burden (WHO, 2000b). The WHO African region estimates that approximately 90% of its LF burden is attributed to *Anopheles*-transmitted *Wuchereria bancrofti* and the other 10% to *Culex*-transmitted *Wuchereria bancrofti*.

2.3.3 Lymphatic Filariasis in Kenya

The first published report on LF in Kenya is on the Lamu Island for the period 1911-1912. *W. bancfrofti* infection was reported in 42 (35.6%) of 118 persons examined (Dunderdale, 1921). A survey conducted to examine for microfilariae in filariasis endemic villages in Pate Island and Tana River found 35.3% of the people to be microfilaria (mf)-positive (Dunderdale, 1921). An epidemiological survey, also in Pate Island, recorded a human infection (microfilaria) rate of 32% and an "elephantiasis" (lymphoedema) rate of 11% in 142 males examined (Heisch *et al*., 1959). A major survey representing the entire Kenyan coast from Vanga on the southern coast near the Tanzanian border to Pate Island on the northern coast was conducted in 1962 (Nelson *et al*., 1962). In general, mf rates among the villages were found to vary from 25% in the north to10% in the south. Among 89 males examined in Faza Island in the north coast the prevalence of mf, "elephantiasis" and hydrocele were 40.6%, 16.8% and 39.3%

respectively. However, the survey was mainly confined to the 10km wide "coastal strip" and the areas along the Tana and Sabaki rivers.

Between 1971 and 1973, a cluster sample survey was conducted among adult males over 14 years of age in 73 sites to gain an insight into the prevalence of the disease in the Coast Province and to assess its public health importance by determining the proportion with clinical signs and symptoms (Wijers, 1977). A total of 5004 males were examined in the study and 28.4% were found to be mf-positive. Physical examinations for clinical signs and symptoms of chronic disease identified 30.2% to have had either hydrocele or elephantiasis of the genitalia or limbs. The overall prevalence of hydrocele alone was 29.9%. The highest mf rate observed in the clusters was 56% and the highest clinical signs and symptoms rate was 64%.

Two areas were chosen for further investigations on the epidemiology of the disease: Mambrui, which is a small coastal town and Jaribuni, a rural area (Wijers and Kiilu, 1977: Wijers and Kinyanjui, 1977). Microfilaria rate in Mambrui was 21.7% and the hydrocele rate was 15.4% while in Jaribuni, the corresponding rates were 22.0% and 17.0%, respectively. In most parts of the coastal region the prevalence of the infection is between 10-25 % (Estambale *et al.,* 1994; Wamae *et al*., 1998; Njenga *et al*., 2000; Mukoko *et al*., 2004).

Direction towards control of LF in Kenya was indicated in trials on MDA to whole affected communities in a few villages in Kilifi and Indian Ocean islands of northern coast of Kenya (Wijers and Kinyanjui, 1977). These studies showed that mf rate was reduced by 75% in most communities one year post treatment and 3 years post treatment the mf rate was below 5% in most treated communities. The number of infective stage larva/1000 vector mosquitoes dissected was reduced by 92-99% in the treated communities.

2.4 Treatment of Lymphatic Filariasis

2.4.1 Chemotherapy

In LF the only drug that was available for some 50 years was diethylcarbamazine citrate (DEC) used at a dose of 6mg/kg/ day for 12 to 14 days (Ottesen, 1985). The microfilaricidal effect of DEC has been widely documented (Addiss and Dreyer, 1999; Ismail *et al.,* 2001). Microfilariae are usually rapidly cleared from the peripheral blood though at high intensity of infection clearance may be delayed (Kimura *et al.,* 1985). There has been evidence suggesting that single-dose treatment with 6 mg/kg of DEC has comparable macrofilaricidal efficacy and long-term microfilaricidal efficacy with a 12 day course (Dreyer *et al.,* 1995). The 12-day course provides more rapid short-term microfilaricidal suppression but when other factors are considered such as cost, convenience and patient compliance it seems reasonable to recommend a single-dose regimen (Ottesen, 1985).

Evidence for adult worm deaths following DEC treatment has included prolonged suppression of microfilaraemia, development of local nodules and identification of degenerating worms in biopsies of these nodules (Figueredo-Silva *et al.*, 1996; Addiss and Dreyer, 1999). Recently, investigators have used ultrasound to monitor the effect of diethylcarbamazine on adult worms *in vivo* (Dreyer *et al.*, 1998). Several observations showed that DEC treatment of infected individuals stopped the filarial dance sign (of adult worm) as observed by ultrasound (Noroes *et al.*, 1997; Fox *et al.*, 2005). Several investigators have reported a decrease in the incidence of filarial adenolymphangitis following treatment with DEC (Simonsen *et al.*, 1995b) while others have reported no change in lymphatic function in persons with lymphoedema one year after treatment with DEC (Freedman *et al.*, 1995). However, several observations of resolution of early stage hydrocele and lymphoedema have been reported following community-wide mass treatment with DEC (Meyrowitsch *et al.*, 1996; Dunyo and Simonsen, 2002).

Diethylcarbamazine is known to produce side effects that can be systemic such as fever, headache, myalgia, malaise and haematuria related to the death of microfilaria or localized such as nodules, pain, adenitis and retrograde lymphangitis. These side effects suggest an inflammatory reaction due to the death of the adult worm at a particular anatomical site (Addiss and Dreyer, 1999). It is notable that DEC cannot be used in endemic areas with co-infection of onchocerciasis as it may lead to serious adverse events (Molyneux *et al.*, 2003) due to severe Mazotti reactions (complex skin reaction

seen in patients after undergoing treatment of onchocerciasis). Furthermore, the killing of microfilaria in the eye can lead to blindness.

In areas where LF is co-endemic with onchocerciasis, the drug recommended for use is ivermectin which is a microcline, for the treatment and control of onchocerciasis (Ottesen and Campbell, 1994). It has also been shown to be a potent microfilaricidal agent against some filarial parasites. In a single 200 - 400µg/kg dose it suppresses *W. bancrofti* microfilariae for periods of 6 -24 months (Richards *et al.*, 1991; Kazura *et al.*, 1993). The systemic side effects for ivermectin are similar to DEC but there are no local side effects associated with death of the adult worms seen in DEC treatment (Cartel *et al.*, 1991).

The third agent used for the control of LF is albendazole. Albendazole is a broad spectrum benzimidazole carbamate with efficacy against a wide range of human and animal helminthes parasites (Horton, 2000). The mechanism of action of albendazole remains unclear (Addiss *et al.*, 2004).

For the control of LF, it is recommended that DEC or ivermectin be given in combination with albendazole as a single dose. Single doses of albendazole (600 mg) given alone or in combination with either ivermectin (400 µg/kg) or DEC (6 mg/kg), have proved to have both long-term effectiveness and safety in decreasing microfilaraemia in *W. bancrofti* infections (Ismail *et al.*, 1998). These findings were also seen at the lower dosages (albendazole 400 mg and ivermectin 200 µg/kg),

commonly used in the treatment of intestinal helminthes and onchocerciasis, respectively (Addiss *et al.*, 1997; Ismail *et al.*, 2001). Furthermore, the addition of albendazole does not result in an increase in frequency of adverse reactions compared with DEC treatment alone (Ismail *et al.*, 2001). Moreover, the significant microfilaricidal activity induced by the two drug combinations, circulating filarial antigen levels, presumably reflecting the presence of viable adult worms, were seen to fall progressively. Important to note is that the combination of albendazole with DEC had consistently lower antigen levels than the combination with ivermectin probably reflecting the superior macrofilarical effect of DEC (Ottesen *et al.*, 1999; Ramzy *et al.*, 2006).

2.4.2 Treatment of Individual Patients

The aim of individual treatment is to eliminate the parasite in order to reduce or prevent morbidity and DEC has been shown to be effective and safe (WHO, 1987). For treating patients infected with *W. bancrofti* the recommended dosage for DEC is 6mg/kg of body weight daily for 12 consecutive days. A repeat course may be initiated 2 weeks after the last dose of the previous course. The drug is excreted from the body mainly through the kidneys. It is recommended that DEC should not be given in pregnancy and care should be taken when treating individuals with chronic kidney or cardiac disorders. Two types of adverse reactions can occur with DEC- general and local with or without fever and they are positively associated with microfilaraemia density (Singh *et al.*, 1985).

2.5 Factors Associated with Treatment Compliance

Several countries have observed that population compliance is often significantly lower than reported coverage. The technical advisory group of GPELF noted that the delivery of drugs to people who do not consume the drugs has an adverse effect on drug availability as well as programme impact. For this reason, it encourages programme managers to implement their programme using the principal of directly-observed treatment (DOT) (WHO, 2008). A number of studies have underscored the importance of compliance in the elimination programmes (Remme *et al*., 1995; Michael *et al*., 2004).

The difference between coverage and compliance, which means that a large proportion of the population receive the tablets but do not consume them, has been documented in Indian states (Babu and Kar, 2004) and is a common problem to Kenya and other LF elimination programmes. Many of the distributors are loaded with a high target of households in a limited amount of time and therefore they just issue the tablets and do not observe the swallowing. Babu and Mishra (2008) highlighted that a great majority of the people consume the drugs due to the perceived benefits of the drug and that community mobilization and activities of information, education and communication (IEC), as well as the role of the distributors should be emphasized. In a study by Mathieu *et al*. (2004), the knowledge that filariasis was mosquito-borne was associated with taking drugs during MDA indicates that health messages which explain LF motivate people to take the antifilarial drugs. It is therefore worth investing in

explaining about MDA as well as the LF disease, its causes, transmission, risk and prevention.

A study by Babu and Kar (2004) highlighted the predominant reasons for not consuming the drugs to be: fear of side effects; being away during the MDA; being sick; and lack of perceived need to take the drugs. According to the same study, training of the health workers and the distributors also influenced compliance with treatment. Intensive training was therefore prescribed for all drug distributors on communication skills and on the disease and its prevention. In Leogane, Haiti knowledge of LF was found to be directly related to participation in MDA (Mathieu *et al.*, 2004). Other factors determining compliance, which are more readily modifiable such as compliance within the endemic communities and coverage of the largest population are heavily dependant on: 1) operational effectiveness of the programmes (especially social mobilization, supervision and monitoring); 2) the adequacy of resources (both funding and human); and 3) the political commitment to support the programme (Kyelem *et al.*, 2008).

2.6 Prevention of Disability Associated with Lymphatic Filariasis

The goal of the second component of the elimination programme is to prevent disabilities associated with LF so that people with the disease are enabled to have a better quality of life and to ensure their full participation in community life, both socially and economically. This involves secondary and tertiary prevention which is

aimed at people who are already affected by the disease, and can be achieved through disability management as part of home-based long-term care and through changing the attitudes of communities (WHO, 2005). Current lymphoedema management strategies are based on the central role of acute adenolymphangitis attacks (ADLA) as a trigger for lymphoedema progression.

Simple intervention packages are in use that have resulted in dramatic reductions in ADLA rates, a lower prevalence of chronic inflammatory cells in the dermis and sub dermis, and improvement in quality of life. Thus, although knowledge of filariasis-related morbidity and its treatment has expanded in recent years, much work remains to be done to address the needs of more than 40 million persons who suffer from these conditions worldwide (Addiss and Brady 2007).

Addiss (2005) posed an ethical question on how the filariasis programme could limit itself only to MDA when millions of persons with chronic lymphoedema and hydrocele expect to receive little clinical benefit, and when safe and effective clinical interventions already existed that could be used to address these conditions. Furthermore, mobilizing communities to accept MDA is facilitated when access to care is provided for those with chronic filarial disease. Cantey *et al.* (2010) demonstrated that lymphoedema management programmes also increased compliance with MDA programmes. It was also thought that humanitarian and religious donors, who may have

no inherent interest in elimination of a parasite *per se*, might be motivated to assist in relieving the suffering of affected individuals.

2.7 Socio-economic Consequences of Lymphatic Filariasis

Whilst LF is not a fatal disease, it brings a significant social and economic burden to affected individuals, their communities and the health system (Gyapong *et al*., 1996b; Ramaiah *et al*., 1997; 1998; 1999; 2000; Ramu *et al*., 1996). Indeed, the treatment of lymphoedema and ADL episodes of secondary bacterial infection is costly as the infection is life-long and the conditions impair productivity of agricultural communities. Surgical care of patients with hydrocele and other manifestations places a great burden on health care in highly endemic areas. Mwobobia *et al*. (2000) in a study done in Kenya reported that the generally high frequencies of hydrocelectomy in the study area were evidence of the heavy social and economic burden imposed by hydrocele-attributable morbidity and its management.

In addition, it has been documented that chronic physical disability resulting from LF may have serious negative social and psychological consequences for the patients. Patients with elephantiasis or hydrocele are often shunned and become isolated within their communities; they are mocked and suffer social stigmatization. A study done in Kenya by Amuyunzu (1997), however found that the community did not stigmatize people with filarial swellings, and invited such people to social functions and shared food and drinks with them without any stigma. Hydrocele in men of all ages can lead to

sexual and social dysfunction; whereas lymphoedema of the limbs or genitals may lead to social ostracism of young women (Dreyer *et al.*, 1997; Ahorlu *et al.*, 1999). The consequences of LF can lead to dependence, as patients may not be able to work, marry or participate in social gatherings, situations which reinforce their isolation and create a vicious poverty inducing circle. The study conducted by Amuyunzu (1997), found that the patients identified intermittent pain with chronic manifestations as a major problem and that once in pain, the patients became bedridden and exerted demands for cure and care from members of their households. In summary, the debilitating manifestations of LF make it a major source of psychosocial and economic burden to individual patients and households in the endemic communities.

2.8 Vector Control

Parasitism and disease incidence are linked to parasite transmission intensity by the vector (Kazura et *al.*, 1997). Hence, preventing the vector/host contact is likely to have a significant impact in reducing transmission of filarial parasites. Vector control success depends on community motivation and involvement and it is often expensive and rarely sustainable (Srividya *et al.*, 1996; Krishnamoorthy *et al.*, 2002). The following approaches depending on the vector species can be used: larviciding using *Bacillus sphaericus*, polystyrene beads, bed nets (both insecticide-impregnated and unimpregnated), chemical agents, indoor residual spraying (Bockarie *et al.*, 2002; Pedersen and Mukoko, 2002; Burkot *et al.*, 2006). The current study did not however focus on vector control in Kenya.

2.9 Lymphatic Filariasis Elimination

2.9.1 The Global Programme to Eliminate Lymphatic Filariasis

Despite decades of research and control efforts little impact was made on controlling LF before the launch of the GPELF in 2000 with the exception of China, Solomon Islands, Sri Lanka (*Brugia*), Suriname, Japan and Korea (Webber, 1979; Kimura *et al.*, 1985; 1992; Ottesen, 1997; 1999).

The International Task Force for Disease Eradication (ITFDE) was set up in 1988 to evaluate the potential for eradication of candidate diseases (Molyneux *et al.*, 2004). The Task Force reviewed almost 100 medical conditions (mostly infectious diseases) using the following criteria: social and political considerations; biological and technical feasibility; and a full understanding of cost and benefit issues (Aylward *et al.*, 2000). In 1993, the ITFDE concluded that only six diseases (dracunculiasis, rubella, poliomyelitis, mumps, LF and cysticercosis) were categorized as eradicable or potentially eradicable based on existing technology (CDC, 1993).

There is, however an indication that with regard to eradication and elimination, the terms have often been used inappropriately (Molyneux *et al.*, 2004). Nevertheless, most authorities agree that the following criteria are essential in assessing eradicability of infectious diseases: availability of an effective intervention to interrupt transmission of the agent; availability of practical diagnostic tools with sufficient sensitivity and

specificity to detect levels of infection that can lead to cessation of transmission; and humans are the only essential host for the life-cycle of the agent (Dowdle, 1998).

On the basis of scientific advances and LF elimination success in some areas including China, Solomon Islands, Santa Catarina state in Brazil (Webber, 1979; Fan, 1990; Kimura *et al.*, 1992; Schlemper *et al.*, 2000), the Fiftieth World Health Assembly (WHA) in May 1997 passed a resolution urging member states to eliminate LF globally as a public health problem (WHO, 1997).

After the adoption of the resolution WHA 50.29 calling for LF elimination, the global programme was launched. The GPELF, coordinated by WHO, aims at eliminating LF globally as a public health problem by 2020. The strategy is based on interruption of transmission using MDA and, in parallel, alleviating and preventing the suffering and disability caused by the disease (Ottesen *et al.*, 1997; Ottesen, 2000; Molyneux and Zagaria, 2002). It is envisaged that a yearly treatment with albendazole and ivermectin or albendazole and DEC to all at risk populations for 4-6 years (corresponding to the estimated reproductive lifespan of the adult parasite) will decrease the reservoir of microfilariae and stop transmission of *W. bancrofti* provided there is satisfactory drug coverage.

The recommended drug distribution strategy has been preferred to vector control which still requires validation for its impact in large-scale control programmes and cost-

effectiveness assessment. Vector control is often perceived to be expensive and rarely sustainable while two of the drugs are donated free of charge for Africa; nevertheless, vector control activities are encouraged as an ancillary intervention by the GPELF (WHO, 1999; WHO, 2002). The impact of vector control in malaria e.g. indoor residual spraying and bed nets have potential positive impact on *W. bancrofti* transmission (Pedersen and Mukoko, 2002).

Mass drug administration requires resources and middle income countries such as China have made more progress compared to Africa where all 39 endemic countries are low income economies and only 15 were implementing MDA by 2007 (WHO, 2007). Of the 382 million people at risk in the region, only 47 million (12.3%) had been treated by 2007 (WHO, 2008). Increasing resources for scaling up coverage in poor countries is the key to achieving global elimination by 2020 (Bockarie and Molyneux, 2009).

Following the establishment of the GPELF, governments of countries endemic for LF have been, since 2000, initiating programmes to eliminate the disease as a public health problem. In its first eight years the GPELF delivered 1.9 billion treatments to individuals living in 48 of the 83 endemic countries (Ottesen *et al.*, 2008). The 310 million treatments to children and women of childbearing age have also significantly reduced intestinal helminthes, onchocerciasis, lice, scabies and other conditions particularly anemia (Ottesen, *et al*., 2008; Molyneux, 2009).

Against the dramatic progress made by the global programme with respect to MDA, the technical advisory group was concerned at the pace of efforts to manage disability associated with LF. Effective disability prevention programmes reinforce community acceptance of MDA and are a necessary component of LF elimination programmes (Cantey *et al.,* 2010). The GPELF technical advisory group welcomed the completion of the new manual on disability prevention and urged WHO to make resources available to programme managers. The technical advisory group also urged the secretariat to redouble its outreach efforts to the many nongovernmental development organizations engaged in disability prevention efforts, recognizing their essential role in these activities (WHO, 2008).

Most countries implementing MDA have also initiated activities on care and prevention of LF-related disability. The activities focus largely on a community home-based self-care approach where LF sufferers, their households and communities are taught in their own homes how to treat LF-related lymphoedema and prevent acute attacks. To alleviate and prevent suffering and to reduce the disability and handicap caused by the chronic consequences of LF, the principal strategy focuses on decreasing secondary bacterial and fungal infections of limbs or genitals where the lymphatic function has already been compromised by filarial infection. Scrupulous hygiene and local care are dramatically effective in preventing painful, debilitating and damaging episodes of lymphangitis. These consist of regular washing with soap and water, daily exercising of the limbs, limb elevation, wearing comfortable footwear and carrying out other simple

procedures at home (WHO, 1994a; Ottesen, 2000; Molyneux and Zagaria, 2002). In addition, efforts have been intensified to provide increased access to hydrocele surgery at district level (WHO, 2006).

2.9.2 The Global Alliance to Eliminate Lymphatic Filariasis

After the resolution calling for LF elimination by 2020 was passed in 1997, the Global Alliance to Eliminate LF (GAELF) Secretariat invested in establishing a broad coalition of partners in the global effort. In December 1999, the partners in Lymphatic Filariasis Elimination agreed on an organizational plan that defined the LF Global Alliance as "a free, non-restrictive partnership forum open to all interested parties for the exchange of ideas and the co-ordination of activities" (WHO, 1999).

In May 2000, the first meeting of the GAELF was held forming a unique partnership of public and private sector organizations committed to eliminating LF. The partners may have different perspectives, roles and mandates, which are co-ordinated to create the desired synergy. The Alliance brings together international organizations and foundations, bilateral donors, international non-government development organizations, the private sector with the two drug donor companies (GSK and Merck & Co), academic and research institutes and Ministries of Health of the endemic countries. The partners provided early support in the task of eliminating lymphatic filariasis (Molyneux et *al.*, 2000; WHO, 2002b). The prime role of the GAELF is to serve the

global programme, particularly through advocacy and raising awareness and creating societal and political commitment (WHO, 2000a).

Since 2007, the US Government, the UK Government and the Bill and Melinda Gates Foundation have pledged new funding to lend support to the implementation of preventive chemotherapy programmes, and the pharmaceutical companies Merck, GlaxoSmithKline, Pfizer, Johnson & Johnson and MedPharm have also committed to continued large donations of drugs (Butler, 2009).

2.9.3 Community Directed Treatment and Regular Health System Treatment

Studies conducted Ghana and Kenya by Gyapong *et al*. (2000) and Wamae *et al*. (2000) respectively (TDR/IDE/RP/CDTI/00.2, 2000) compared community directed treatment (ComDT) and regular health system treatment (HST) methods of drug delivery. ComDT achieved high levels of treatment coverage (75-88%) while HST achieved 45% coverage. Therefore ComDT was recommended for drug delivery for LF elimination in Africa.

In ComDT, the community with the assistance of HST, designs and implements a method of drug delivery that is most suitable to its needs. The District Health Management Team (DHMT) together with political authorities are the first to be sensitized on ComDT followed by the peripheral health providers who are then requested to sensitize the community leaders. The leaders are then expected to go back

to their villages and through community meetings ask the communities to select the community drug distributors (CDDs). The criteria for selection of CDDs (WHO, 2000) include the following: they must be able to read and write; keep records; be trustworthy; be well known by the village members and be willing to distribute drugs to all eligible persons in the allocated areas without remuneration by the project.

The selected CDDs are then trained by the health personnel and programme team to undertake MDA. However, since ComDT is a community project, the community is at liberty to decide on the best way to remunerate the CDDs. The drugs reach the CDDs after going through the normal government procedure of issuing drugs to the dispensary. The CDDs are expected to observe the swallowing of the drugs as they administer them and keep records on forms provided by the programme. Distribution is done house to house with a substantial amount of callbacks for those persons who miss initial visits. The whole exercise is expected to take place on a single day with the following day being for mop-up. The CDDs are expected to make returns to the dispensaries within their divisions. The health facilities then forward the returns to the District Medical Office where the reports are prepared.

ComDT using CDDs has proved to be feasible and effective in a wide range of geographical and cultural settings (UNDP/World Bank/WHO/TDR, 1999). The fundamental basis of community "directedness" is a community ownership of the planning and distribution process. The same approach has been used for MDA with

ivermectin for onchocerciasis control in endemic areas and has contributed to the success of the control programmes (Gyapong *et al*., 2005). It is however notable that this approach has had challenges in its field implementation in an attempt to maintain high treatment coverage (Miri, 1998). Many simple, affordable and effective disease control measures have had only limited impact on the burden of disease due to their inadequate distribution in poor and remote communities (WHO, 2010).

2.9.4 Behaviour Change Communication

Behaviour Change Communication (BCC) materials (including posters, leaflets and banners) written in Kiswahili, the national language, were used to sensitize the communities on LF. These materials contained basic information on lifecycle, causative agent, transmission, pathogenesis and control by chemotherapy. The posters and leaflets were given to the health personnel to sensitize the communities while the banners were posted on major roads. Some of the posters were posted on walls at dispensaries, schools and trading centers. Public meetings (barazas) were used as the main forum for sensitizing and mobilizing the communities and the peripheral health staff at the dispensaries. School children were also sensitized and used as agents to take the message back home.

Success of MDA campaign depends on an aggressive community sensitization towards the disease and elaborate social mobilization. However, the GPELF is faced with several challenges mainly due to the fact that LF is not a fatal disease and does not

threaten the developed world thus there is less political motivation by decision-makers. This is despite the fact that high financial commitment is crucial for a global programme targeting over a billion people in 83 countries. A further challenge in implementation is to persuade people who have no symptoms of the disease to take the drugs (Bockarie and Molyneux 2009). Yet for elimination to be achieved, individuals living in the affected communities must be convinced to take the drugs even if they have no evidence of infection or signs of the disease. Plaisier *et al*. (2000) emphasizes on the need to ensure that there is no group of persons remaining totally untreated within 4 to 6 rounds of MDA because a group that misses treatment every round and is infected forms a reservoir of mf contributing to transmission of the infection.

CHAPTER THREE:

3.0 MATERIALS AND METHODS

3.1 Study Site

The study was conducted in Kwale and Malindi districts of the Coast Province, Kenya (Figure 3). Both districts are endemic for LF caused by *Wuchereria bancrofti*. The total population of Malindi district is 384,643 (Republic of Kenya Ministry of Health, 2006). The district lies between latitudes 2.2º and 4º south and between longitudes 39º and 41º east and covers a geographical area of 7,605 km^2 (Figure 4). The villages along the River Sabaki in Malindi have a filarial endemicity of at least 7.1% (Njenga *et al.*, 2008).

Kwale District, in the south coast (Figure 4), has an area of 8960 km^2 with a projected population of 583,000 persons. It lies at an altitude of between 60 and 135 metres above sea level. It borders Taita Taveta to the west, Kilifi district to the North West, Mombasa and Indian Ocean to the east and Republic of Tanzania to the south.

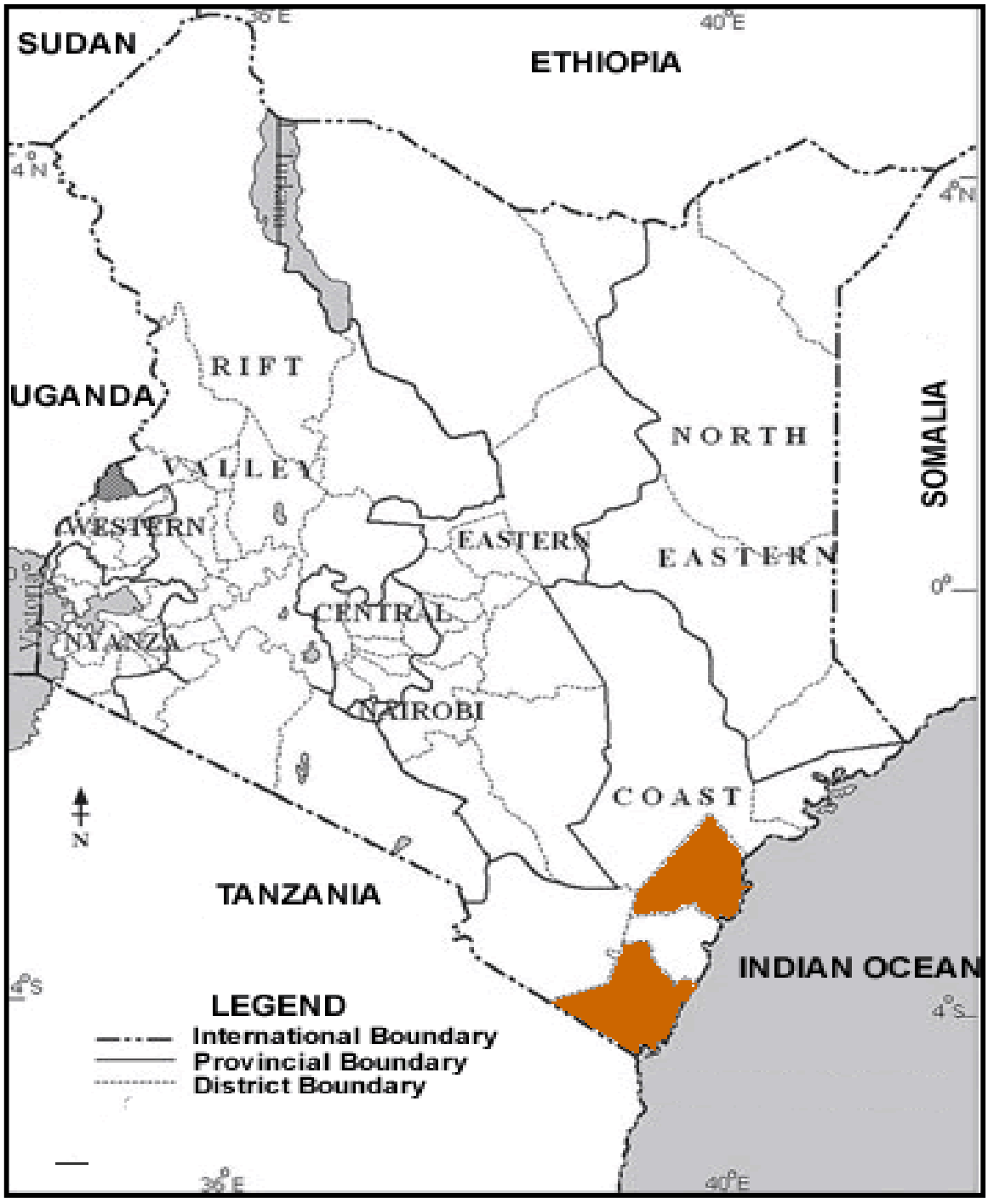

Figure 3: Map showing Kwale and Malindi Districts, Kenya.
Source: Google Tracks for Africa, (2010).

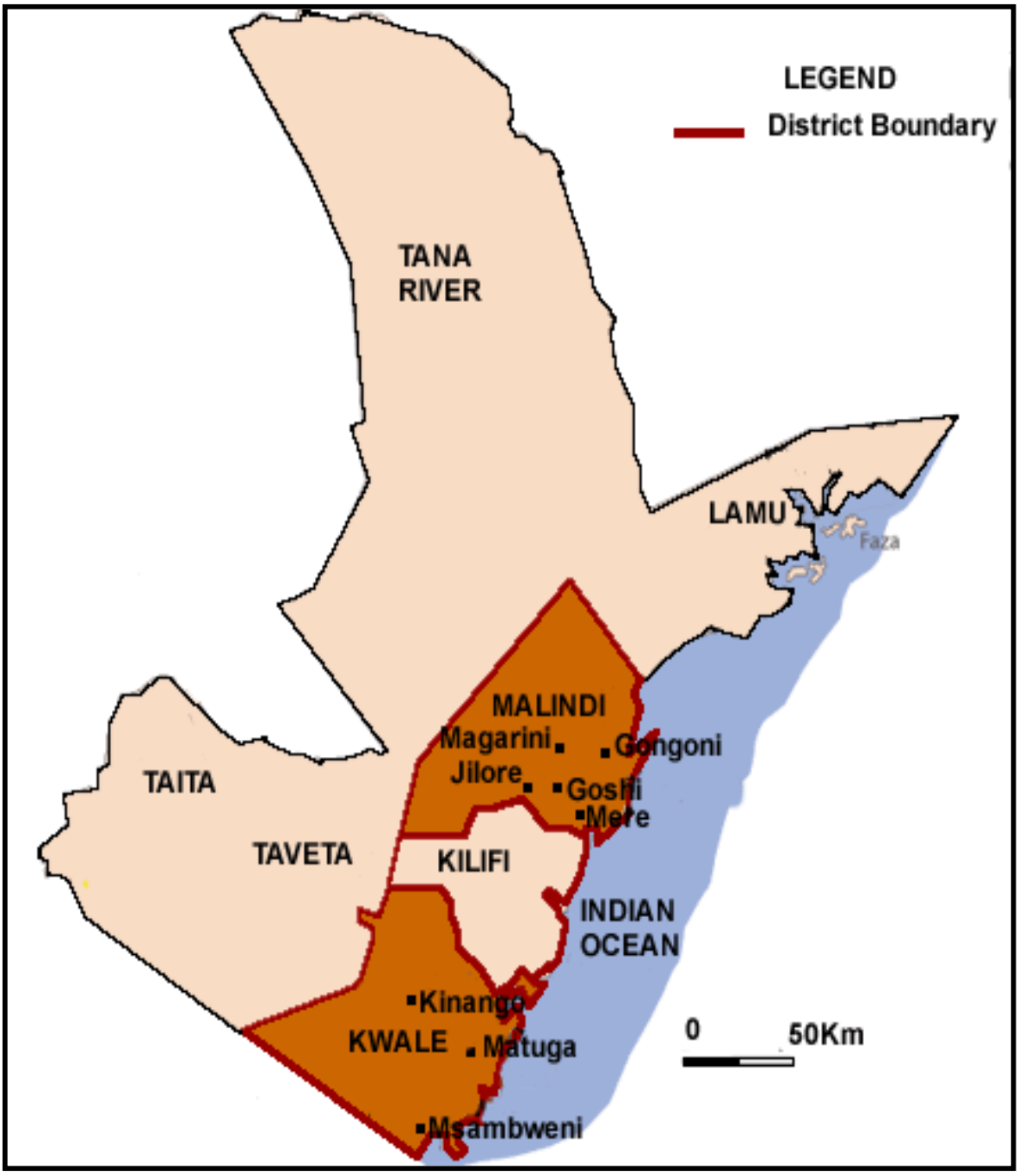

Figure 3.1: Map showing Kwale and Malindi Study districts
Source: Google Tracks for Africa, (2010).

3.2 Study Design

This was a retrospective cross-sectional study that was based on the third round (2008) of mass treatment. The 2008 round was selected as a reference point due to the ability of the populations to recall the events.

3.3 Study Population

In Kwale District, the inhabitants are the Digo and Duruma, of the Miji-Kenda ethnic group. The villagers were mainly subsistence farmers who grow maize, legumes and tubers. Coconut is the chief cash crop but is only produced by a few households. Domestic animals include goats, cattle and sheep. The inhabitants of Malindi District are the Giriama, also of the Miji-Kenda ethnic group who are peasant farmers growing cassava, maize and coconut and keeping livestock such as cows and goats. The area is composed of scattered, mainly grass-thatched houses with mud walls.

Mass treatment has been conducted thrice, 1st round in 2003, 2nd round in 2005 and 3rd in 2008 to communities in the villages of the two districts. All members of the communities except children below 2 years, the very sick, pregnant and lactating mothers were targeted for the treatment. MDA coverage data which was available from the Ministry of Public Health and Sanitation was used to select high and low treatment coverage areas (locations) from Malindi and Kwale Districts. In Malindi District, Goshi location represented high coverage and Gongoni low coverage and in Kwale District, Tsimba location in Matuga division represented high coverage and Gadini location in

Kinango division, low coverage. All the villages in the selected locations were listed and entered into a computer. Records on villages in administrative locations were available from the Chiefs of the locations. Simple random sampling was applied to select two study villages from Gongoni, Goshi and Tsimba and three villages from Gadini location using SPSS version 12 software. In Tsimba; Patanani and Mbengani villages were selected for high coverage while in Gadini; Dzivani, Takawa and Tzunza were selected for low coverage. Zhogato and Midodoni villages in Gongoni represented low coverage while Kavunyalalo and Magongonloni villages in Goshi represented high coverage.

A complete census of all the households in each selected village was done and the data entered into a computer. From a list of all the households in selected villages, systematic random sampling technique was applied to select two hundred (200) households from the areas of high coverage (80% and above) and two hundred and eighty (280) households from the areas of low coverage (60% and below) for each district. The starting point was randomly selected and every fourth household was then selected until the desired sample size was achieved. An extra five households were included in the study (Table 3.1).

Table 3.1: Study Population by District and MDA Coverage in 2008.

District	Location	Village	No. Households Interviewed (%)	MDA Coverage Status (2008)*
Kwale	Gandini	Takawa	56 (5.8%)	Low
	Gandini	Dzivani	84 (8.7%)	Low
	Gandini	Tsunza	140 (14.5%)	Low
	Tsimba	Patanani	100 (10.4%)	High
	Tsimba	Mbengani	101 (10.5%)	High
Malindi	Gongoni	Zhogato	140 (14.5%)	Low
	Gongoni	Midodoni	142 (14.7%)	Low
	Goshi	Kavunyalalo	102 (10.6%)	High
	Goshi	Magongoloni	100 (10.5%)	High

Source of MDA Coverage Status (2008)*: Ministry of Public Health and Sanitation, (2009).

3.4 Inclusion Criteria

The following set of criteria was utilized for selecting the participants in the study:

- Adult community members, who were 18 years old and above; one adult member per household representing the selected household where a household head was not present;
- Consent to participate; and
- People who had been residents in the areas during the 2008 MDA

3.5 Exclusion Criteria

- Community members, below 18 years of age;
- Those unwilling to give consent to participate;
- Recent migrants into the area

3.6 Sample Size Determination

In sample size determination, the formula $n=z\alpha^2\ p\ (1-p)/d^2$ by Fisher *et al*., (1993) was applied.

where z= standard error from the mean corresponding to 95% confidence level

α = level of significance

p= level of compliance to treatment (if unknown use 50%)

d= absolute precision (margin of error)

$z\alpha = 1.645$ (1-tailed at 5% level of significance)

$z\alpha/2 = 1.96$ (2- tailed at 5% level of significance)

Since the levels of compliance (p) according to MDA data of 2008 were different for different locations in the two districts, and based on the recommended treatment coverage of at least 65% and above then the sample sizes were different. In the current study, 80% and above treatment coverage was considered high whereas 60% and below coverage was considered low based on the coverage recommended by GPELF. Thus, p was 0.8 in the high treatment coverage areas and 0.6 in low treatment coverage areas. Hence when the sample size calculation formula was applied;

$1.645^2 \times 0.8 \times 0.2/0.05^2$ for high = 173 households + an additional 17 households = 200 x 2 districts = 400 high treatment coverage households.

$1.645^2 \times 0.6 \times 0.4/0.05^2$ for low = 260 households + an additional 20 households = 280 x 2 districts = 560 low coverage households. An extra 5 households were included and therefore the total number of households involved in the study was 965 for the two districts.

3.7 Data Collection

3.7.1 Household Survey/Interviewer-Based Questionnaires (IBQs)

The quantitative data were collected by trained field assistants using an interviewer-based questionnaire which was administered to heads or adult representatives of the sampled households using *Kigiriama* or *Kiduruma*, the local languages of the inhabitants (Appendix 1). Proxy measures were used to assess the socio-economic status of the household heads.

3.7.2 Semi-structured Interviews (SSIs)

Semi-structured interviews (SSIs) schedules in each sampled village were carried out by trained field assistants using the predominant local language to collect data from the opinion leaders who were purposively selected. The opinion leaders included the chiefs, village elders, teachers, church leaders, Muslim leaders (imam), office bearers of associations, elected representatives and representatives of Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs). The SSI schedules aimed at to assessing these groups of persons' opinion of the treatment, source of MDA information and their perceptions of compliance with the treatment (Appendix 2). In the villages where less than ten participants were available, two from any one of the nine categories participated so as to achieve the required number (n=80).

Another set of SSI schedules was conducted among community members with LF clinical signs (Appendix 3). Purposive selection was used to identify the patients with obvious signs of lymphoedema, hydrocele or both so as to gather qualitative data on

their knowledge about filariasis and MDA programme, sources and adequacy of information about MDA, their participation and perceptions of the programme. The village chairmen helped in the identification of the participants and gave information on their name, sex and age. A total of eighty (80) LF patients participated in the study.

Two CDDs per village usually administer drugs during the LF mass treatment and a third set of SSIs (Appendix 4) was administered by the PI to all the CDDs who distributed drugs to the selected study villages. The guide aimed at assessing the involvement of the CDDs in the MDA process. A total of 15 CDDs participated in the study. The health workers serving the health facilities in the selected villages were also interviewed by the PI on their perceptions of mass drug administration in the selected villages (Appendix 5). Only one health facility serves the two low compliant villages in Gandini location, Kwale district, one serves the two high compliant villages of Goshi location and the two low compliant villages of Gongoni location, Malindi district. Only Tsimba location, Kwale district has a health facility serving each of the two selected villages.

3.7.3 Focus Group Discussions (FGDs)

Four FGDs (Appendix 6) were conducted using standardized procedures (Khan *et al*., 1991) in each location (i.e. the two villages in each location combined) with groups representing women, men and youth male and female (n=16) so as to gather data on their knowledge of LF (causes, signs and susceptibility), their opinion of MDAs,

participation in MDA, willingness to continue participating and how the MDA programme can be supported. Community groups; women, men and youth targeted for FGDs were not excluded from the household survey so that the survey was representative and gave everyone an equal chance of being represented. Notes were taken during the FGDs and audiocassettes used to tape record all the information in the local languages. The tapes were later transcribed and translated into English.

3.7.4 Self-Administered Questionnaires (SAQs)

The four LF Coordinators at the district level were interviewed and a self administered interview schedule given to the National Programme manager (Appendix 7 and 8 respectively). These interviews dealt with issues on recent steps taken to control filariasis, development of BCC for mass treatment, training of medical and health workers and community sensitization for drug administration. The interviews were conducted in a sequence so as to allow for flexibility and explore for more information from one interviewee to the next.

3.7.5 Pretesting of Study Instruments

A pre-test was conducted to assess the adequacy of the interviewer-based questionnaire and the semi-structured interviews. For the FGDs, the field assistants role played during the training using the local languages and unclear issues were clarified in the process. This provided an opportunity to assess the ease of understanding of the research tools.

3.8 Data Analysis

The quantitative data were processed using EPI Info and analyzed using SPSS version 15.0 computer software. The responses to open-ended questions such as on causes of LF, reasons for not taking the drugs, source, content, frequency of information and opinion of MDA were coded before entry. Equivalent responses were pooled to arrange the responses in different categories. Two-way tables were used to compare categorical data and the statistical significance of differences in MDA compliance were assessed by the χ^2 test and a P value of ≤ 0.05 and was considered significant. The qualitative data were analyzed manually according to the themes of the study. Additionally, qualitative software, QSR NVIVO8 was used for further analyses. The contents in the data collected were coded using nodes. For specific analyses, simple and advanced coding queries were used to search for words, texts and phrases in the materials whereas matrix coding was used for paired comparisons.

3.9 Ethical Considerations

This study was approved by Kenya Medical Research Institute (KEMRI) Scientific Steering Committee and KEMRI/National Ethical Review Board (Appendix 9). It was then forwarded to the WHO Ethical Review Committee where it was also approved. Consent was sought at various levels, from national, provincial, district and local authorities. Meetings, in which local leaders were invited, were held in order to inform communities about the study and obtain verbal consent. Informed consent was then sought from all individuals who participated in the study. The participants were

informed that they were free to withdraw their participation at any stage of the study (Appendix 10). The data gathered were kept confidential and no names were required from the study participants.

CHAPTER FOUR:

4.0 RESULTS

4.1 Background Characteristics of the Study Population

4.1.1 Socio-demographic Characteristics of the Household Survey Respondents

The mean age of the respondents, most (62.6%) of whom were females, was 39.5 (SD=15.612) and median, 35.0 (range 18-92 years). Majority of the respondents were in the age groups of 25-29 and 30-34 years (Figure 4.1).

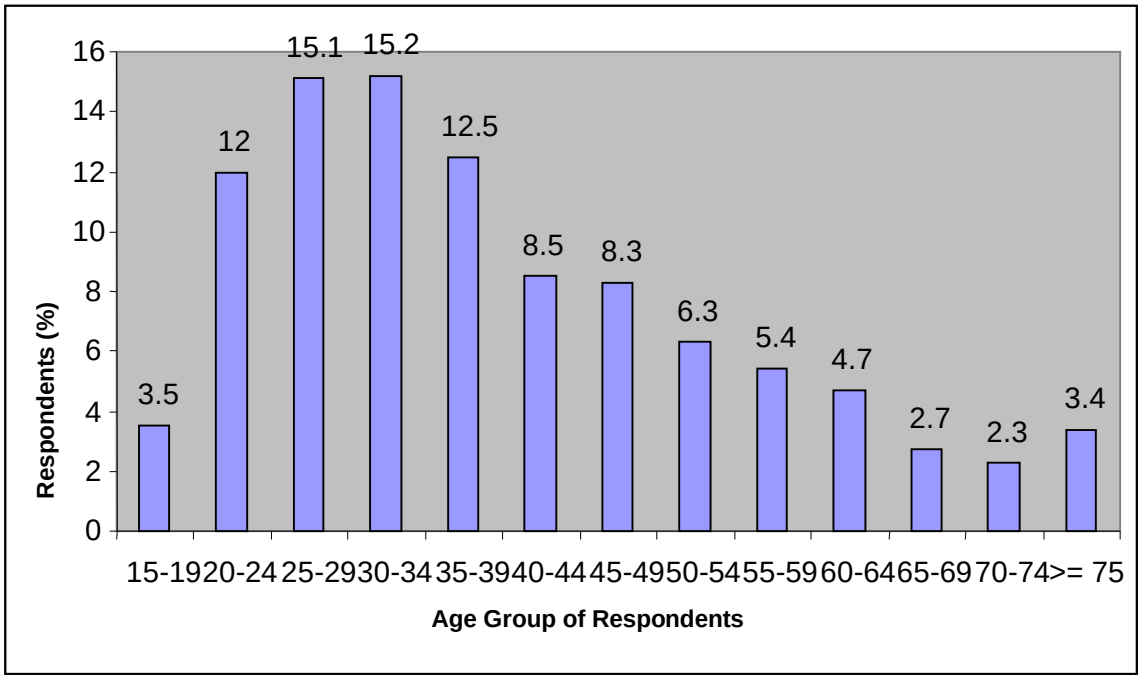

Figure 4.1: Ages of the Household Survey Respondents.

Four fifths (80.4%) of the respondents were in marital unions, 9.4%, were single or divorced and 10.3% were widowed. Eighty five per cent of the married respondents were in monogamous unions. A higher proportion (40.5%) of the respondents was Christians, 35.8% Muslims and about one quarter (23.7%) was non- practicing. Nearly

one half (45.8%) of the respondents had never attended school and 30.7% did not complete primary level (Figure 4.2).

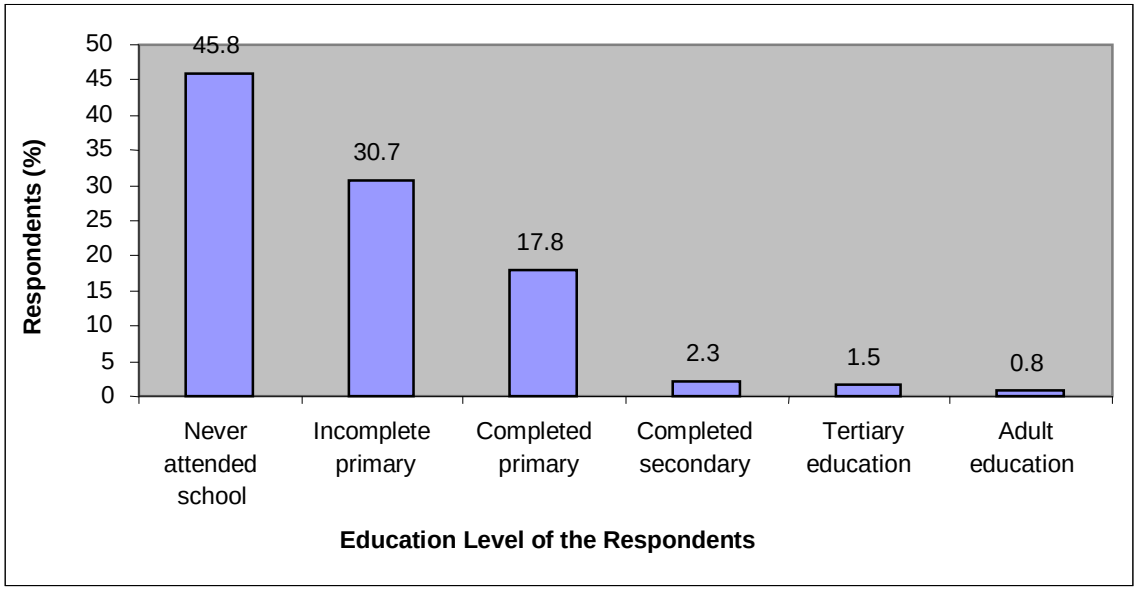

Figure 4.2: Education Levels of the Household Survey Respondents.

Nearly two-thirds (62.5%) of the respondents were peasant farmers and about one- fifth (21.3%) were casual laborers, fishermen or business owners. Less than one-fifth (16.1%) were either salaried workers or housewives (Figure 4.3).

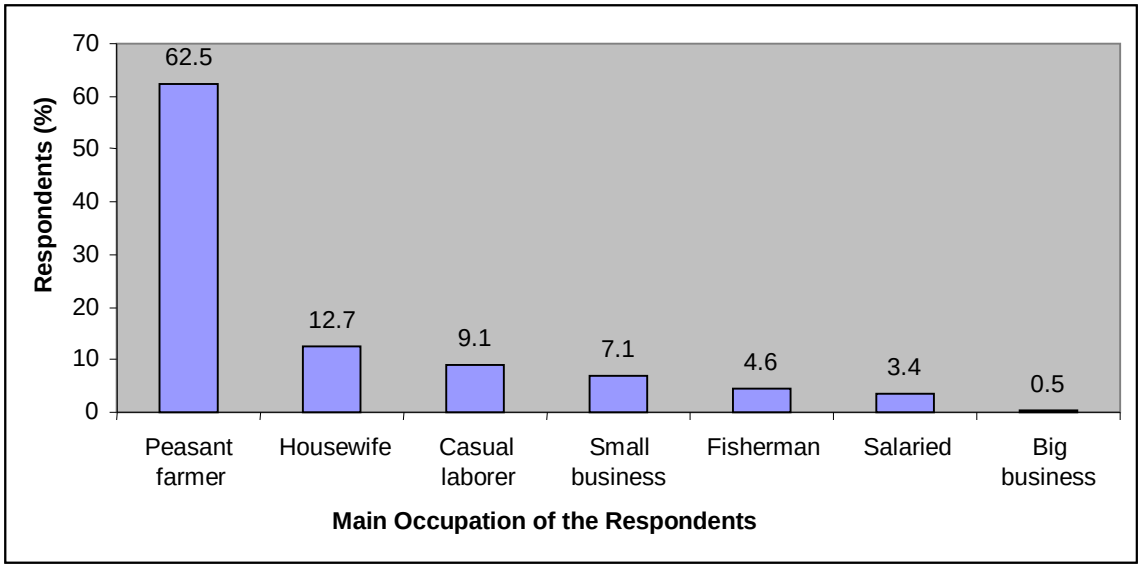

Figure 4.3: Main Occupations of the Household Survey Respondents.

4.1.2 Socio-economic Characteristics of the Household Survey Respondents

A descriptive analysis of the socio-economic status of the study population is given in this sub-section. In order to determine the socio-economic status, proxy measures were used; that is ownership of structure/house, land and durable consumer goods.

4.1.2.1 Housing Characteristics of the Study Population

A large proportion (96%) of the study population reported that they owned the structure (house) they lived in while the remaining proportion (4%) were either living with the owner's consent or squatting. Four-fifths (80%) of the study population owned the land they had built on, 7.4% did not own the land but had built with the owner's consent and about 4% were squatters.

Eighty-two percent (82%) of the respondents had grass or palm tree leaves (*makuti*) thatch as the roofing material used for their houses while 16% had corrugated iron sheets and the remaining (2%) had either tin cans or gall-sheet as the roofing materials. Earth, mud, dung and sand were the most popular type of flooring material (94.2%). Only a small proportion (5.6%) of the respondents had dwellings with floors that were made of cement. Slightly more than two-fifths (44%) of the study population lived in dwellings that needed major repairs, 28% lived in dwellings that were then under repair or construction and 16% lived in dwellings that were completely dilapidated. Only about 12% of the respondents lived in dwellings that were in good condition. Firewood was the most common source of cooking fuel (99.4%) (Table 4.1).

Table 4.1: Summary of Household Characteristics of the Study Participants.

Roofing Material (n= 964)	**Frequency**	**%**
Grass/ *makuti* (palm tree leave	792	82.1
Tin cans	6	0.6
Corrugated iron sheets	157	16.3
Brick/gall sheet	9	0.9
Flooring Material (n= 965)		
Earth/mud/dung/sand	909	94.2
Cement	54	5.6
Not yet completed	2	0.2
Cooking Fuel (n= 965)		
Firewood	959	99.4
Charcoal	6	0.6

The respondents were also asked about their state of ownership of durable consumer household goods in the form of radio, television and bicycle. The results which show

that radio was the most commonly owned durable consumer good are summarized in figure 4.4.

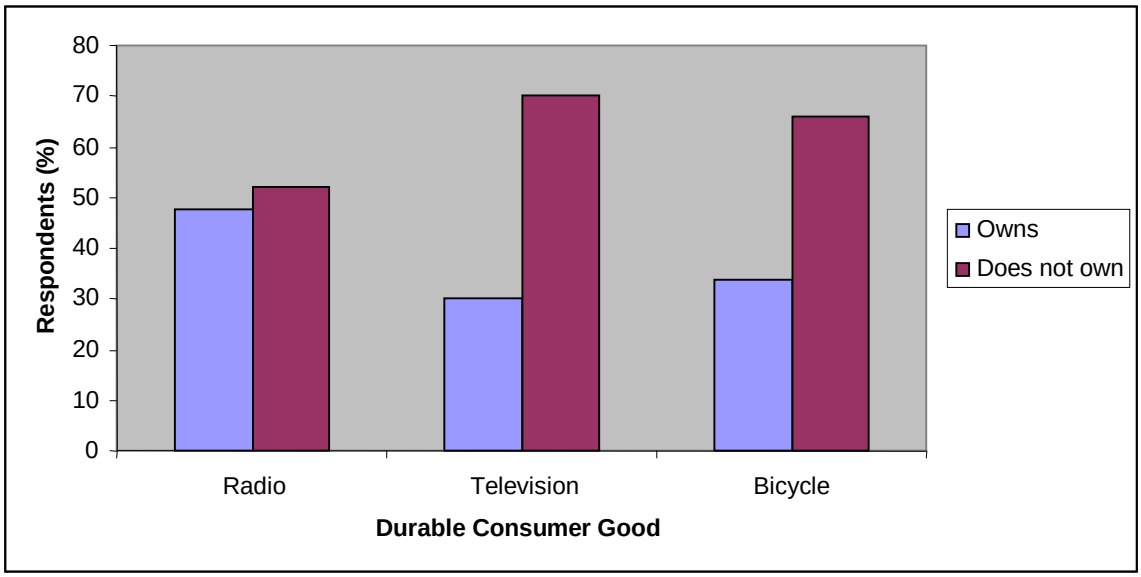

Figure 4.4: Ownership of Durable Consumer Goods by Households.

4.1.2.2 Water and Sanitation Characteristics of the Study Population

On source of drinking water, over a half (54%) of the households reported that they drew their water from a piped source (tap), 30% from spring, river, lake, dam or rain water and the remaining 16% got their drinking water from open or covered wells. A high proportion (65.4%) reported that the drinking water was usually available, 12.5% could access the drinking water several hours a week, 13% reported that the drinking water was infrequently available and less than 10% reported that the water was available at least once or twice a week. More than two-thirds of the respondents (72.3%) reported that they did not have a toilet facility in their homestead. Among

those with a toilet facility 267, 84.6% (226) had a traditional pit latrine, and about 14.2% had either a flush toilet or a Ventilation Improved Pit (VIP) facility (Figure 4.5).

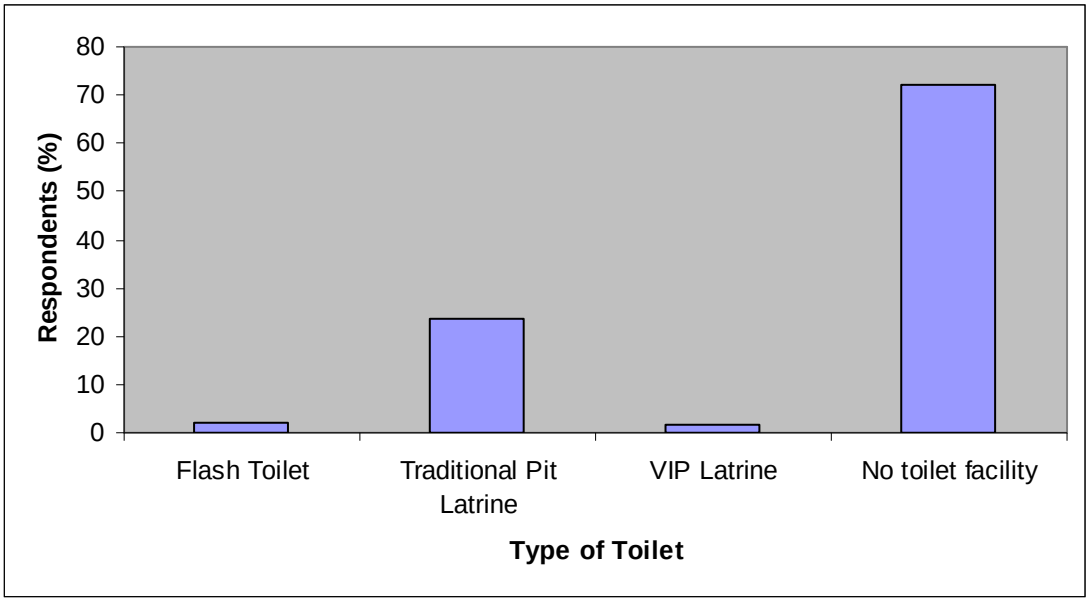

Figure 4.5: Ownership of Sanitation Facilities by Households.

With regard to sharing of the toilet facility, nearly one-fifth (18.3%) reported that they shared the toilet facility with other households and about one-third (31.7%) did not share their facility. A large proportion (87%), of the households reported that they disposed off their household waste through composting, burning or burying. Slightly less than 9% damped their waste in empty land/plot and the remaining had their waste collected by either the government or private company.

4.1.3 Descriptive Characteristics of the Opinion Leaders and LF Patients

Out of the total 80 opinion leaders who participated in this study's qualitative arm, slightly more than one-fifth (21.3%) were local leaders, one-fifth (20%) were Christian

religious leaders, and another one-fifth (20%) were social group leaders. Islamic leaders, (4%) and others such as traditional herbalists, (3%) ranked low. With regard to the LF patients also interviewed for qualitative arm (n= 80), hydrocele patients accounted for nearly two-thirds (64%) and lymphoedema, (35%). Only 1% of the patient population had both hydrocele and lymphoedema. The mean age of the patients was 52.4 years with an SD of 16.7. The youngest patient interviewed was 22 years and the oldest 98 years of age.

4.2 Socio-economic Factors and Their Influence on Compliance with Mass Treatment

4.2.1 Religion and Compliance with Mass Treatment

Religion was significantly associated with compliance with mass treatment, $P<0.001$ ($\chi^2= 24.021$; df 3). While Christians were equally distributed in both types of villages, Islam and non-practicing respondents were more common (66% and 62%, respectively) in the low compared to 34% and 38%, respectively in the high compliant villages (Figure 4.6).

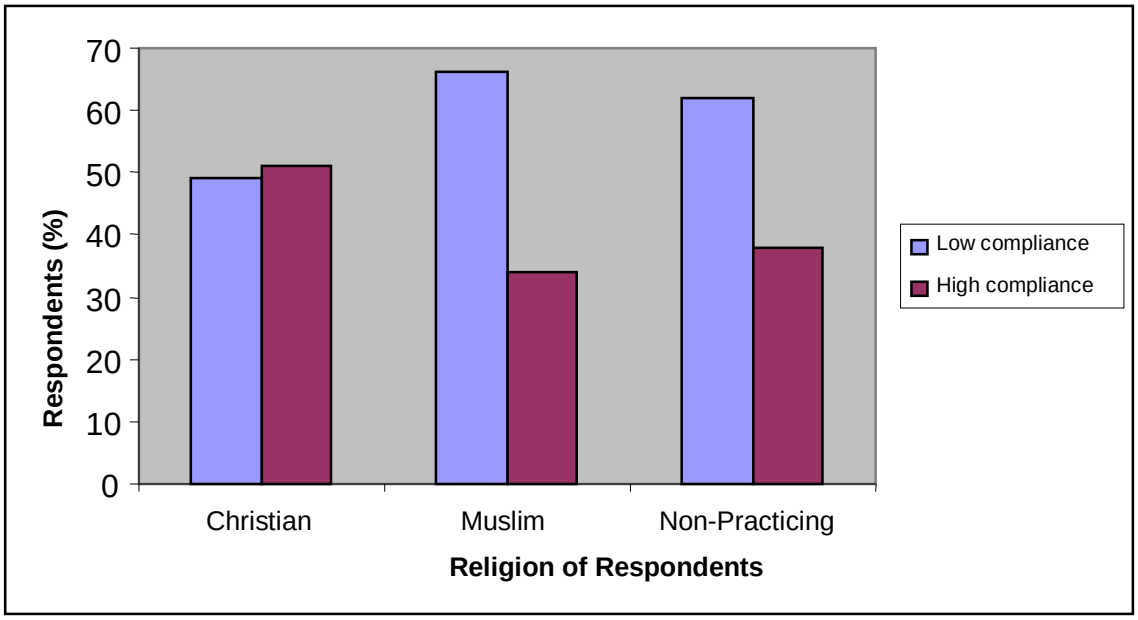

Figure 4.6: Religion and Compliance with Mass Treatment.

Other socio-demographic characteristics: age, sex and marital status were not associated with compliance with mass treatment in both types of villages, $P > 0.05$. Similar proportions, 80.4% in the high and 80% in the low compliant villages were married, majority (30%) from both types of villages were the age group of 25 to 35 years.

4.2.2 Income Level and Compliance with Mass Treatment

The main occupation, a proxy income indicator, was significantly associated with compliance, $P < 0.001$ ($\chi^2 = 48.086$; df 7). Business, fishing and casual labour associated with high income level among the study population was more common (27%) in the low than in the high compliant villages (12.2%). Peasant farming, which is a proxy

indicator of low income level, was slightly more common in the high (68.5%) compared to 58.2% in the low compliant villages (Figure 4.7).

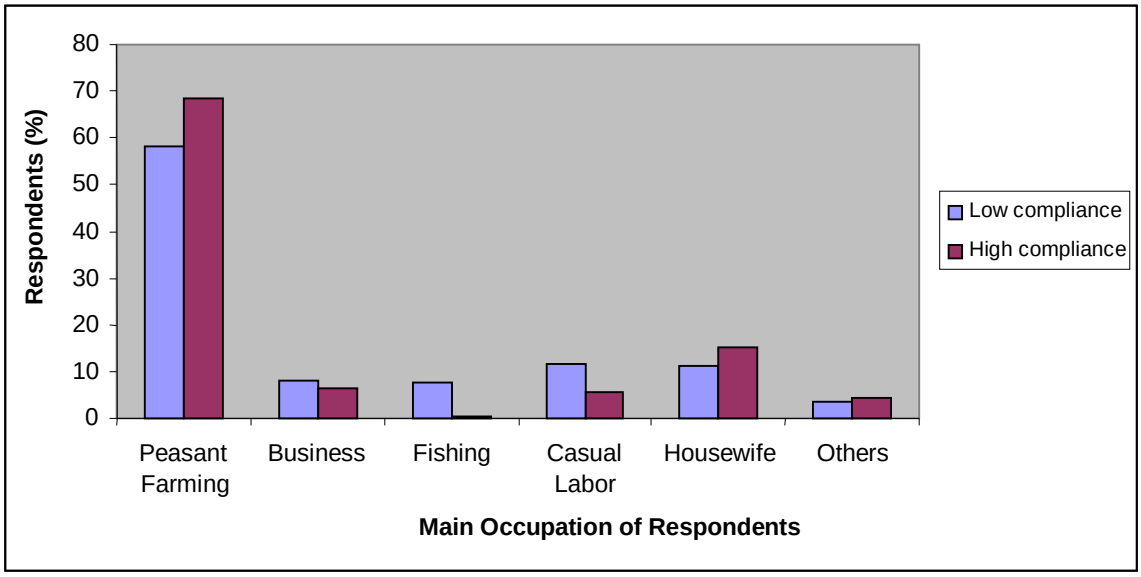

Figure 4.7: Main Occupation and Compliance with Mass Treatment.

In both the high and the low compliant villages, the level of education was not associated with compliance with the MDA of 2008, (P> 0.05). Nearly the same proportions of community members from the high (47.6%) and the low (44.5%) had never attended school and only 19% from the high and 17% from the low compliant villages had completed primary school education.

Ownership of land was significantly associated with compliance with mass treatment; P< 0.001 (χ^2= 70.341; df 3). Almost all households (95%) in the low compared to 78% in the high compliant villages owned land (Figure 4.8).

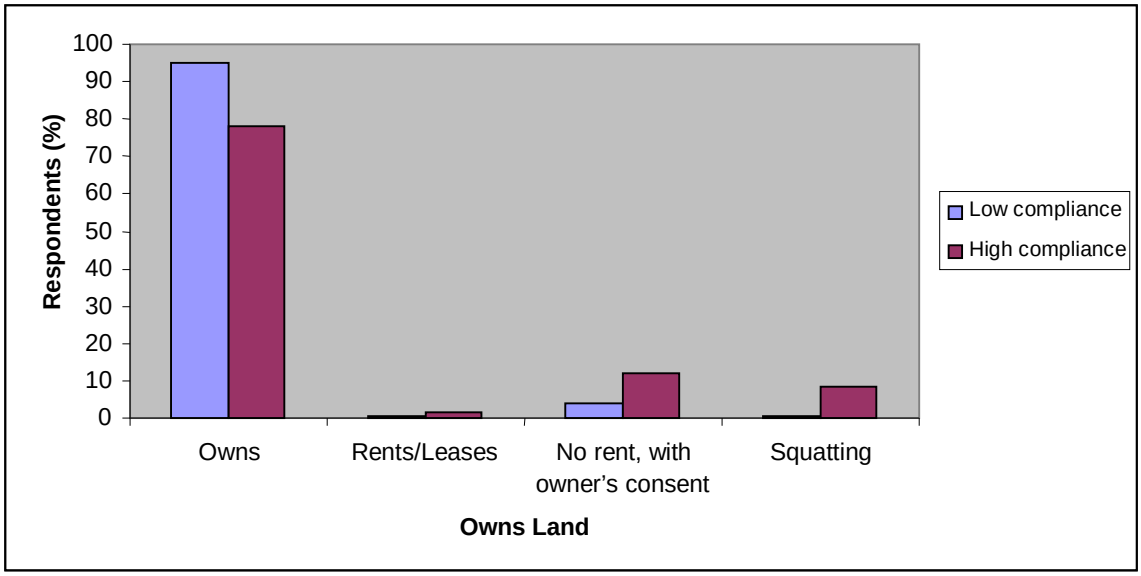

Figure 4.8: Ownership of Land and Compliance with Mass Treatment.

There was a significant association of ownership of residential housing structure and compliance; $P< 0.01$ ($\chi^2= 15.772$; df 3). Almost two-thirds, 59% in the low compared to 41% in the high compliant villages owned the housing structures they lived in. All the squatters were from the high compliant villages (Figure 4.9).

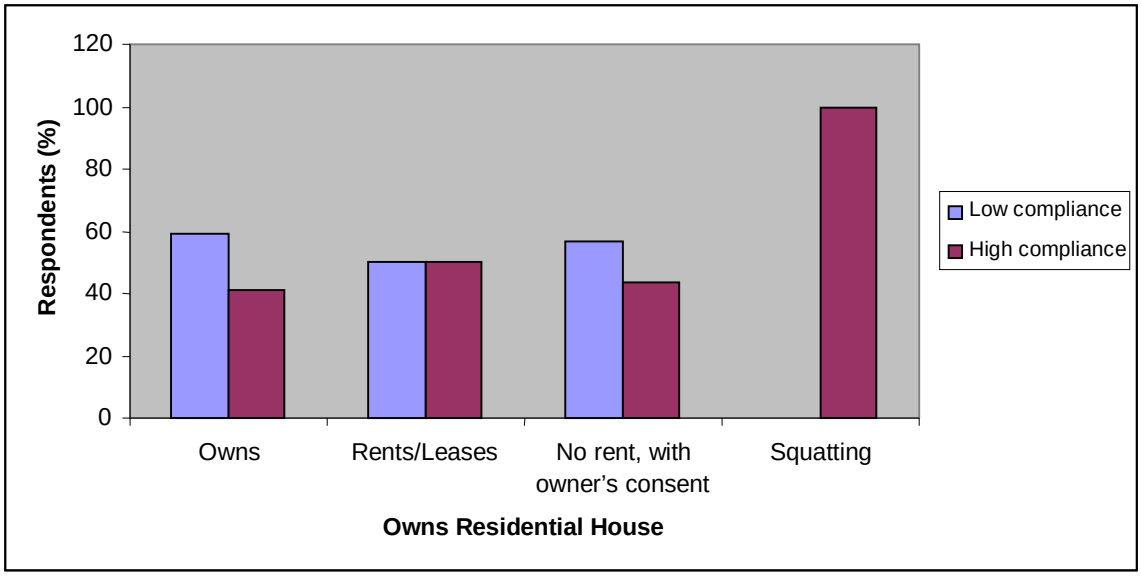

Figure 4.9: Ownership of Housing Structure and Compliance with Mass Treatment.

Ownership of a radio was significantly associated with compliance with MDA, $P< 0.001$ ($\chi^2= 22.724$; df 1). A higher proportion (56.8%) of the respondents in the high compared to 41% in the low compliant villages owned a radio.

4.2.3 Knowledge of Signs of LF and Compliance with Mass Treatment

Knowing someone with lymphoedema was significantly associated with compliance; $P< 0.001$ ($\chi^2= 28.700$; df 1). Over two-thirds (71%) of the respondents in high compared to 54% in low compliant villages knew someone with lymphoedema. Knowing someone with signs of hydrocele was also significantly associated with compliance; $P< 0.001$ ($\chi^2= 21.734$; df 1). A higher proportion (81%) of respondents in the high compared to 68% in the low compliant villages knew someone with a hydrocele.

Knowing the cause of lymphoedema was significantly associated with compliance; $P< 0.05$ ($\chi^2 = 29.511$; df = 15). While slightly more respondents (37%) in the high compared to 25.8% in the low compliant villages knew the cause of lymphoedema, misconceptions such as witchcraft, rain, malnutrition and inheritance or a lack of knowledge were more common among the respondents in the low compared to those in the high compliant villages. It was however apparent that in each type of village more than one-half of the respondents did not know the cause of lymphoedema (Table 4.2).

Table 4.2: Household Survey Responses on Cause of Lymphoedema.

Responses on Causes of Lymphoedema	**Village Type**				
	Low Compliance		**High Compliance**		**Total**
	n	**%**	**n**	**%**	**N**
Witchcraft	28	5.0	13	3.2	41
Rain	6	1.2	2	0.5	8
Blood	21	3.7	8	2.0	29
Mosquitoes	145	25.8	149	37.0	294
Cold climate	3	0.5	2	0.5	5
Malnutrition	10	1 .8	2	0.5	12
Walking for long	5	0.9	0	0	5
Inheritance	7	1.2	2	0.5	9
God's will	5	0.9	1	0.2	6
Nervous breakdown	5	0.9	0	0	5
Excessive water in joint	5	0.9	3	0.7	8
Poor hygiene	5	0.9	2	0.5	7
Others	3	0.5	2	0.5	5
Do not know	314	55.9	216	53.6	530
Total	562	100	403	100	965

Knowing the cause of hydrocele was also significantly associated with compliance; $P< 0.001$ ($\chi^2= 49.758$ df = 16). Knowing that hydrocele is transmitted through a mosquito

bite was more prevalent (26.8%) in the high compared to 14.1% in the low compliant villages although in both areas the levels of knowledge were low. Misconceptions about the cause of hydrocele were more prevalent in the low compliant villages. It is also apparent that in each type of village about three-fifths of the respondents did not know the cause of hydrocele (Table 4.3).

Table 4.3: Household Survey Responses on Cause of Hydrocele.

Responses on Causes of Hydrocele	**Village Type**				
	Low Compliance		**High Compliance**		
	n	**%**	**n**	**%**	**Total N**
Witchcraft	25	4.4	14	3.5	39
Rain	9	1.6	1	0.25	10
Blood	33	5.8	14	3.5	47
Mosquitoes	79	14.1	108	26.8	187
Sex with a hydrocele patient	8	1.4	6	1.9	14
Malnutrition	20	3.6	7	1.7	27
Walking for long	5	0.9	0	0	5
Cold climate	6	1.1	0	0	6
Poor hygiene	8	1.4	2	0.5	10
Others	16	2.8	15	3.7	39
Do not Know	343	61.0	236	58.6	581
Total	562	100	403	100	965

Knowing the cause of LF was however not different in the patients from both types of villages, the cause prominently reported was witchcraft by 17.7% of the participants. Nearly two-fifth (39%) of all the patients reported that they did not know what caused LF while only 10% knew that LF is transmitted by mosquitoes. A large proportion (88.8%) of the patients indicated that the signs of LF included pain and swelling of limbs and genitals.

From the qualitative data, some participants of 3 FGDs from the low compliant villages had misconceptions, such as witchcraft and heredity when referring to the causes of swollen limbs. In one female FGD from a low compliant village some participants reported that they had no idea what caused swollen limbs. Majority of the participants of two FGDs in low and 2 from high compliant villages had misconceptions on causes of swollen genitals reporting that sexual intercourse, witchcraft and heredity were the causes. A male respondent in one FGD conducted in the low compliant area indicated that:

Swollen genitals are caused through sexual intercourse, this is when you have an affair with a woman whose husband has swollen genitals then you acquire the disease. (40 year old, male adult respondent, Takawa village)

4.2.4 Perception of Risk of LF Infection and Compliance with Mass Treatment

Perception of being at risk of getting LF infection was significantly associated with compliance, $P< 0.001$ ($\chi^2= 34.579$ df = 3). The risk perception was higher (52%) in the high compared to the low compliant villages (45%). Moreover, a higher proportion (42%) from the low compared to 27% from the high compliant villages reported that they did not know if they were at risk of LF infection (Figure 4.10).

Furthermore in 5 FGDs, 3 from low and 2 from high compliant villages, some participants reported that it was mainly the aging men with multiple sex partners who were at risk of LF infection while in 4 FGDs, 3 in low and one in high compliant

villages some participants reported that young children were most at risk of LF infection through inheritance. In a male FGD in one low compliant village a member stated that:

It is mostly the children who are born while their mothers and fathers are sick who are at risk of infection. (22 year old, male youth respondent, Midodoni village)

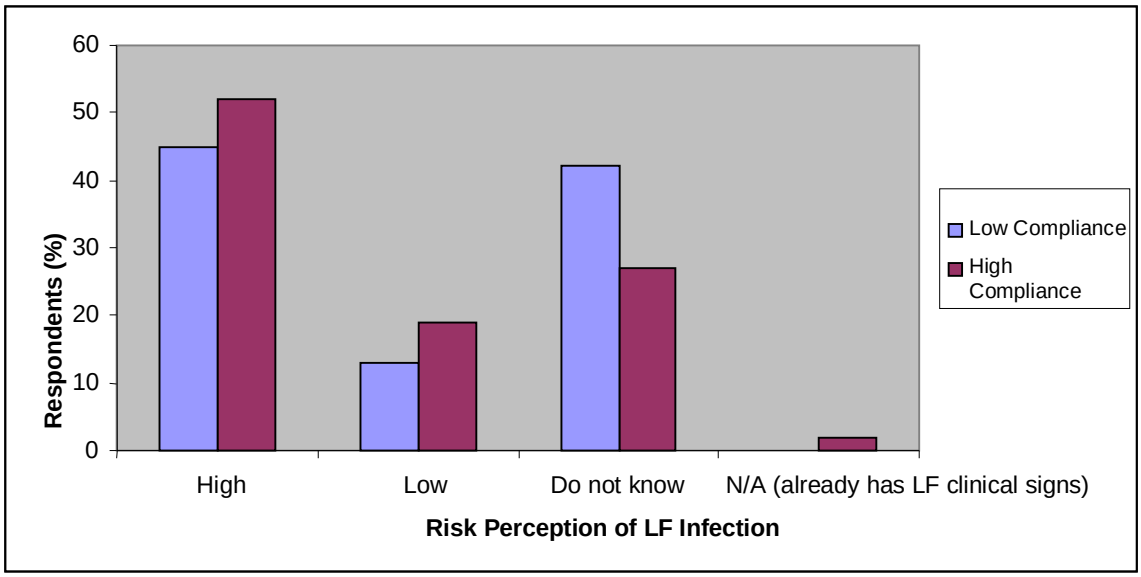

Figure 4.10: Risk Perception of LF Infection among Household Survey Respondents.

4.2.5 Awareness of Mass Drug Administration and Compliance

Awareness of MDA for LF was not significantly associated with compliance, 73% in low and 78% in high compliant villages reported that they were aware of MDA for LF in their communities ($P > 0.05$). However, the results of the data collected from the opinion leaders showed that there was a slight difference in awareness of MDA between the two groups; a higher proportion (51.4%) of the opinion leaders in the high

compared to 48.6% in the low compliant villages was aware of the mass treatment. Moreover, a high proportion (52.2%) of LF patients in the high compliant villages was aware of the mass treatment while a high proportion (58.3%) in the low compliant villages was not.

Furthermore, while a slightly higher proportion (52.8%) of the opinion leaders in the high compliant villages correctly indicated that MDA is done by CDDs, a higher proportion in the low complaint villages indicated that they did not know (60%) or the health workers (66.7%) did the MDA. With regard to the LF patients however, a slightly higher proportion (54.2%) in the low compliant villages indicated that MDA was done by CDDs while a high proportion in the high compliant villages indicated that they did not know (56%) or the village elders (80%) did the MDA.

Awareness of when the MDA was done was inconsistent in both groups of opinion leaders. It was apparent that they were not clear on when the MDA for 2008 took place. Similarly, awareness of when MDA was done was inconsistent in both groups of LF patients; only half (50.6%) of all patients could recall that MDA was done in 2008 while the remaining had no idea of when it was done. Both groups of opinion leaders were aware of the method of drug distribution (house to house) although there was a slight difference in the proportion of those in the high compared to those in the low compliant villages (52% and 48%, respectively). A large proportion (83.8%) of all the patients was aware that MDA was done through house to house method of drug

distribution. Both groups of patients were aware why MDA was done but with a slightly higher proportion 51.6% in the high compared to 48.4% in the low compliant villages indicating that MDA was done to prevent and control LF. A large majority (93.8%) of all the opinion leaders was aware that MDA was done to control and prevent LF.

4.2.6 Disease Stage and Compliance with Mass Treatment

The mean number of years with chronic disease was significantly different in both groups of the LF patients; $P< 0.05$ ($t = -2.152$, $df = 72$). Patients in the high compliant areas had a higher (15.2) mean number of years with chronic disease compared to those in the low compliant areas (9.8).

4.3 Influence of Individual Preferences and Behavioural Factors on Compliance with Mass Treatment

4.3.1 Perceived Need for Treatment and Compliance with Mass Treatment

Responses to the question on whether MDA was necessary for the respondents was not significantly different for both low and high compliant village members - 93% and 92% respectively thought that MDA was necessary. This opinion was supported by a large majority of participants of all the 16 FGDs who reported that they perceived the drugs distributed for LF to be necessary but emphasized the importance of being educated more on how many each person was required to swallow and whether it was for everyone or for only those who had the signs of LF.

4.3.2 Problems Related to Drug Size, Number and Taste and Compliance with Mass Treatment

Problems associated with size, number and taste of the drugs used in MDA were significantly associated with compliance. The problems were more prominent (61.3%) in the low compliant villages compared to 38.7% in the high compliant villages. In 4 FGDs from low compliant villages some participants felt that the numbers of drugs administered were too many and in 9 FGDs, 6 in low and 3 in high compliant villages, majority of the participants felt that the drugs were too bitter, had a bad smell and made people to vomit. A female respondent in one youth FGD in a low compliant village stated that:

The drugs made many people feel like vomiting, they were too many and another person instead of taking all four drugs at once, he kept them and took one each day for he said that they were too many (and the group laughed). (20 year old, female youth respondent, Tsunza village)

4.3.3 Problems Related to Drugs Swallowing and Compliance with Mass Treatment

The problems with swallowing the drugs were significantly associated with compliance, $P< 0.01$ ($\chi^2=12.598$, df =2). A higher proportion (61.4%) of the respondents in the low compared to 38.6% in the high compliant villages reported having experienced problems with swallowing the drugs. Moreover, a large majority of the participants of 4 FGDs in high and 4 in low compliant villages reported that one type of drug was too big especially for the children to swallow.

4.3.4 Experience of Side Effects and Compliance with Mass Treatment

Experiencing side effects after taking the drugs was significantly associated with compliance, $P< 0.001(\chi^2= 20.582$, df =3). Almost three-fifths (59.5%) of the respondents in the low compared to 40.5% in the high compliant villages reported that they had experienced side effects. Some participants of 6 FGDs - 4 from low and 2 from high compliant villages also reported that their community members had experienced problems of increased swelling of genitals and blisters after swallowing the drugs. Furthermore, 3 of the 6 CDDs in the low and one in a high compliant village reported that some community members complained of having experienced swollen limbs, pain in private parts of males, swollen testicles and sexual inactivity or low libido. Furthermore, some participants of 2 FGDs in high and also 2 CDDs in the high and one from a low compliant village reported that the community members expelled worms after taking the LF drugs.

On management of the side effects, 4 CDDs reported that they referred those affected to the nearby health facility for medical attention. Indeed, 2 health workers in high and 2 in low compliant villages reported that they managed side effects cases such as male's scrotal irritation, swelling and pain and body rashes following drug distribution by giving pain killers.

There was also a significant association between the type of side effects and compliance with treatment $P< 0.001(\chi^2= 89.018$, df =5). The side effects which

included giddiness, fever, headache and vomiting were more expressed in the low than in the high compliant villages (Figure 4.11).

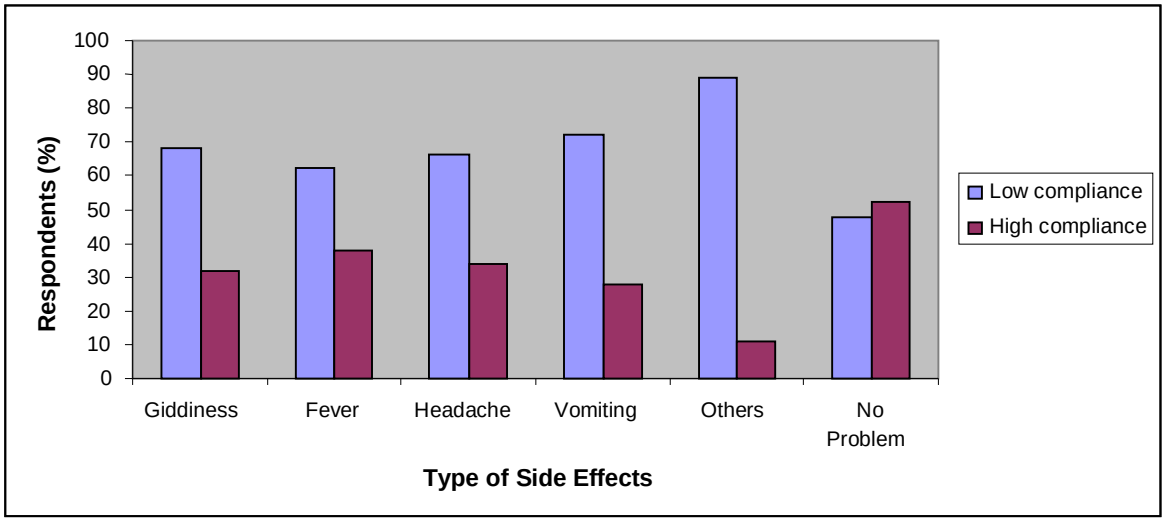

Figure 4.11: Type of Side Effect and Compliance with Mass Treatment.

4.3.5 Having Another Illness and Perception of Modern Medicine and Compliance with Mass Treatment

The reasons why one would not take drugs in the next MDA were significantly associated with compliance, $P< 0.01$ (χ^2=15.806, df =5). Reasons such as a dislike for modern medicine and perceiving the drugs as unnecessary were more common in the low compliant villages while reasons such as having another illness and fear of reactions that could deter one from taking drugs were more common among the high compliant villagers (Table 4.4).

Table 4.4: Reasons for not Willing to Take Drugs in Next MDA among Household Survey Respondents.

Reasons	Low Compliance	High Compliance %
Not distributed in my house/ villag	3.5	0.2
Do not like modern medicine	2.7	0.2
Not necessary for me	4.0	1.0
Fear of reactions	1.1	2.7
Have another illness	0.4	2.6
N/A	88.3	93.3

4.3.6 Method of Drug Distribution and Compliance with Mass Treatment

Reasons given for not wanting the drugs to be distributed by the house to house method in the next MDA round were significantly associated with compliance ($P< 0.001$ **(**χ^2=34.068, df =7). The reasons which mostly prevailed around the CDD included having to wait for the CDD for long and CDD not explaining well were more common in the low than in the high compliant villages (Table 4.5).

Table 4.5: Reasons for not Wanting the Drugs to be Distributed in the Same Way among Household Survey Respondents.

Reasons Given	Low Compliance		High Compliance	
	n	%	n	%
Had to wait too long for the CDD	33	6.1	4	1.0
CDD did not explain well the need f the drugs and their side effects	51	9.5	15	3.7
CDD did not have enough drugs	2	0.4	1	0.2
Poor interaction with the CDD	27	5.0	20	5.0
CDD never came	13	2.4	19	4.7
Have another illness	1	0.2	0	0
Never heard of MDA	1	0.2	0	0
N/A (Took Drugs)	409	76.2	344	85.4

From the qualitative study, in the FGDs - 4 from high and 4 from low compliant villages, a large majority of the participants reported that the interaction with the CDDs was poor as they did not give adequate information about the drugs, left drugs behind for absentees, did not have good communication skills, overdosed the people and were strangers to the community members. One female adult FGD participant in a low compliant village stated that:

One thing which surprised me this last time is that the CDDs came to my house when I was not in but gave my children the drugs, the worst thing is that my neighbour's children were in my house then and were also given the drugs, then I was blamed. Next time CDDs must ensure that they issue drugs in the presence of an adult and if there is no adult they must come to check again the following day.

(42 year old, female adult respondent, Zhogato village)

However, the opinion leaders prominently felt that the CDDs were doing a good job although their numbers needed to be increased. Similarly the LF patients felt that the CDDs were good in their role but an increase in their number and adequate training would help improve their work. Moreover, in all the 16 FGDs, some members reported that the CDDs needed to be supported by being given umbrellas, uniforms and badges. The umbrellas would protect them from harsh weather conditions and the badges enable the village members to identify them easily.

The opinion leaders from both groups however indicated that the present process of drug distribution was good although they felt that there was a need to involve all stakeholders. Both groups of patients also indicated that the present method of drug distribution was good although they felt that it was hurriedly done. It was only in one FGD from the low complaint villages where some participants felt that the drug distribution method should be changed from house to house to central point distribution**.**

4.3.7 Social Support, Alcohol and Substance Use and Compliance with Mass Treatment

Social support, that is being encouraged by others in the community to take the drugs during MDA and alcohol and substance use were not significantly associated with compliance in both the high and the low compliant villages ($P > 0.05$). Nearly the same proportions of opinion leaders from both groups indicated having facilitated MDA (47.2% in low and 52.8% in high compliant villages). However, a higher proportion (54.8%) of the patients in the low compared to 45.2% in the high compliant villages indicated having given some facilitation.

The kind of facilitation given by the opinion leaders was significantly different between the two groups $P<0.05$ ($\chi^2= 8.245$, df= 3). Two-third (66.7%) of the opinion leaders in the high compliant villages indicated that they facilitated the process through awareness creation and nearly the same proportions (64%) in the low compliant areas through

assisting the CDDs to find their way to households. The main facilitation given by the patients in both types of villages was community mobilization (54.8% in the low and 45.2% in the high compliant villages).

4.3.8 Participation in 2008 MDA and Willingness to Continue Taking Drugs

A higher proportion, (71%) of the respondents in the high compared to 58% in the low compliant villages reported that they had taken drugs during the 2008 MDA. Reasons given for failure to take drugs were around CDDs not visiting the household and being absent during MDA. Other reasons included thinking that the drugs were for LF patients with clinical signs only and a lack of perceived need of taking the drugs (Figure 4.12).

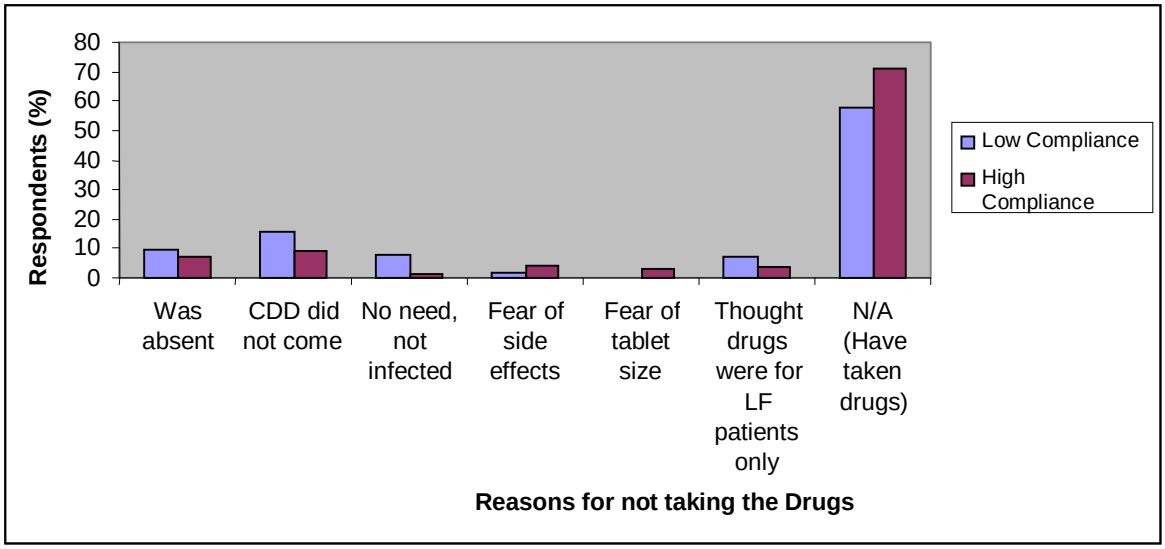

Figure 4.12: Reasons for not Taking Drugs among Household Survey Respondents.

Whether or not one would be willing to take drugs during the next MDA was significantly associated with compliance, $P< 0.001$ ($\chi^2= 20.410$ df = 2). More (93.3%) respondents in the high compliant villages compared to 88.3% in the low compliant villages reported that they would take the drugs during the next round of MDA.

The opinion leaders' perception of their communities' participation in MDA was not different in both groups although more than a half (53.4%) in the low compliant villages indicated that their communities' participation in MDA was good, a higher proportion (68.8%) of those in the high compliant villages indicated that their communities' participation was not good. There was no significant difference in the patients' response on participation in MDA. However, two-thirds (66.7%) of the patients in the low compliant villages indicated that their community's participation was poor, while nearly three-fifths (55.9%) of those in the high compliant villages indicated that their community's participation was good.

The types of problems/barriers experienced by the opinion leaders in both groups were not different; the main problem cited was poor mobilization by close to one-half (47.4%) of all the opinion leaders. Similarly there were no differences in type of problems/barriers experienced among the two groups of patients; the main problems included poor mobilization by almost one-quarter (27.5%) and CDD not coming to distribute the drugs by slightly more than one-tenth (13.8%).

4.4 Factors that Influence the CDDs' Motivation to Participate in the LF Elimination Programme

4.4.1 Demographic Characteristics of the Community Drug Distributors

Although a total of 18 CDDs were targeted for the study, that is two CDDs for every village, only 15 had distributed drugs in 2008 round of treatment. Thus a total of 15 CDDs, 9 females and 6 males participated in this study: 9 were from the high and 6 from the low compliant areas (Table 4.6).

Table 4.6: Demographic Characteristics of the CDDs.

CDDs	Low Compliance (n=6)	High Compliance (n=9)
Education N= 15		
Incomplete prima school	1	-
Completed Prima school	3	2
Incomplete High Scho	1	2
Completed High Scho	1	5
Occupation N =15		
Business	2	2
Farmer	2	5
CHW	2	1
Student	-	1
Religion N=15		
Christian	2	5
Muslim	4	4

4.4.2 Selection of CDDs for Drug Distribution

Six of the 15 CDDs interviewed reported that they were selected by their community members because they had higher education levels compared to other members, 5 because of their good behavior and familiarity with village members, and 6 because they were known to participate in similar programmes as volunteers. Only one CDD, a

male reported that he was selected because he was known to his area chief. Four-fifths (12) of the CDDs reported that they agreed to distribute drugs because they liked helping their communities and 4: 3 in high compliant and one in a low compliant village, because they were trusted by their community members as they usually engaged in community programmes and were therefore recognized. Two out of the 6 CDDs in low compliant villages reported that they considered the role of drug distribution to be an obligation as many people did not want to volunteer.

Furthermore, slightly more than one-half (7) of the CDDs (4 from low and 3 from high compliant villages) reported that the selection process was not done in a transparent manner and that some chiefs selected their own relatives who in most cases were unfamiliar with the areas assigned to them, thus strangers to the village members. One health worker from a high compliant village further emphasized on the need to ensure that CDDs were selected from the villages that they were to distribute drugs in. The health worker commented on use of strangers in drug distribution which might have contributed to low compliance levels as village members were unwilling to receive drugs from persons not known to them. Moreover, in all 16 FGDs, majority of the participants reiterated that the CDDs must be selected from within the villages where they were to distribute drugs. A female adult respondent in an FGD in a low compliant village reported that:

My village members in the last MDA questioned why strangers had to be brought to distribute drugs yet we have our own boys and girls who are well known to the villagers and have distributed these drugs previously, that is why people refused to take these drugs the last time compared to the first time when our own youth distributed the drugs and people really took the drugs. (55 year old, female adult respondent, Tsunza village)

4.4.3 Training of CDDs on Drug Distribution

Nearly all (14) CDDs reported that they had received training on drug distribution; however, one-third from each of the two types of villages mentioned that the training was very brief and hurriedly done. Only one CDD, a male from a low compliant village reported that he was not trained in the 2008 campaign but had been trained during the previous (2005) campaign. All trained CDDs reported that they received the training from health personnel at the local health facility and all reported that the content of the training included names and dosages of drugs used, causes of LF disease, side effects, target population, need to observe swallowing and how to maintain the records. One-third of the CDDs in the high (3) and in the low (2) compliant villages reported that the duration of the training session was between 10 minutes to one hour. Two CDDs in high compliant villages reported that their training session lasted for two hours. Only about one-half (7) of the CDDs, five in the high and two in the low compliant villages reported that the training session lasted for one full day (Table 4.7).

Table 4.7: Length of CDD Training.

Length	Low Compliance	High Compliance
Not trained	1	-
Ten minutes to one hour	3	2
Two hours	-	2
One day	2	5
Total	6	9

In 6 FGDs, 3 in low and 3 in high compliant villages, some participants also reported that the CDDs were not given adequate training on communication skills that would enable them develop a good rapport as well answer all questions about the programme raised by village members with confidence. Furthermore, one health worker in a high compliant village also emphasized the importance of training CDDs so as to prevent hostility towards them and doubts about their qualifications in administering the drugs.

4.4.4 Adequacy of Drugs Received by CDDs

About one half (8) of the CDDs, (6 in high and 2 in low compliant villages) reported that they received enough drugs for distribution while 4, (3 in high and one in a low compliant village) reported that they did not receive enough drugs. Only four CDDs reported that they received more drugs than they required for distribution (Table 4.8). However, two CDDs in low the compliant villages reported that they received the drugs very late on the day of the distribution. Thus, even if 3 CDDs in the low compliant villages received more drugs than they required for distribution, 2 of them received the drugs too late on the day of distribution which may have negatively influenced their capacity to deliver on time.

Table 4.8: Sufficiency of Quantity of Drugs Received by CDDs.

Sufficient	Low Compliance	High Compliance
Enough	2	6
Not Enough	1	3
More than Enough	3	-
Total	6	9

All (15) CDDs reported that they observed the principal of DOT although two-thirds (6) in high and one-third (2) in low compliant villages reported that they left drugs for household members who were absent at the time of delivery. Only one half (3) of the CDDs in low compliant villages reported that they observed all household members swallowing the drugs.

4.4.5 Record Maintenance during Drug Distribution

All 15 CDDs reported that they maintained records during distribution which they submitted to the health officers. However, two CDDs, in high and 2 in low compliant villages reported having experienced some problems in record maintenance as they had not received adequate training, had limited time to distribute drugs, do summaries, make returns and that the record books were very old and outdated. One health worker in a low compliant village moreover, reported that some villages lacked record keeping books further making the exercise more difficult and possibly negatively influencing record keeping.

4.4.6 Duration of Drug Distribution Period and Compliance with Treatment

A majority (10) of the CDDs were unable to distribute drugs to all the households assigned to them. The reason given for failure to reach all households was time limitations due to the large number of households in comparison with the duration of distribution. Only one-third of the CDDs in each of the two types of villages reported that they reached all households but did not make call backs due to time limitations. Furthermore, in 7 FGDs, 4 in low and 3 in high compliant villages some participants reported that the number of CDDs needed to be increased in order to reduce their workload and enable them to cover all households allocated to them and also to avoid keeping household members waiting. All the CDDs reported that the one day period of drug distribution was not satisfactory for conducting the drug distribution.

One-third (5) of the CDDs in both types of villages as well two health workers and two LF coordinators indicated that an increase in the number of CDDs as well as in the drug distribution period would help improve future MDA campaigns. All the LF coordinators also mentioned that the MDA planning period needed to be extended for improved programme performance. Eighty-five percent of the LF patients and more than one-third (37.1%) of the opinion leaders indicated the need for adequate training, increased number of CDDs and drug distribution period as steps for improving compliance with treatment. A majority of participants of most, 13 out of the 16 FGDs also felt that the MDA duration was too short and was the reason as to why some

community members missed the treatment. Indeed a male adult respondent in one of the FGDs in a high compliant village observed that:

The duration should be increased with special emphasis on the officers in charge of MDA to give about a week's education to the villagers to ensure that they understand how this disease is transmitted. (39 year old, male adult respondent, Mbengani village)

4.4.7 CDD Interaction with Community Members

Majority (13) of the CDDs reported that most of the village members had too many questions and doubts about the programme with some claiming that the drugs were for sterilization. One-fifth (3 out of 15) of the CDDs further reported that some community members insulted them and refused to swallow the drugs. A majority (11) of the CDDs and close to two-thirds (57.7%) of the opinion leaders cited community education, sensitization and awareness creation as the most important measures towards improving drug distribution. One-fifth (20%) of the opinion leaders (n= 80) highlighted the need to empower CBOs, FBOs and youth groups for improved mobilization and advocacy. More than two-fifths (41.7%) of the LF patients moreover highlighted the importance of conducting the MDA consistently and about one-fifth (19.5%) on the need to organize a morbidity control programme to care for those with clinical manifestations.

Furthermore, two-thirds (10) of the CDDs felt that they did not get any support from the programme implementers which may have negatively influenced their motivation resulting in reduced compliance levels. One-third (5) of all the CDDs felt that the health

workers failed to support them by not giving them adequate incentives, sensitizing the community members and supervising the drug distribution activity. Moreover, one-fifth (3) of the CDDs in high complaint villages reported that the local leaders (chiefs and village elders) were not supportive as they had not conducted community mobilization and demanded bribes from CDDs who wished to be selected in future drug distribution campaigns. Furthermore, only two of the four LF coordinators mentioned supervision of health workers at the village level in their description of the process of drug distribution.

Only one-third (5) of the CDDs reported that they got support from community members through former CDDs who assisted in the drug distribution and record maintenance and from theatres group that performed plays highlighting on the importance of swallowing the drugs. Another one-third (5) of the CDDs however, indicated that the health officers were very supportive in training and encouraging them to conduct the distribution. The remaining one-third (5) indicated that the village members were very supportive as they helped in community sensitization and mobilization.

4.4.8 Remuneration/Appreciation of CDD Services by the Programme and Community Members

All 15 CDDs reported that they received some financial incentives in the form of money and only 3 in high and one in a low compliant village reported that they

received moral incentives through recognition by community members and health officers who invited them for other community trainings on health programmes. All 15 CDDs also reported their willingness to distribute drugs in subsequent campaigns. Majority (11) of the CDDs cited their desire to help their communities to be free from the LF while one-fifth (3) felt that in the process of drug distribution, they got more educated about the disease and about community behaviors and perceptions.

4. 5 The Role of Behaviour Change Communication in Mass Drug Administration Uptake

4.5.1 Source of MDA Information and Compliance with Mass Treatment

The source of MDA information was significantly associated with compliance with mass treatment; $P< 0.001$ ($\chi^2= 33.663$ df = 9). The CDDs were the most common source of information in both types of villages (48.5% in the high compared to 40 % in the low compliant villages) followed by village leader and the community leaders (17.7% in the high and 12.8% in the low compliant villages). The health facilities, radio and posters were more common sources of information in the low compared to the high compliant areas (Figure 4.13).

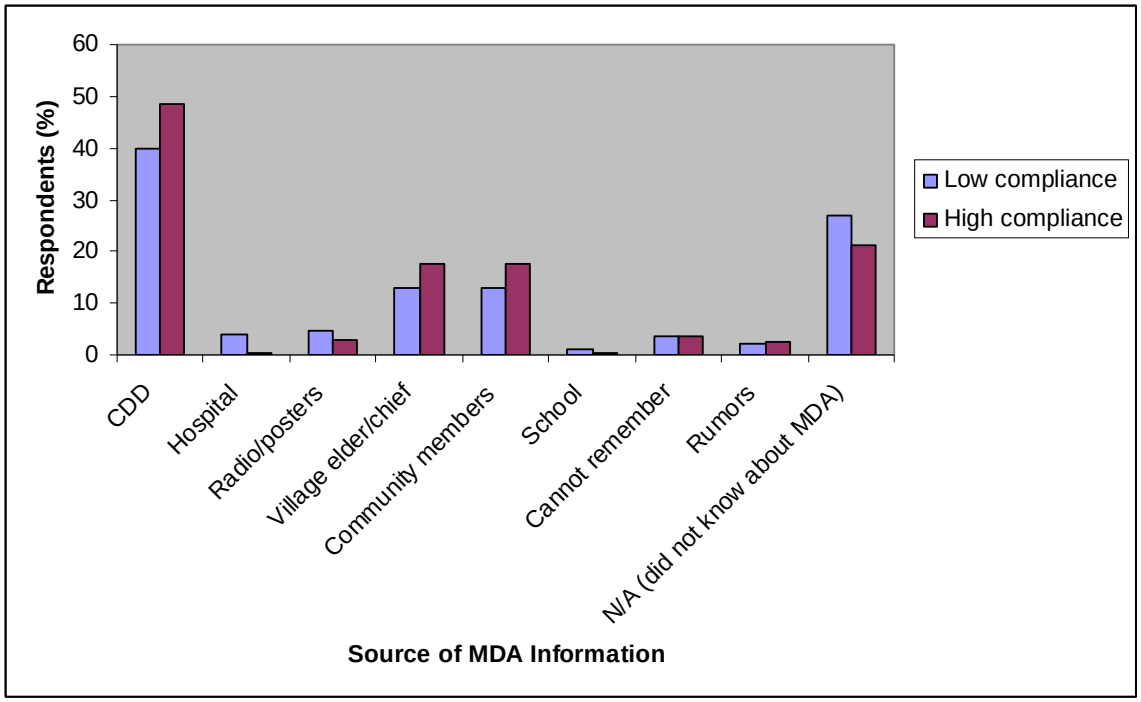

Figure 4.13: Source of MDA Information among Household Survey Respondents.

Data from the opinion leaders showed that although there was no difference in source of MDA information in both groups, nearly two-thirds (64.7%) in the low compliant villages indicated that the CDD was the most common source while 59.6% in the high compliant villages listed the village elders' meeting as their main source. The source of MDA information according to the LF patients in both types of villages was not different although a higher proportion (54.8%) in the high compared to 45.2% in the low compliant villages reported that they obtained the information from the village elders' meetings. However, a lower proportion (45.5%) of LF patients in the low compared to 54.5% of those in the high compliant villages mentioned that they got the information from the CDDs.

4.5.2 Content of MDA Information Received and Compliance with Mass Treatment

The content of information received about MDA was significantly associated with compliance, $P< 0.001$ ($\chi^2= 24.980$ df= 6). Nearly three-quarters (71%) in high compared to 61% in the low compliant groups received the correct information - that the drugs were given to treat and control LF while 28% in the low compared to 24 % in the high compliant villages reported to have not received any information (Figure 4.14).

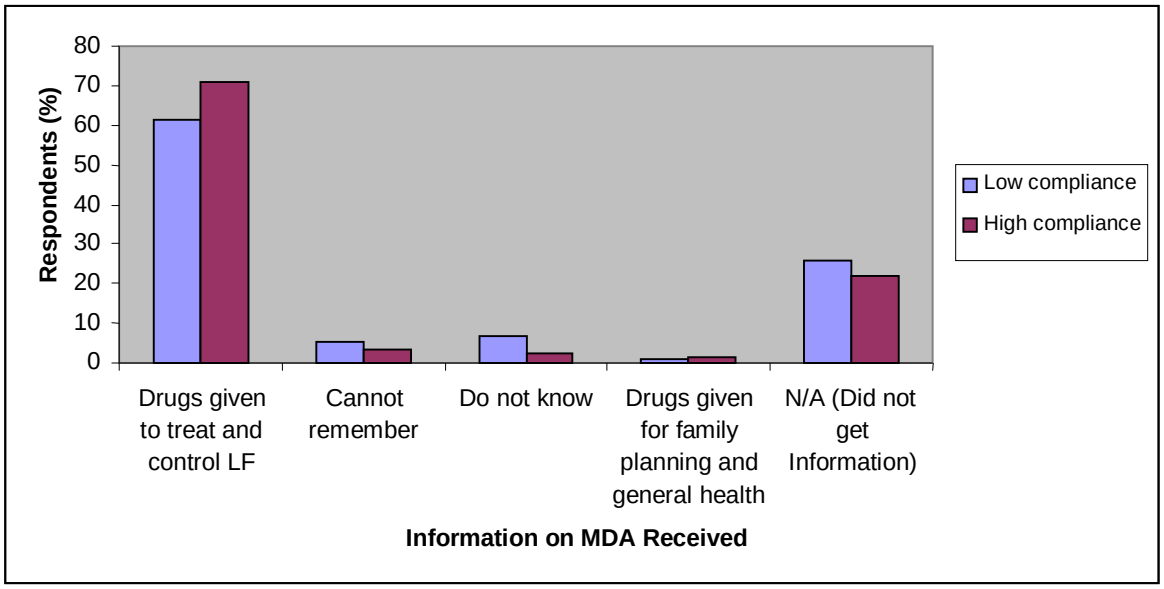

Figure 4.14: Content of Information about MDA Received by Household Survey Respondents.

On correctness of content of MDA information received, the data from the opinion leaders indicated that there were no major differences among the two groups. However, a larger proportion (55.6%) of the opinion leaders in the low compliant villages thought that the information was adequate while a larger proportion (60%) of those in the high compliant villages indicated that the information was inadequate. Similarly the

perception of adequacy of MDA information was significantly different in the two groups of LF patients; $P< 0.05$ ($\chi^2= 7.124$, df= 2). While more than two-thirds (69%) of the patients in the low compliant villages indicated that the information was adequate, 63.4% in the high compliant villages thought the MDA information was inadequate.

There was a significant difference in perception of time given to understand about MDA between the two groups of opinion leaders, $P<0.05$ ($\chi^2= 9.856$ df= 3). While a higher proportion (63.9%) of opinion leaders in the low compliant villages indicated that the time was enough, a higher proportion (65.9%) in the high compliant villages indicated that the time was not enough. Furthermore, while 57.7% of the patients in the low compliant villages thought that the time given was enough, 51.7% of those in the high compliant villages thought that the time was not enough.

A higher proportion (62.5%) of the opinion leaders in the low compliant villages indicated that the information on mass treatment was enough while slightly more than three-fifths (61.9%) in the high compliant villages indicated that the information was too little. Similarly, a higher proportion (59.1%) of the patients in the low compliant villages indicated that the information was enough while slightly more than a half (53.5%) of the patients in the high compliant villages indicated that the information was too little.

Slightly more than half (55%) of the opinion leaders in the low compliant villages indicated that the period between awareness creation and drug distribution was enough

while close to three-fifths (58.5%) in the high compliant villages indicated that the period was too short. On the other hand, a higher proportion (55.3%) of the patients in the low compliant villages indicated that the period between awareness creation and drug distribution was too short while two-thirds (66.7%) in the high compliant villages indicated that the period was enough.

4.5.3 Frequency of Receiving MDA Information and Compliance with Mass Treatment

Frequency of receiving information on MDA was significantly associated with compliance, $P< 0.001$ ($\chi^2= 51.186$ df= 6). While both high and low compliant village members reported that they received the information at least once, 65.5 % and 50.3% respectively, a significant proportion (10.5%) in low compared to 7.9% in high compliant villages did not know how many times they had received the information (Figure 4.15).

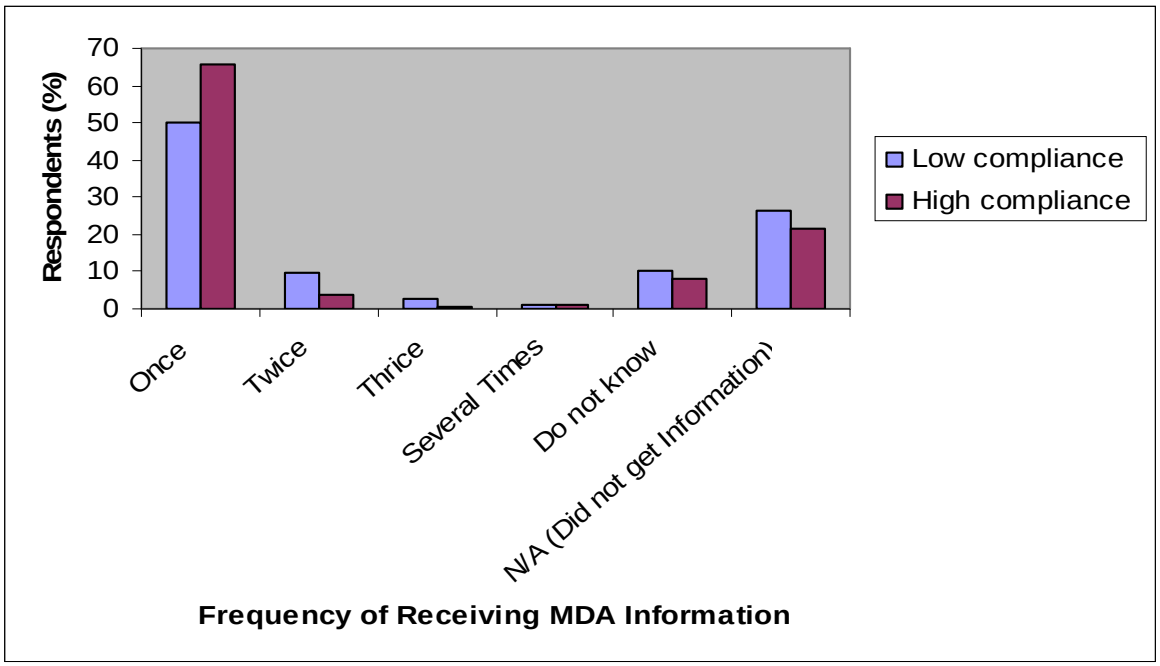

Figure 4.15: Frequency of Receiving MDA Information among Household Survey Respondents.

The qualitative data illustrated the importance of community mobilization for MDA. Majority of the participants in 6 FGDs in low and 2 in high compliant villages reported that they got the MDA information one or two days before the distribution day. Majority of the participants of 7 FGDs, 6 in high and one in a low compliant village reported that they were given the MDA information 3 days before distribution day. Some participants of 3 FGDs, all from high compliant villages however reported that they got the information 4 to 7 days before MDA day. In all FGDs, majority of the participants emphasized that the community members needed to be given adequate sensitization and education about the LF programme. A male youth participant in an FGD in a high compliant area said:

But the problem is that people were not educated on the drugs and the CDDs just came and gave out the drugs, they did not explain the negative and positive effect that is why many people did not swallow the drugs. (26 year old, male youth respondent, Kavunyalalo village)

Moreover, one half (3) of the CDDs in low and one in a high compliant village reported that their communities had not been sufficiently informed about the mass treatment campaign. One-third (5) of the CDDs moreover reported that they informed their community members about the campaign during the actual drug distribution time. All CDDs felt that there was inadequacy in source, content and frequency of MDA information and that combined effort by health workers, local administration and mass media through posters and radio announcements needed to be used in order to create awareness and raise the compliance levels.

Only 2 health workers, one in a high and one in a low compliant village reported community mobilization and awareness creation as activities assigned to them. Only one health worker from a high compliant village reported that he had sensitized the community members on MDA while 2 health workers in high and one in a low compliant village reported that they had delegated the role of community sensitization to village elders, CHWs and CDDs. Only three health workers in high and one in a low compliant village reported that they were trained about the drug distribution with 2 of them reporting that the training they had received was inadequate; important issues

were taken for granted; and that no factual information was given. One health worker in a low compliant village reported that he did not sensitize his community members as he was a new officer in the area and did not have sufficient information about the campaign. Only one LF coordinator mentioned community sensitization and health education as steps taken to control LF in his area.

4.5.4 Individuals' Opinion on Source of Information and Compliance with Mass Treatment

Individuals' opinion on source of MDA information was significantly associated with compliance, $P< 0.001$ ($\chi^2= 29.052$ df = 5). More than two-fifths (43%) in low and 46% in high compliant villages considered the source good, 12.4% in high compared to 5% in low compliant villages considered the source poor while 12.4% in high and 11% in low compliant villages indicated that the source should be more factual (Figure 4.16).

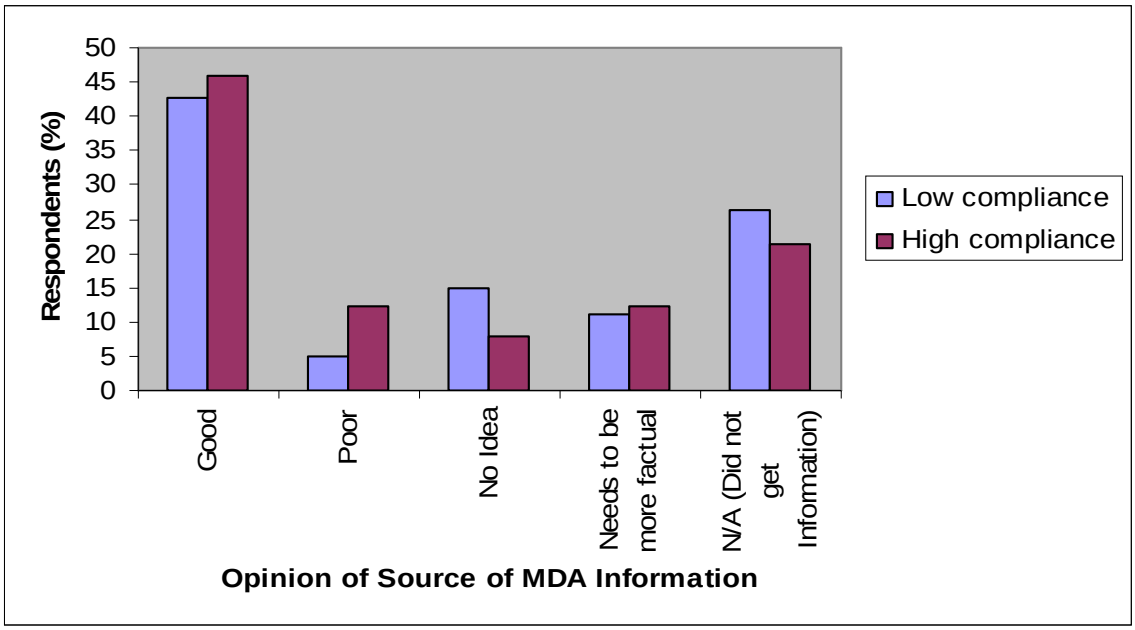

Figure 4.16: Opinion on Source of MDA Information among Household Survey Respondents.

Furthermore, majority of the participants of all FGDs indicated that awareness creation would be important for ensuring that people complied with the treatment. A female respondent in an FGD in a low compliant village observed that:

I would like them to do like those who advertise using microphones or loud speakers in a car going house to house or different areas in the village explaining when the drugs will be given out, what they are for and who is required to take them. Also the village chairman should encourage his village people and many will get the information and accept to take the drugs next time.

(54 year old, female adult respondent, Dzivani village)

CHAPTER FIVE:

5.0 DISCUSSION

5.1 Socio-economic Factors and Their Influence on Compliance with Mass Treatment

The study results indicate that several socio-economic factors including religion; occupation; ownership of land and housing structure; ownership of a radio; accurate knowledge on the cause of LF and perceived risk of infection influenced compliance with MDA.

Religion was found to be significantly associated with compliance with mass treatment ($P<0.001$). Whilst compliance was high among the Christians, it was low among the Muslims. This could be due to limited engagement of Muslim leaders in the sensitization activities. Weerasooriya *et al*. (2007) observed that Muslims do not traditionally allow strangers into their homes and places of worship. Therefore, they recommended the need to explore cooperation from Muslim leaders as a measure of increasing treatment coverage.

Compliance with mass treatment among the non-practicing (those who do not practice any religion) was also found to be low. This could be due to adherence to traditional beliefs that deter non-practicing community members from using modern medicine. Compliance for this group could also be low due to limited opportunities for such

people to meet and influence each other. There is evidence that the extensive involvement of persons in religious groups promotes beliefs and activities relating directly to health, health practices or healthcare. The overall impact of religion on health could have enough public health significance as observed by Koenig (2001).

The main occupation was significantly associated with compliance ($P<0.001$). Business, salaried worker, fishing and casual laborer as main occupations, which for the study communities denote high income levels, thus high socio-economic status, were found to negatively influence compliance. This could be due to the fact that people who are engaged in income generating activities tend to be away from their homes as they seek opportunities elsewhere, which could be a cause of non-availability during treatment. This finding is similar to that of Yirga *et al*. (2010), which showed that people in employment missed treatment due to absence from their communities. Furthermore, those with relatively high incomes may be less likely to take advantage of free public health programmes with the assumption that if they need treatment they could access it.

Other socio-economic factors that were significantly associated with compliance included ownership of land ($P<0.001$) and housing structure ($P<0.01$). Ownership of land and housing structure were considered proxy indicators for high income in this study. The results indicate that those who owned such property were less likely to

comply with free public health programmes. Such people tend to be more able to afford private medical costs. A study done by Kleeberger *et al*. (2004) on socio-economic factors and adherence to antiretroviral treatment (ART) presumed that patients with a higher level of income differed from those of lower/middle income in terms of behavioural characteristics and hierarchy at the decision-making process, thus affecting their adherence to ART. Perceived economic support by a significant other was found to have a direct association with levels of adherence to ART, in another study (Morse *et al*., 1991). Such findings confirm the link between income and disparities in health status and the will to adhere to treatment, placing the lower income patients on a deprivation scope, while allowing for higher income patients to adjust according to relative social status, possibly being influenced by other socio-economic status (SES) factors such as education and occupation (Adler *et al*., 2002).

The situation with MDA for LF is different because the treatment is free and the drugs are given only once a year therefore the issue of affordability among the low socio-economic group should not be a key determinant for compliance. Indeed, those in the higher SES group are less likely to comply mainly because they might feel less susceptible to infection or have access to private health services. Similar findings reported by Nandha *et al*. (2007) showed that income level seemed to play an independent significant role, compliance being lowest among the high-income group. Feedback from the workers of the Integrated Child Development Scheme (ICDS) revealed that entering the premises of residents in high-income areas for drug

distribution itself was difficult as the entrances were locked most of the time, and wherever entry was possible the response was poor. People with high income levels were not willing to take preventive medication and this could perhaps be due to the fact that for such people preventive medication is not a felt need as they do not feel at risk of such infections.

Ownership of radio, another proxy indicator of income, was also associated with compliance with treatment ($P<0.001$). More people from the high compliant group owned a radio. Indeed, those who owned a radio were more likely to have been aware of the MDA programme having listened to radio announcements whilst those who did not own may have missed out. Similarly, Nuwaha *et al*. (2005) attributed radio as a social support mechanism associated with compliance with ivermectin treatment. Radio is also a major source of health and development education and this would imply a higher level of knowledge among those who own and listened to it.

Accurate knowledge on the cause of LF was significantly associated with compliance ($P<0.001$). In the low compliant group, knowledge on cause of LF captured through assessing the proportion of people who knew LF was transmitted by mosquitoes, was lower than in the high compliant areas. These findings are similar to those of Mathieu *et al*. (2006) in a study conducted in Leogane, Haiti persons who knew that LF was transmitted by mosquitoes were more likely to have participated in MDA than persons who did not know. However, the communities' knowledge of the cause of LF was in

the current study found to be generally low. Another study by Babu et al. (2004) showed that people with insufficient knowledge on LF gave low priority to its prevention.

Inadequate knowledge of the cause of LF has earlier been reported in a study done in Kenya where the majority of the study population blamed it on witchcraft, eating burnt or bad food and sexual transmission with a minority relating it to mosquitoes (Amuyunzu, 1997). In Malaysia, Haliza (1986) established that only nine of 108 respondents in an endemic area knew that LF was transmitted through mosquito bites. Many people believed that walking barefoot on dirty ground or consuming contaminated food or drinks was the responsible cause. In Tanzania, Muhondwa (1983) established that people were aware of hydroceles; the predominant chronic sign in East Africa although not of filariasis *per se*, for which there was no local name. People generally knew that mosquitoes transmitted malaria but not filariasis. In the Philippines Lu *et* al. (1988) and Schultz (1988) found that filariasis was attributed mainly to contact with cold water after heavy work; only a few educated people mentioned mosquito bites as the cause. The diversity in beliefs in the causation of the disease makes a case for intensified health education in endemic communities.

Perception of being at risk of LF infection was significantly associated with compliance ((P<0.001). High compliance areas tended to reflect a higher perception of susceptibility to LF. This result is consistent with the findings of the study by Yirga *et*

al. (2010) and a similar study by Nuwaha *et al*. (2005), which positively associated high risk perception with compliance. In general, the degree of stigma seems to be associated with the severity and visibility of the disease. Similarly, results of a study in the Philippines by Lu *et al*. (1988) found that people with hydrocele were not excluded from social functions; they went to school, worked, married, had children and lived with their families. Cases were considered serious only when they reached the size of a sack: hydroceles the size of a coconut were apparently considered unremarkable. Amuyunzu (1997) observed that the communities' perception of being at risk of getting LF varied, in some instances it provoked sympathy and in others laughter. Thus, it is mainly those who had swollen genitals that the community members laughed at but for those with swollen limbs, the community members appeared to have sympathy on them.

The findings of the current study are similar to those of Ahorlu *et al*. (1999) based on a study conducted in Ghana where hydrocele was considered to have no link with ADL manifestations, but was believed to be inherited and to some extent enhanced by hard work, excessive drinking of palm-wine and sexual activities. Similar beliefs about LF have been reported from other endemic areas of the world, such as the Phillipines (Lu *et al*., 1983), India (Bandyopadhyay, 1996; Ramaiah *et al*., 1996) and northern Ghana (Gyapong *et al*., 1996b). Ahorlu *et al*. (1999) reiterated on the need for these beliefs to be addressed if control programmes are to be locally accepted and supported.

The interviews with LF patients revealed that having a higher disease burden was associated with compliance with mass treatment ($P<0.05$)**.** Patients from the high compliant areas had a higher mean number of years with chronic disease compared to those from the low compliant areas. The patients in the high compliant areas had lived with the disease for more years than those in the low compliant areas and were therefore more aware of the detrimental effects of LF on their health. This could have influenced their willingness to comply with treatment. In the Dominican Republic, Person *et al*., (2006) also reported that a large majority (94%) of the women with chronic lymphoedema interviewed had sought care from traditional practitioners or trained physicians. In a study done in Tahiti by March *et al*. (1960) people were reported to seek DEC voluntarily during attacks of lymphangitis. As such, this study confirmed that patients were more likely to comply with treatment as they were at risk of experiencing filarial fevers and would therefore be more willing to take precautions.

Several factors, which have been shown in other studies to have influenced compliance, were not significant in the current study. These include age, sex, marital status and level of education ($P>0.05$). A study by El-Setouhy *et al*. (2007) also did not find an association between age group and sex with compliance to treatment.

The findings of the current study however compare differently to those by Mathieu *et al*. (2004) where coverage among those aged 14-29 years was found to be lower than those aged over 69 years. Furthermore, men were more likely to have taken the drugs

than the women. Amarillo *et al*. (2008) found sex to be significantly associated with receiving drugs with more females receiving the drugs than their male counterparts.

There was no association between the level of education and compliance in the current study ($P>0.05$). This is similar to the report of Amarillo *et al.* (2008) where the level of education was not associated with receiving the filarial drugs. What was clear in the current study was that most people were aware of the signs of LF and the stigma associated with it. This finding outlines the need for intensified health education for communities living in both types of villages. In the study area, the persons with swollen limbs and genitals were well known to the other community members and it was reported that such persons experienced pain and were bedridden four times in a month. Besides, a large proportion of the community members associated the disease with witchcraft or sexual behavior which meant that stigma was prevalent, the level of education notwithstanding.

5.2 The Influence of Individual Preferences and Behavioural Factors on Compliance with Mass Treatment

The study results established that several individual preferences and behavioural factors influenced compliance with MDA. These included problems related to the size, the number and taste of the drugs; experience of side effects; poor perception towards the treatment; and a dislike of the drug distribution system.

Complaints related to drug size, number and taste were more common in the low compliant villages than in the high compliant sites. Problems with swallowing the drugs were also more commonly reported in the low compliant areas and could have negatively influenced compliance ($P<0.01$). These could also be attributed to lack of awareness creation on the drugs used in MDA, their taste, size and number. It could also be due to the time limitations as the CDDs did not have adequate time to sensitize their communities. Similar reasons have been established in other programmes (e.g. Babu *et al*., 2004; Mathieu *et al*., 2004), which also indicated that the drugs were too many to be consumed at one time.

Having experienced side effects to the drugs during previous MDAs was significantly associated with compliance ($P<0.001$). A larger proportion from the low compared to the high compliant areas reported to have experienced side effects following treatment. This could be due to inadequate community sensitization on side effects which has been observed to affect compliance in other programmes. The study by Babu *et al*. (2004) also reported that the most important reason for not taking drugs after receiving them was fear of side-effects, followed by 'being away from the family', 'being unwell' and 'not seeing the necessity to take the drugs'. Similarly Ramaiah *et al*. (2000), Babu and Satyanarayana (2003) and McLaughlin *et al*. (2003) have reported the impact of adverse side-effects on coverage and compliance with MDA. A recurring issue is that treatment with DEC causes severe reactions in people with mf, not from the drugs directly, but triggered in some way by the death of mf and possibly an effect on the

adult worms. Since most people with mf have no clinical symptoms, these reactions are particularly unwelcome, which makes a case for health education in LF MDA (Evans *et al*., 1993). Haselow *et al*. (2003), when discussing programmatic and communication issues in relation to serious adverse events following ivermectin treatment, emphasized the importance of using IEC support as reminders on possible side effects to support the work of the CDDs.

Kyelem *et al*. (2007) in a study conducted in Burkina Faso emphasized the need for BCC messages to address potential side effects and management guidelines for major symptoms following MDAs for the health personnel. The health personnel by so doing would reduce related fears among the communities and perhaps raise the levels of compliance. In Zanzibar (Mohammed *et. al*. 2006) the communities were educated on importance of adverse reactions as evidence of the therapeutic reaction of the drugs and as a result the public was willing to accept the treatment. Informing people that they could be infected and that the symptoms of the disease may appear five to ten years after being infected may motivate the community members to comply with MDA even though being asymptomatic and having not been diagnosed through nocturnal blood examination (Amarillo *et al*., 2008). The results of the current study showed that the health providers were not adequately engaged in passing information on MDA, which could have influenced the fear of side effects.

Poor perception towards modern medicine was associated with low compliance (P<0.01) in the current study. A dislike for modern medicine prevailed more in the low compliant villages while reasons such as having another illness were more predominant among the high compliant villages. The two factors have been documented elsewhere. On the one hand, Lakwo *et al*. (2006) in a study on non-adherence to community-directed treatment with ivermectin (CDTI) for onchocerciasis control in Tanzania associated local beliefs and poor perceptions of modern medicine with non-adherence to treatment. On the other hand, Mathieu *et al*. (2006) in the study conducted in Leogane, Haiti with an objective of finding out the proportion of persons who were systematically non-compliant and the factors associated with this behaviour also established that having been sick during the drug distribution period was one of the reasons commonly given for non-compliance.

Dislike for the current method of drug distribution was associated with compliance (P<0.001). The results of this study showed that individual preferences on method of drug distribution influenced compliance with MDA. Majority of those from the low compliant areas had a dislike for the current method of drug distribution – where the CDDs went from door-to-door and claimed to have spent a lot of time waiting for the CDDs to come to their houses or the distributor did not explain well about the need to take the drugs, the regimen and their side effects or did not have enough drugs to give. The reasons provided were directly related to the limited time available for CDDs to distribute drugs and the inadequate training given to the distributors, a factor that is

discussed further below. Ashwini *et al*. (2009) also reported failure of the distributor to deliver the drugs as a common reason for non-compliance. Furthermore, Babu *et al*. (2004) found that delays in supplies as well as processes to undertake MDA in some places influenced the coverage and compliance as referenced further below.

Poor interaction of community members with the CDDs was given as another reason for dislike of the distribution method. In areas where there was suspicion that the CDD selection process was not done in a transparent manner, also discussed further below, there were low levels of compliance. People preferred CDDs selected from their villages hence well known to them. This could be due to the fact that they could trust and freely relate to them. Wanji *et al*. (2009) reported that high compliance with doxycycline for onchocerciasis and loiasis in Cameroon was mainly due to the fact that the drugs were delivered by selected community members, which guaranteed some trust and was a great motivating factor in the population to comply with treatment. Katabarwa *et al*. (1998) further reported that selection of CDDs by the community was a useful indicator for predicting sustainability and monitoring progress towards self-sustenance of drug delivery in Uganda.

Compliance with the 2008 MDA round and willingness to take the drugs in subsequent rounds was associated with compliance ($P<0.001$). A higher proportion from high compliant group not only reported that they had taken drugs during the 2008 MDA but also indicated their willingness to take them in subsequent rounds. This is an indication

of higher motivation among these community members that has also been reported in other studies (Amarillo *et al.* 2008). This may also be attributed to their perceived threat of infection with LF in the future, as well as their knowledge on LF prevention. Findings of a study conducted in an urban setting in India by Ramaiah *et al*. (2005) also revealed that those from very low income areas, as opposed to those from high and low income areas, felt that MDA being part of a government-sponsored preventive programme was likely to be beneficial and expressed their willingness to participate.

There were several individual preferences and behavioural factors that did not influence compliance with MDA including perceived need for treatment, social support and substance abuse.

Perception on the need for treatment was not significantly associated with compliance ($P>0.05$). Both high and low compliant groups perceived the treatment as highly necessary for them although a lack of perceived need for the drug was a reason for failing to comply with the treatment among the low than the high compliant group whose reasons were more related to fear of side effects. Weerasooriya *et al.* (2007) indicated that the reasons for failure to consume the drugs, apart from the fear of adverse reactions, were the use of other medicines, a lack of feeling of the necessity for them and forgetting. The results of the current study were similar to those of a study carried out in India by Babu *et al*. (2004), where lack of perceived benefits for the treatment and risk perception were found to be persistent in the community and

contributed substantially to low compliance. People could not perceive the benefits of MDA except a few individuals, and co-administration of albendazole had not greatly influenced the perceptions of the community and could not generate 'perceived benefits'. According to Ottesen *et al*. (1999), many beyond filariasis benefits of albendazole can be directly perceived by individuals who consume it and the compliance within such populations should be appreciably enhanced. Findings of the current study revealed that those from the high compliant areas reported having expelled worms after taking the treatment and this could have contributed to higher levels of compliance. The health workers and CDDs reported that they reassured the people that expulsion of worms was beneficial and was a sign that the drugs had worked. This implies that more investment in BCC focusing on additional benefits of the drugs could increase levels of compliance in communities.

Social support which includes real or perceived resources provided by others that enable a person to feel cared for, valued, and part of a network of communication and mutual obligation (Stroebe, 2000) was not associated with compliance in the current study ($P>0.05$). The existence and amount of social support differed in quality and type among the study communities. Social support generally includes perceived emotional support, instrumental support such as direct assistance, for example transportation, and informational support such as sharing knowledge about resources. Similarly, Amarillo *et al*. (2008) did not associate being able to discuss LF and MDA with other people and being encouraged by others to take the drugs with compliance. This finding further

calls for intensified health education, which could be strengthened through the participation of health personnel. This result however compares differently to that of the study by Yirga *et al*. (2010) on factors associated with compliance with CDTI for onchocerciasis control in southern western Ethiopia where social support was significantly associated with compliance.

The use/abuse of alcohol and other drugs which impairs people's capacity to make proper judgment, thereby increasing their likelihood of missing treatment were not associated with compliance ($P>0.05$). This could be due to the fact that MDA is a one-off event that does not require continued presence of individuals akin to ART. In comparison, Lakwo *et al*. (2006) in a study on non-adherence to CDTI for onchocerciasis control in Tanzania associated alcohol use among community members with non-adherence.

5.3 Factors that Influence Community Drug Distributors' Motivation to Participate in the LF Elimination Programme

Results of the current study showed that several factors influenced the CDDs' motivation to participate in the LF elimination programme. These included issues to do with CDD selection, quality and duration of training, supply of drugs to CDDs, record keeping, and duration of drug distribution, community sensitization, CDD supervision and financial and moral incentives.

The criteria used to select CDDs to distribute drugs in their communities during the 2008 MDA were seen to contribute to their motivational levels. Having a level of education that is superior to other community members, being trustworthy and having good behavior, being familiar to the community members and also knowing well the areas allocated to them for drug distribution are the basic requirements for one to be selected as a CDD. This is in line with a report of a multi-country study done in Ghana and Kenya by UNDP/World Bank/WHO/TDR (2000). The recommended criteria for selection of CDDs to be adhered to by LF programmes included ability to read and write, ability to keep records, trustworthy and willingness to distribute drugs to all eligible persons in the areas allocated without expecting payment from the programme.

These factors, according to the CDDs, increased their motivation to distribute drugs. The CDDs were also motivated by the desire to help their community members to be free of LF infection. They also appreciated the fact that engaging in this activity exposed them to more education and information about LF and about behaviours and perceptions of their community members. The CDDs also felt motivated and recognized when they were used by other programmes to provide volunteer services. In Zanzibar, where the MDA programme has been successful, the drug distributors had been selected on the basis of their experience in disease prevention activities and their residence in the community where the work was to be done (Mohammed *et al*., 2006). The fact that the CDDs in the current study were involved in other interventions, for example malaria and immunization campaigns, gave them further affirmation.

Although community participation is identified as a key factor in the MDA process, communities have not been well involved in many places (Babu *et al*., 2004) and the current study results indicated that most communities were involved in the selection of the CDDs. Out of the 15 CDDs only one was reported to have been nominated by the Chief without consultation. A study done in Ghana suggested that communities understand the role that their members can perform best and should be allowed to select their CDDs (Gyapong *et al*., 2001).

It was notable that a higher proportion of the CDDs who served in the high compliant areas were also CHWs meaning that they were already accepted by the community members as implementers of community health programmes.

The quality and duration of training of the CDDs and health workers was also found to have influenced compliance. The training duration for majority of the CDDs in the current study ranged between thirty minutes to two hours. The recommended duration of training is a full day (WHO, 2000). The CDDs' confidence on drug distribution processes needs to be built and this can only be achieved if they are intensively trained for the recommended duration. Nuwaha *et al*. (2005) in a study on predictors of compliance with CDTI in Uganda pointed out that the CDDs themselves admitted that they had inadequate knowledge and that the training was too short to have equipped them with the necessary skills to conduct health education on onchocerciasis.

Training on good communication skills is critical as it helps the CDDs to communicate appropriately to the community members. Given the short duration of training reported for the current study, it is probable that the CDDs were ill-equipped to sensitize the communities and to guide them appropriately on matters to do with side effects, as earlier indicated. Lack of intensive training resulting in a lack of competency may have been the cause of hostility and mistrust from the community members. Weerasooriya *el al*. (2007) found intensive training to be an important factor and essential for all distributors on communication skills, on the disease and its prevention. These findings are again similar to those of Babu *et al*. (2004), which reveal that in areas where the training programme took the required period, the levels of compliance were high. Furthermore, Yirga *et al*. (2010) reported that the community members felt that the CDDs did not have any better information than the community itself. This would result in either the community members being misled or losing confidence in the CDDs, which would negatively influence compliance.

Most of the CDDs had a high number of households to serve at any given time, thus many issued the drugs without observing the principal of DOT and this may have negatively influenced compliance. In a study conducted by Wamae *et al*. (2006) during which high compliance was recorded, there was an indication that this could have been due to DOT. Failure of the CDDs to observe swallowing of drugs could also be attributed to insufficient training, inadequate supervision and limited time to distribute drugs and make returns as earlier indicated. Furthermore, due to limited duration of

drug distribution, the CDDs could not reach all the households allocated to them therefore they kept the community members waiting for long hours and either arrived very late or did not show up at all contributing to low compliance.

The health system was also culpable in non-compliance. The relatively high turnover among government health staff implied that new entrants into the project sites did not understand the procedures hence they failed to support the CDDs appropriately. Consequently, steps must be taken to ensure that any new staff is trained in advance of drug distribution. The need for repeated and thorough training of volunteers and other categories of staff at all levels of the programme is emphasized by WHO (2000). In Tamil Nadu, India, lack of confidence in the drug distributors was one of the reasons limiting compliance (Ramaiah *et al*, 2000). Poor compliance among persons who received DEC from volunteers may have been due to the latter's poor communication skills as people would doubt the volunteer's ability to assess the eligibility for DEC and to dispense the correct dose (Mahalakshmy *et al.*, 2010). The current study also established that the CDDs from the high compliant areas were of a slightly higher education level and were also more in numbers compared to those of low compliant areas, reasons that could possibly have influenced their motivation.

Delays in supply of drugs to the CDDs may have contributed to their reduced level of motivation, which could have been associated with low compliance. The delay could have been due to logistical issues such as transportation to the local health facilities

from where the drugs were supplied to the distributors. Similarly, Babu *et al*. (2004) reported that a delay in supplies as well as processes to undertake MDA in some places influenced the coverage and compliance. The CDDs from low compliant areas received the supplies late, mainly on the day of distribution and this could have led to a rushed process in order to complete the task within the given time. Another factor associated with low compliance in the current study was that the CDDs were not issued with enough drugs for their designated areas of distribution and had to spend time liaising with the local health facilities in order to receive additional drugs. This could have negatively influenced their capacity to complete their work in a timely manner. This calls for proper planning on the side of the programme implementers to ensure that adequate amounts of drugs are supplied to the distributors in good time.

The CDDs experienced difficulties in doing summaries and making returns at the appropriate time. They felt that the recording books were too old and others were either lost or filled up which may have also contributed to a reduced motivation and could be associated with low levels of compliance which could be due to inadequate record keeping. The programme implementers therefore need to consider budgeting for new recording books, training the CDDs in record keeping and providing support supervision to ensure that the data are accurately recorded.

Recording forms are at the heart of the supply information system. These documents move from one level to another conveying specific information about drug needs and

movements. Copies of recording forms, filed at various points of the distribution network, form the audit trail for tracing the flow of drugs (WHO, 2004). Clear records of the medicine administered are vital to prevent wrong dosages and to monitor drug consumption. The requirements are that medicines should be administered from the original container and the designated member of staff (in this case the CDD) should not sign the medicine record book unless he/she has personally administered, assisted or witnessed the administration of the medicines (UNISON, 2003).

Two days were considered inadequate for drug distribution considering the number of households that were assigned to each CDD to visit, which ranged from 25 to 400. The volume of work for some of the CDDs may have contributed to reduced motivation, consequently leading to low compliance levels. The CDDs felt that the short duration did not provide adequate opportunities to create rapport with individual households and to explain the benefits of taking the drugs, expected side effects, to make call backs and observe swallowing of the drugs as well as visit all households assigned to them.

The problem of follow-up has been reported in other studies applying similar approaches of delivering treatment. For instance, among the constraints/challenges influencing the tasks of ivermectin distributors in CDTI and influencing compliance are follow-up and treating members of the community who were absent during the period of mass treatment (absentees) and refusals (Amazigo, 1999). The CDDs in the current study seem to have been working under time pressure and probably an increase in the

number of CDDs and in the drug distribution days could help reduce the workload and perhaps raise the compliance levels. Similarly, Weerasooriya *et al*., (2007) in the study conducted in Sri Lanka recommended that the MDA programme needed increased human reservoir for drug delivery. They noted that a "Filariasis Week" would be more preferred to a "Filariasis Day" as in some localities people had to walk several kilometers to reach the drug distribution centres. Yirga *et al*., (2010) also concluded that the drug distribution time should last long enough at each treatment round, in order to reach those who were unlikely to comply because of movement due to their nature of employment.

It was evident from the current study that limited efforts were put into the pre-MDA campaign and community members had not been properly sensitized about the programme in the 2008 round, which could have led to the low coverage reported in some of the sites. The role of sensitization seems to have entirely been assigned to the local leaders mainly the chiefs and village elders. The CDDs, who may have been involved in the sensitization process, got engaged only during the actual drug distribution time, which is just before administering the tablet to individual households. This may have contributed to low levels of motivation as the CDDs may have faced difficulties in convincing the community members to take the drugs and thus contributed to the low levels of compliance.

The LF programme manager also mentioned that the programme did not have enough time to carry out effective social mobilization. In some villages, the CDDs did not have enough time to convince the people to swallow the drugs and therefore just recorded their visits and left those unwilling to comply not treated. WHO (2000) recommends the integration of KAP surveys with drug-coverage surveys to prepare for health promotion campaigns for mass drug administration. Mathieu *et al*. (2004) further emphasized the important role of KAP surveys in providing valuable information for programme managers, permitting them to adapt the health-education messages to changes in public knowledge and attitude over time.

The current study attributed mistrust and misconceptions among community members to lack of awareness creation, with some of them claiming that the drugs were meant for sterilization. This finding is similar to a previous study where failure to comply with the treatment was blamed on the suspicions that the drugs were for contraception or that it was a government conspiracy to decimate the coastal people (Wamae *et al*., 2006).

Failure of the health workers to supervise the CDDs during the drug distribution process was another factor that could have contributed to reduced levels of motivation among the CDDs. Although it was reported that some chiefs and village elders demanded bribes from the CDDs before enrollment, the incidences appear to have been isolated. Moreover, the study results indicate that the CDDs felt they were not supported by the health workers through supervision. This could be due the limited

number of health workers and a lack of proper logistics and planning necessary to carry out supervision. Haselow *et al*. (2003) emphasized on the need for increased and improved supervision by health personnel but noted that unfortunately, the ability of many health personnel to supervise and report accurately is usually not optimal due to heavy workload, lack of skills, insufficient logistics and poor motivation.

In the current study, financial and moral incentives were seen to have influenced the CDDs motivation to distribute drugs and were therefore associated with levels of compliance. Inversely, financial incentives, paid as allowances for attending the training and for distributing the drugs, may have contributed to increased levels of motivation among the CDDs. In the study by Wamae *et al*. (2006) communities pointed out that provision of bicycles to the drug distributors to enable them to earn an income during the "off delivery periods" could turn out to be an innovative way for CDDs to generate income, stay motivated and remain in the programme for its life-span.

Moral incentives, through recognition by community leaders and members, and being invited to trainings and seminars organized either at community or at health facility levels may have contributed to increased levels of motivation and possibly led to high levels of compliance. The current study results also showed that the CDDs got encouraged by the they support they received from community members who assisted in carrying the drugs during distribution and the local theatre groups which contributed in sensitizing the community members about MDA. The CDDs also appreciated the

role played by the health workers in training them to ensure that they were competent to serve their fellow community members. In high compliance areas, there appears to have been close working relationships between he CDDs and health workers especially during community sensitization. However, the CDDs felt that the workload did not match with the monetary incentives given. The LF Programme manager furthermore observed that insufficient funding was a major challenge that had limited the recruitment of enough CDDs for the MDA campaign. Similarly, Nuwaha *et al*. (2005) cited, among other problems, non-payment of allowances as a problem encountered by the distributors in their work. The lack of incentives for CDDs and inaccessibility by some target communities has been reported as additional obstacles to drug distribution Otubanjo *et al*., (2008). This view should however be balanced with the capacity to sustain programmes in the long-term where cash payments are introduced to incentivise the CDDs.

The results showed that the CDDs were not, as in the previous MDAs (2003 and 2005), provided with T-Shirts, badges and caps, which served as incentives. This could be due to insufficient budget allocations as indicated by the Programme manager. These items would make them easily identifiable by the community members as well as protect them from harsh weather conditions. Yirga *et al*. (2010) also indicated that some of the CDDs admitted to be de-motivated due to the discontinuation of incentives that included T-Shirts and other necessary supplies that had been provided at the beginning of the programme. Success of Zanzibar's MDA programme was attributed to the drug

distributors being designated as Filarial Prevention Assistants (FPAs) and where all distributors had T-Shirts for identification (Mohammed *et al*., 2006). Amazigo *et al.* (2007) however attributed sustainability of CDTI to political goodwill, personal satisfaction and altruistic fulfillment rather than to cash or in-kind compensation.

5.4 The Role of Behaviour Change Communication in Mass Drug Administration Uptake

Several factors related to behaviour change communication influenced compliance with MDA including access to information on MDA, source of MDA information, correctness of information, number of times community members got information about MDA, individual opinions about the sources of MDA information and awareness of MDA.

Access to information on MDA, which was better in high compared to low compliant areas, was a contributing factor to compliance with treatment. Similar results of the study done by Wanji *et al*. (2009) on community-directed delivery of doxycycline for the treatment of onchocerciasis in areas of co-endemicity with loiasis in Cameroon, showed that due to the social awareness campaigns, the population was well informed on the process and the role expected of it. This contributed much to its success and each partner in the CDI process adequately played his or her role. Community involvement in health not only helps to break the bond of dependence that characterizes so much health development work but also creates a general awareness among local people of

the potential for their involvement in all forms of development (WHO, 1985). In comparison, Mathieu *et al*. (2006) found that non-compliant persons were no less exposed to health education materials.

The source of MDA information was associated with compliance ($P<0.001$). Although the CDDs followed by the chief and/or village elder were the most common sources of MDA information in both low and high compliant groups, the hospital, radio/posters and other community members were more common sources of information in the low compared to the high compliant areas. These sources of information might have been more difficult to interpret, hence limiting the adequacy of the information disseminated. Haselow *et al.* (2003) on programmatic and communication issues in relation to serious adverse events following ivermectin treatment in areas co-endemic for onchocerciasis and loiasis indicated that nurses and CDDs typically conducted community sensitization activities. However, Amarillo *et al.* (2008) showed that mass media, specifically television, was widely used and was shown to be crucial in disseminating information about MDA. There are questions on the effectiveness of such efforts in transmitting the information and motivating behavior change across projects based on coverage statistics.

The correctness of the information, which would in most circumstances be determined by the source, was associated with compliance ($P<0.001$). This further suggests that the MDA information received by some of the community members may have been

inadequate and/or incorrect as the two groups - CDDs and chiefs and/or villages elders - are non-health professionals. Health professionals should support non-health professionals through clarifying issues that are medical in nature. Amarillo *et al*. (2008) further highlighted the important role of the health workers as the community's major source of information indicating that their active and sustained participation is vital in running a five- year MDA programme to eliminate LF. Efforts of health workers may also need to be complemented with continuing, if not intensified, support from the local government unit. In Zanzibar, (Mohammed *et al*. 2006) combined messages from an advisory board, ministries, national institutions, non-governmental organizations, (NGOs), religious organizations and political leaders were used to disseminate the information to the target population.

In a study carried out in India by Aswathy *et al*. (2009) on perceptions and practices of MDA against filariasis in a rural community, the results showed that a large proportion the people did not know the term 'mass drug administration' although they lived in an area that had experienced three rounds of MDA in their lifetime. However, in Haiti only about 9% of the persons interviewed claimed to be unaware of mass drug administration (Mathieu *et al*., 2004). Other than having the correct information that the drugs were given to treat and prevent LF, some respondents in the current study could not remember or did not know why the drugs were given while others had an understanding that that the drugs were given for family planning and general good health. This suggests that awareness creation might have been inadequate and/or the

materials and/or methods used may not have been well targeted. The findings of the current study are similar to those of Yirga *et al.* (2010) where health education activities were very weak and could have otherwise provided epidemiological information that could have probably raised perceived risk of individuals to the disease. Among the predominant reasons given for non-compliance were: thinking that the drugs were for the LF patients with swollen limbs and genitals only; and a lack of perceived need for the treatment.

In the Philippines, Amarillo *et al*. (2008) showed that nearly all those sampled did not know that a person with LF could be asymptomatic and majority were only aware of the manifestations of the disease, which appear in its later stages. This lack of knowledge may have influenced their health-seeking behaviour such as waiting at home to receive the drugs and their perception of being infected, especially when they did not have symptoms and were not feeling unwell. Nutbeam (2000) expressed that in terms of 'content', efforts to improve people's knowledge, understanding and capacity to act, should not only be directed at changing personal lifestyle or the way in which people use the health services. Health education could also raise awareness of the social, economic and environmental determinants of health, and be directed towards the promotion of individual and collective actions, which may lead to modification of these determinants.

The number of times that the community members got information about MDA was associated with compliance (P<0.001). More people from the low compliant areas had never heard of MDA and one half got the information only once. This indicates that the community members were likely to forget or may not have retained the correct information about the day that the drugs would be distributed. Since the distribution was done on a single day (the second day is for mop-up) some community members were bound to be missed out. The findings therefore suggest that the low compliant members may have had limited and infrequent exposure to health education materials. Rao and Sharma (1986) observed that it is plausible that more frequent contact with the population before treatment could improve compliance especially if the contact involved health education. In comparison, Mathieu *et al*. (2006) found that non-compliant persons were not less exposed to health education materials but did not retain or accept the messages.

Individual opinions about the sources of MDA information were associated with compliance (P<0.001). Apparently a higher proportion of people in the low compliant areas had either never heard about MDA and therefore could not give their opinion towards the source of information or just responded that they had no opinion. This could imply that the sources of MDA information in the low compliant areas were infrequent or rare and hence the low levels of compliance. Nutbeam (2000), in a report on health literacy as a public health goal, mentioned that interventions which relied primarily on communication and education mostly failed to achieve substantial and

sustainable results in terms of behaviour change, and made little impact in terms of closing the gap in health status between different social and economic groups in society.

Awareness of MDA was not associated with compliance in both high and the low compliant areas ($P>0.05$). A majority of the community members in both high and low compliance villages had heard about MDA for LF elimination. This could be due to the fact that two MDA rounds had been implemented prior to the 2008 campaign and thus majority of the community members living in the endemic areas were likely to have heard about the programme.

CHAPTER SIX:

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions of the Study

The following conclusions can be drawn from the study:

(1) Key socio-economic factors that influenced compliance with mass treatment were religion and income level, knowledge of disease cause and signs, high risk perception and disease burden.

(2) Experience of side effects of treatment, problems related to drug composition and method of distribution were associated with low compliance with mass treatment. Furthermore, behavioural factors such as use of alcohol and drugs and social support did not influence compliance with mass treatment.

(3) The factors that positively influenced CDDs' motivation included; having higher education level, trustworthiness, familiarity with community members, recognition and an innate desire to help their community members. Factors that negatively influenced CDDs' motivation to distribute drugs included: the CDDs training which was not done in adherence to WHO guidelines. Issuing the CDDs with insufficient drugs for distribution and outdated record keeping books further impaired their motivation. Other negative factors included insufficient drug distribution period, inadequate financial remuneration, lack of moral support and incentives.

(4) Behaviour change communication has a key role in compliance with mass drug administration and it should be adequately planned for. In addition, health personnel should be encouraged to support the CDDs to ensure that the people are sufficiently sensitized about the treatment and its outcomes.

6.2 Recommendations of the Study

There is need for programmes to explore the need to deliver drugs to places of work for those community members whose occupations require them to be away from their homes during treatment periods. Central point distribution as well as house-to-house methods should be combined to optimize compliance.

Alternative methods of awareness creation and information dissemination about MDA need to be explored in order to reach these groups. Muslim leaders and their places of worship could be utilized for the campaign and non-practicing groups could perhaps be sensitized through traditional medicine persons and other sources of care and service provision.

There is a need to invest more in health education in both the low and high compliant areas using messages that acknowledge and address the stigma associated with the symptoms of LF while addressing the problems openly and appropriately. This should focus on mobilization and education campaigns among the health workers, local leaders

and the general community using appropriate health education materials and should emphasize active participation and be culture specific.

Adequate behaviour change and communication methods that would help bridge the gap between knowledge and perceptions need to be put in place. A combination of various types of BCC materials should be used to provide adequate information on LF drugs highlighting issues on eligible population, dosages, purpose of taking the drugs, the potential side effects and drug distribution mode. These would help to counter any fears or mistrust about mass treatment. The BCC materials designed and printed at the national level need to be disseminated and distributed to the communities but not to remain in the hands of the Programme Officers. The health personnel should be central to the delivery of content about the programme. The theatre groups which exist among the community members could be empowered and frequently used to assist in advocacy and sensitization.

Collaboration with existing non-governmental organizations, community-based organizations, faith-based organizations, women, men and youth groups could facilitate awareness creation and advocacy for the programme. Mobile clinics, equipped with loudspeakers could be introduced to further improve the coverage and mopping up operations. The LF patients with clinical manifestations could be used in community mobilization and advocacy.

Quality training about LF and MDA would help the CDDs to confidently address questions from the communities. It would be important to involve the CDDs in community sensitization and mobilization to help build confidence and trust among community members. Importantly, each CDD should be provided with enough supplies of drugs to cover all the assigned households and the drug distribution record books need to be updated and lost or filled up ones replaced. Increasing the number of drug distributors would be a solution to ensure that all households are covered during the treatment period and that each CDD has ample time to interact with the household members and to conduct DOT. An increase in the duration of drug distribution period would help in ensuring that call backs are made and records are well maintained.

For motivation, CDDs need to be supervised by the health personnel and they should be provided with in-kind support (including financial where possible) as well as incentives such as T-shirts and badges that would make them easily identifiable to the community members and thus address the element of mistrust. The main focus in incentivising CDDs is to ensure that it does not put a financial strain on the programme and that it does not compromise sustainability.

Finally, there is need for the policy makers to give priority to LF and other neglected tropical diseases (NTDs) in the budgetary allocations and be committed to the LF programme to ensure that the MDAs are consistently implemented. Institution of a

morbidity control programme would help take care of LF clinical cases and thus reduce the disease burden and could possibly increase drug coverage and compliance.

6.3 Recommendations for Further Research

The following areas of research are proposed in order to provide answers to some of the issues raised through this study.

1. There is a need to look into alternative ways of targeting people engaged in income generating activities that impact on their ability to participate in MDA. In addition, the wealthy people who are missed during MDA may also require alternative strategies. It is important to explore the additional use of factories, schools, institutions, fishing areas, mining firms and other work places as alternative drug delivery channels to target non-compliers for LF elimination.

2. The current channels used for dissemination of MDA and other health information should be strengthened while exploring new ways of reaching different members of the endemic communities. It is important to identify channels within the communities that could be used to increase awareness about LF.

3. Although the study has shown that it is important to incentivise CDDs, it is also clear that the selection process is an important component of ensuring commitment. There is

need for studies to explore factors that determine the willingness of communities to support CDDs and those that do not. Focusing on the perceptions of CDD on what makes it worthwhile to serve communities would provide useful insights for the management of LF and other chronic diseases.

REFERENCES

Addiss D. G. and Brady M. A. (2007). Morbidity management in the Global Programme to Eliminate Lymphatic Filariasis: a review of scientific literature. *Filaria Journal* **6**: 2.

Addiss D.G. (2005). Global elimination of lymphatic filariasis: Origins, progress and challenges. *Health Economics Research* **21**(1): 12-17.

Addiss D., Critchley J., Ejere H., Garner P., Gelband H. and Gamble C. (2004). Albendazole for lymphatic filariasis *Cochrane Database Systematic Reviews* **1**: CD003753.

Addiss D. and Dreyer G. (1999). Treatment of lymphatic filariasis Imperial College Press, London pp 151- 199.

Addiss D. (1998). Bulletin of World Health Organization **17** (2): 145-145.

Addiss D.G., Beach M. J., Streit T.G., Lutwick S., LeConte F.H., Lafontant J.G., Hightower A.W. and Lammie P. J. (1997). Randomized placebo-controlled comparison of ivermectin and albendazole alone and in combination for *Wuchereria bancrofti* microfilaraemia in Haitian children. *Lancet* **350**: 480-484.

Adler N. E. and Newman K. (2002). Socio-economic disparities in health: pathways and policies *Health Affairs (Millwood)*. **21** (2): 60-76.

Ahorlu C. K., Dunyo S. K., Koram K. A., Nkrumah F.K., Aagaard-Hansen J. and Simonsen P. E. (1999). Lymphatic filariasis related perceptions and practices on the coast of Ghana: implications for prevention and control. *Acta Tropica* **73**: 251-264.

Amarillo M. L., Belizario V.Y. Jr., Sadiang-abay J.T., Sison S. A. and Dayag A.M. (2008). Factors associated with acceptance of mass drug administration for the elimination of lymphatic filariasis in Agusan del Sur, Philippines. *Parasites & Vectors* **1**: 1-14.

Amazigo U., Okeibunor J., Matovu V., Zouré H., Bump J. and Seketeli A. (2007). Performance of predictors: Evaluating sustainability in community-directed treatment projects of the African programme for onchocerciasis control**.** *Social Science and Medicine* **64**: 2070-2082.

Amazigo U. (1999). Community selection of ivermectin distributors. *Community Eye Health Journal* **12** (31): 39-40.

Amuyuzu M. (1997). Community perception regarding chronic filarial swellings: A case study of the Duruma of Coastal Kenya. *East African Medical Journal* Vol. **74:** 411-415.

Anonymous (2005). Global programme to eliminate lymphatic filariasis. Progress report for 2004. *Weekly Epidemiological Record* **80**: 202-212.

Aswathy S., Beteena K. and Leelamoni K. (2009). Mass drug administration against filariasis in India: perceptions and practices in a rural community in Kerala. *Annals of Tropical Medicine and Parasitology* **103** (7): 617-624.

Ashwini K., Pawan K., Kondagunta N., Divakar N., Lena A. and Ashok K. (2009). A study on coverage and compliance of mass drug administration programme for elimination of filariasis in Udupi district, Karnataka, India. *Journal of Vector Borne Diseases* **46:** 237–240.

Aylward B., Hennessey K. A., Zagaria N., Olive J. M. and Cochi S. (2000). When is a disease eradicable? 100 years of lessons learned. *American Journal of Public Health* **90**: 1515-1520.

Babu B. V. and Mishra S. (2008). Mass drug administration under the programme to eliminate lymphatic filariasis in Orissa, India: a mixed-methods study to identify factors associated with compliance and non-compliance. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **102**(12): 1207-1213.

Babu B. V. and Kar S. K. (2004). Coverage, compliance and some operational issues of mass drug administration during the programme to eliminate lymphatic filariasis in Orissa India. *Tropical Medicine and International Health* **9**: 702-709.

Babu B.V. and Satyanarayana K. (2003). Factors responsible for coverage and compliance in mass drug administration during the programme to eliminated lymphatic filariasis in the East Godavari district, South India. *Tropical Doctor* **33**: 79-82.

Bandyopadhyay L. (1996). Lymphatic Filariasis and the women of India. *Social Science and Medicine* **42**: 1401-1410.

Birtwum R.B., Sylla M. and Diarra T. (1997). Evaluation of ivermectin distribution in Benin, Cote d'Ivoire, Ghana and Togo: estimation of coverage of treatment and operational aspects of the distribution system. *Annals of Tropical Medicine and Parasitology* **91**: 567-569.

Bockarie M. and Molyneux D. (2009). The end of lymphatic filariasis? *British Medical Journal* **338***:* b 1686.

Bockarie M.J., Tisch D.J., Kasten W. et al. (2002). Mass treatment to eliminate filariasis in Papua New Guinea. *New England Journal of Medicine* **347**: 1841-1848.

Buckley J.J. (1960). On Brugia gen. nov. for *Wuchereria* spp. of the 'malayl' group, i.e., *W.malayi* (Brug, 1927), W. pahangi Buckley and Edeson, 1956, and W. patei Buckley, Nelson and Heisch, 1958. *Annals of Tropical Medicine and Parasitology* **54**: 75-77.

Burkot T., Durrheim D., Melrose W., Speare R. and Ichimori K. (2006). The argument for integrating vector control with multiple drug administration campaigns to ensure elimination of lymphatic filariasis. *Filaria Journal* **5**:10.

Butler D. (2009). Neglected Disease Boost. *Nature* **457**: 772-773.

Cantey P.T., Rout J., Rao G., Williamson J. and Fox L.M. (2010). Increasing Compliance with Mass Drug Administration Programs for Lymphatic Filariasis in India through Education and Lymphoedema Management Programs. *PLoS Neglected Tropical Diseases* 4(6): e728.

Cartel J. L., Spiegel A., Nguyen L., Genelle B. and Roux J. F. (1991). Double blind study on efficacy and safety of single doses of ivermectin and diethylcarbamazine for treatment of Polynesian *Wuchereria bancrofti* carriers. Results at six months. *Annals of Tropical Medicine and Parasitology* **42**: 38-40.

Cobbold T.S. (1877). Discovery of the adult representative of microfilaremic filariae. *The Lancet* **110**: 70-71.

Centres for Disease Control and Prevention (1993). Recommendations of the International Task Force for Disease Eradication. *MMWR Recommendations and Reports* **42**: 1-38.

David H. L. and Edeson J. F. (1965). Filariasis in Portuguese Timor, with Observations On a New Microfilaria Found in Man. *Annals of Tropical Medicine and Parasitology* **59**: 193-204.

Demarquay J.N. (1863). Helminthologie. *Gazette Medicale de Paris*. **18**: 665-667.

Dowdle W. R. (1998). The principles of disease elimination and eradication. *Bull World Health Organization* **76** (2): 22-25.

Durrheim D. N., Wynd S., Liese B. and Gyapong J. O. (2004). Lymphatic filariasis endemicity- an indicator of poverty? *Tropical Medicine and International Health* **79**:

417- 424.

Dreyer G., Addiss D., Santos J., Figueredo-Silva and Noroes J. (1998). Direct assessment in vivo of the efficacy of combined single-dose ivermectin and diethylcarbamazine against adult *Wuchereria bancrofti*. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **92**: 219-222.

Dreyer G., Noroes J. and Addiss D. (1997). The silent burden of sexual disability associated with lymphatic filariasis. *Acta Tropica* **63**: 57-60.

Dreyer G., Noroes J., Amaral F., Nen A. Medeiros Z., Coutinho A. and Addiss D. (1995). Direct assessment of the adulticidal efficacy of a single dose of ivermectin in Bancroftian filariasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **89**: 441-443.

Dunderdale G. (1921). Notes on the incidence of filarial infection on the neighbourhood of Lamu, British East Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **15**: 190-197.

Dunyo S. K. and Simonsen P. E. (2002). Ivermectin and albendazole alone and in combination for the treatment of lymphatic filariasis in Ghana: follow-up after re-treatment with the combination. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **96**: 189-192.

El-Setouhy M., Elaziz K. M., Helmy H., Farid H. A. Kamal H. A., Ramzy R. M., Shannon W. D. and Weil G. J. (2007). The Effect of Compliance on the Impact of Mass Drug Administration for Elimination of Lymphatic Filariasis in Egypt. *American Journal of Tropical Medicine and Hygiene* **77** (6): 1069-1073

Estambale B. B., Simonsen P. E., Knight R. and Bwayo J. J. (1994). Bancroftian filariasis in Kwale District of Kenya Clinical and parasitological survey in an endemic community. *Annals of Tropical Medicine and Parasitology* **88**: 145-151.

Evans D. B., Geland H. and Vlassof C. (1993). Social and economic factors and the control of lymphatic filariasis: a review. *Acta Tropica* **53:** 1-26.

Fan P. C. (1990). Eradication of bancroftian filariasis by diethylcarbamazine-medicated common salt on Little Kinmen (Liehyu district), Kinmen (Quemoy) Islands, Republic of China. *Annals of Tropical Medicine and Parasitol*ogy **84:** 25-33.

Figueredo-Silva J., Jungmann P., Noroes J., Piessens W. F., Coutinho A., Brito C., Rocha A. and Dreyer G. (1996). Histological evidence for adulticidal effect of low doses of diethylcarbamazine in bancroftian filariasis. *Transactions of the Royal Society*

of Tropical Medicine and Hygiene **90**: 192-194.

Fischer P., Supali T. and Maizels R. M. (2004). Lymphatic filariasis and Brugia timori: prospects for elimination. *Trends in Parasitology* **20**: 351-355.

Fisher L. and van Belle G. (1993). Biostatistics: A Methodology for Health Sciences. John Wiley, New York.

Fox L. M., Furness B.W., Hasser J.K., Brissau J. M., Louis-Charles J., Wilson S. F., Addiss D. J., Lammie P. J. and Beach M. J. (2005). Ultrasonographic examination of Haitian children with lymphatic filariasis: a longitudinal assessment in the context of antifilarial drug treatment. *American Journal of Tropical Medicine and Hygiene* **72**: 642-648.

Freedman D.O., Bui T., De Almeida Filho P.J., Braga C., Maia e Silva M.C., Maciel A. and Furtado A.F. (1995). Lymphoscintigraphic assessment of the effect of diethylcarbamazine treatment on lymphatic damage in human bancroftian filariasis. *American Journal of Tropical Medicine and Hygiene* **52**: 258-261.

Gyapong J.O., Kumaraswami V., Biswas G. and Ottensen E. A. (2005). Treatment strategies underpinning the global programme to eliminate lymphatic filariasis. *Expert Opinion Pharmacotherapy* **6**: 179-200.

Gyapong J.O., Gyapong M. and Adjei S. (1996b). The epidemiology of acute adenolymphangitis due to lymphatic filariasis in northern Ghana. *American Journal of Tropical Medicine and Hygiene* **54**: 591-595.

Gyapong J.O., Adjei S. and Sackey S.O. (1996a). Descriptive epidemiology of lymphatic filariasis in Ghana. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **90**: 26-30.

Gyapong M., Gyapong J.O. and Owusu-Banahene G. (2001). Community-directed treatment: the way forward to eliminating lymphatic filariasis as a public-health problem in Ghana. *Annals of Tropical Medicine and Parasitology* **94**: 343-352.

Gyapong M., Gyapong J., Weiss M. and Tanner M. (2000). The burden of hydocele on men in Northern Ghana. *Acta Tropica* **77**: 287-294.

Haddix A.C. and Kestler A. (2000). Lymphatic filariasis: economic aspects of the disease and programmes for its elimination. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **94**: 592-593.

Haddix A.C., Carter S., Michael E. and Benton B. (1999). Cost effectiveness of

Integrating lymphatic filariasis elimination into APOC onchocerciasis control programs Report prepared for the Joint Action Forum/Joint Program Committee, Den Haag.

Haaland A. (1984). Pre-testing Communication Materials with Special Emphasis on Child Health and Nutrition Education UNICEF, Rangoon.

Haliza M. R. (1986). Comparison of knowledge on filariasis and epidemiological factors between infected and uninfected respondents in a Malay community. *Southeast Asia Journal of Tropical Medicine and Public Health* **17**(3): 457-463.

Haselow N., Akame J., Evini C. and Akongo S. (2003). Programmatic and Communication Issues in Relation to Serious Adverse Events Following Ivermectin Treatment in areas Co-endemic for Onchocerciasis and Loiasis. *Filaria Journal* **2** (1): 1475-2883.

Heisch R.B., Nelson G.S. and Furlong M. (1959). Studies in filariasis in East Africa in the Island of Pate, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **53**: 41-53.

Horton J. (2000). Albendazole: a review of antihelmintic efficacy and safety in humans. *Parasitology* **121**:113-132.

Ickovics J.R. and Meisler A.W. (1997). Adherence in AIDS Clinical Trials: A framework for clinical research and clinical care. *Clinical Epidemiology* **50**(4): 385-391.

Ismail M.M., Jayakody R.L., Weil G.J., Fernando M.S. De Silva G.A. and Balasooriya W.K. (2001). Long-term efficacy of single-dose combinations of albendazole, ivermectin and diethylcarbamazine for the treatment of bancroftian filariasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **92**: 94-97.

Ismail M.M., Jayakody R.L., Weil G.J., Nirmalan N., Jayasinghe K.S., Abeyewickrema W., Rezvi Sheriff M.H., Rajaratnam H.N., Amarasekera N., de Silva D.C., Michalski M.l. and Dissanaike A.S. (1998). Efficacy of single dose combination of albendazole, ivermectin and diethylcarbamazine for the treatment of bancroftian filariasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **2**: 94-97.

Jensen B.B and Schnack K. (1994). Action competence as an educational challenge In: Jensen, B. B., Schnack, K. (Eds.), Action and Action Competence as Key Concepts in Critical Pedagogy. Royal Danish School of Education Studies, Copenhagen, pp 5-18.

Katabarwa N. and Mutabazi D. (1998). The selection and validation of indicators for monitoring progress towards self-sustainment in community-directed, ivermectin-treatment programmes for onchocerciasis control in Uganda. *Annals of Tropical Medicine and Parasitology* **94:** 343-352.

Kazura J.W., Bockarie M., Alexander N., Perry R., Bockarie F., Dagoro H., Dimber Z. Hyun P. and Alpers M.P. (1997). Transmission intensity and its relationship to infection and disease due to Wuchereria bancrofti in Papua New Guinea. *Journal of Infectious Diseases* **176**:242-246.

Kazura J., Greenberg J., Perry R., Weil G., Day K. and Alpers M. (1993). Comparison of single-dose diethylcarbamazine and ivermectin for treatment of bancroftian filariasis in Papua New Guinea. *American Journal of Tropical Medicine and Hygiene* **49**: 804-811.

Khan M. E., Anker M., Patel B.C., Barge S., Sadhwani H. and Kohle R. (1991). The use of focus groups in social and behavioral research: some methodological issues. *World Health Statistics Quarterly* **44**: 145-149.

Kimura E., Spears G.F., Singh K.I., Samarawickrema W.A., Penaia L., Sone P.F., Pelenatu S., Faaiuaso S.T., Self L.S. and Dazo B.C. (1992). Long-term efficacy of single-dose mass treatment with diethylcarbamazine citrate against diurnally sub periodic *Wuchereria bancrofti*: eight years' experience in Samoa. *Bull World Health Organization* **70**: 769 -776.

Kimura E., Penaia L., and Spears G.F. (1985). The efficacy of annual single-dose treatment with diethylcarbamazine citrate against diurnally sub periodic bancroftian filariasis in Samoa. *Bull World Health Organ*. **63**:1097-1106.

Kleeberger C.A, Phair J.P, Strathdee S.A, Detels R., Kingsley L. and Jacobson L.P. (2004). Determinants of heterogeneous adherence to HIV-antiretroviral therapies in the Multicenter AIDS Cohort Study**.** *Journal of Acquired Immune Deficiency Syndrome* **26**(1): 82-92.

Koenig H.G. (2001). Collective Amnesia: The Absence of Religious Faith and Spirituality in Health Communication Research and Practice. *Health Communication* **16** (1): 1-5.

Koenig H., Micheal G., McCullough E. and David B. Larson (2001). Handbook of Religion and Health Introduction pp13**.**

Krishnamoorthy K., Rajendran R., Sunish I.P. and Reuben R. (2002). Cost-effectiveness of the use of vector control and mass drug administration, separately or in

combination, against lymphatic filariasis. *Annals of Tropical Medicine and Parasitology* **96** (2): S 77-90.

Kyelem D., Biswass G., Bockarie M.J., Bradley M.H., El-Setouhy M., Fischer P.U., Henderson R.H., Kazura J.W., Lammie P.J., Njenga S.M., Ottesen E.A., Ramaiah K.D., Richards F.O., Weil G.J. and Williams S.A. (2008). Determinants of Success in National Programs to Eliminate Lymphatic Filariasis: A Perspective Identifying Essential Elements and Research Needs. *Tropical Medicine and Hygiene* **79** (4): 480-484.

Kyelem D. (2007). Epidemiology and Control of Lymphatic Filariasis in Burkina Faso Liverpool School of Tropical Medicine, The University of Liverpool: 253-254.

Lakwo T. and Gasarasi D. (2006). Non-adherence to community-directed treatment with ivermectin for onchocerciasis control in Rungwe district, southwest Tanzania. *East African Medical Journal* **83** (6): 326-332.

Lindsay S.W. and Thomas C.J. (2000). Mapping and estimating the population at risk from lymphatic filariasis in Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **94:** 37-45

Lu A.G., Valencia L.B., Llagas L., Aballa L. and Postrado L. (1988). Filariasis: A study of knowledge, attitudes and practices of the people of Sorsogon, Social and Economic Research Project Reports No.1, TDR/Ser/PRS/1, WHO, Geneva

Lu A.G., Valencia L.B., Llagas L., Baltazar, J. and Cahanding M.L. (1983). The social aspect of filariasis in the Philippines. *Southeast Asia Journal of Tropical Medicine and Public Health* **14:** 40-46.

Mak J.W. (1986). Problems in filariasis control and the need for human behaviour and socio-economic research. *Southeast Asia Journal of Tropical Medicine and Public Health* **17**: 479-485.

Mahalakshmy T., Kalaiselvan G., Parmar J. and Dongre A. (2010). Coverage and compliance to diethylcarbamazine in relation to Filaria Prevention Assistants in rural Pondicherry. *India Journal of Vector Borne Diseases* **47**: 113-115.

March H.N., Laigret J., Kessel J.F. and Bambridge B. (1960). *American Journal of Tropical Medicine and Hygiene* **9**: 180-184.

Mathieu E. Direny A. N, Rochars M. B., Streit T. G., Adiss D.G. and Lammie P.J. (2006). Participation in three consecutive mass drug administrations in Leogane, Haiti. *Tropical Medicine and International Health* **11**(6): 862-868.

Mathieu E., Lammie P. J., Raddy J., Beach M. J. Streit T., Wendt J. and Adiss D. G. (2004). Factors associated with participation in a campaign of mass treatment against lymphatic filariasis, in Leogane, Haiti. *Annals of Tropical Medicine and Parasitology* **98** (7): 703-714.

Matubazi D. and Duke B.O.L. (1998). Onchocerciasis control in Uganda: How can self-sustaining, community-based treatment with ivermectin be achieved? *Annals of Tropical Medicine and Parasitology* **92**: 195-903.

McLaughlin S.I., Radday J. and Micheal M.C. (2003). Frequency, severity and costs of adverse reactions following mass treatment for lymphatic filariasis using diethylcarbamazine and albendazole in Leogane, Haiti. *American Journal of Tropical Medicine and Hygiene* **68:** 568-573.

Meyrowitsch D.W., Simonsen P. E. and Makunde W.H. (1996b). Mass diethylcarbamazine chemotherapy for control of bancroftian filariasis through community participation: comparative efficacy of a low monthly dose and medicated salt. *Transactions of the Royal* Society *of Tropical Medicine and Hygiene* **90**: 74-79.

Micheal E. , Malecela-Lazaro M.N., Simonsen P.E., Pederson E.M., Barker G., Kumar A. and Kazura J.W. (2004). Mathematical modeling and the control of lymphatic filariasis. *Lancet Infectious Diseases* **4**: 223-224.

Michael E. and Bundy D.A. (1997). Global mapping of lymphatic filariasis *Parasitology Today* **13**:472-476.

Micheal E., Bundy D. A. and Grenfell B.T. (1996). Re-assessing the global prevalence and distribution of lymphatic filariasis. *Parasitology Today* **112**: 409-428.

Ministry of Health, Kenya Kenya Demographic and Health Survey 2006.

Miri E.S. (1998). Problems and perspectives of managing an Onchocerciasis control Programme. *Annals of Tropical Medicine and Parasitology* **92:** S121-S128.

Mohammed K., Molyneux D., Albonico M. and Rio F. (2006). Progress towards eliminating lymphatic filariasis in Zanzibar: a model programme. *Trends in Parasitology* **22**: 340-344.

Molyneux D. H., Hotez P.J., Fenwick A., Newman R.D., Greenwood B. and Sachs J. (2009). Neglected Tropical Diseases and the Global Fund. *Lancet* **373**: 296-297.

Molyneux D.H., Hopkins D.R. and Zagaria N. (2004). Disease eradication, elimination and control: the need for accurate and consistent usage. *Trends in Parasitol*ogy **20**:347- 351.

Molyneux D.H., Bradley M., Hoerauf A., Kyelem D. and Taylor M. J. (2003). Mass drug treatment for lymphatic filariasis and onchocerciasis *Trends in Parasitology* **19**: 516-522.

Molyneux D.H. and Zagaria N. (2002). Lymphatic filariasis elimination: progress in global programme development. *Annals of Tropical Medicine and Parasitol*ogy **96** (2): 15-40.

Molyneux D.H., Neira M., Liese B. and Heymann D. (2000). Lymphatic Filariasis: Setting the scene for elimination. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **94**: 589-591.

Morse V.E., Simon P.M., Coburn M., Hyslop N., Greenspan D. and Balson P.M. (1991). Determinants of subject compliance within an experimental anti-HIV drug protocol. *Social Science and Medicine* **32**(10): 1161-1167.

Moulia-Pelat J. P., Glaziou P., Weil G. J., Nguyen L.N., Gaxotte P. and Nicolas L. (1995). Combination ivermectin plus diethylcarbamazine, a new effective tool for control of lymphatic filariasis. *Tropical Medicine and Parasitology* **46**: 9-12.

Muhondwa E. P.Y. (1983). Community Participation in Filariasis Control**:** The Tanzania Experiment WHO/TDR/Ser/SWG (4)/WP/83.13. WHO, Geneva.

Mukoko D. A., Pedersen E. M., Masese N.N., Estambale B. B. and Ouma J.H. (2004). Bancroftian filariasis in 12 villages in Kwale district, Coast Province, Kenya - variation in clinical and parasitological patterns. *Annals Tropical Medicine Parasitol*ogy **98**: 801-815.

Mwobobia I.K., Muniu E. M., Kombe Y. and Wamae C.N. (2000). Hydrocelectomy: a proxy for hydrocele prevalence in coastal Kenya. *Annals of Tropical Medicine and Parasitology* **94:** 479-484.

Nandha B., Sadanandane C., Jambulingam P. and Das P.K. (2007). Delivery strategy of mass annual single dose DEC administration to eliminate lymphatic filariasis in the urban areas of Pondicherry, South India: 5 years of experience. *Filaria Journal* **6**: 6-7.

Nelson G.S., Heisch R. B. and Furlong M. (1962). Studies in filariasis in East Africa II. Filarial infections in man, animals and mosquitoes on the Kenya Coast. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **56:** 202-217.

Njenga S. M., Wamae C.N., Njomo D.W., Mwandawiro C.S. and Molyneux D.H. (2008). Impact of two rounds of mass treatment with diethylcarbamazine plus albendazole on *Wuchereria bancrofti* infection and the sensitivity of immunochromatographic test in Malindi, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **102**: 1017-1024.

Njenga S. M., Muita M., Kirigi G., Mbugua J., Mitsui Y., Fujimaki Y. and Aoki Y. (2000). Bancroftian filariasis in Kwale district, Kenya. *East African Medical Journal* **77**: 245-249.

Noroes J., Dreyer G., Santos A., Mendes V.G., Medeiros Z. and Addiss D. (1997). Assessment of the efficacy of diethylcarbamazine on adult *Wuchereria bancrofti* in vivo. *Transactions of the Royal Society of Tropical Medicine and Hyg*iene **91**: 78-81.

Nutbeam D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st Century. *Health Promotion International* **15** (3): 259-267.

Nuwaha F., Okware J. and Ndyomugyenyi R. (2005). Predictors of compliance with community-directed ivermectin treatment in Uganda: quantitative results. *Tropical Medicine and International Health* **10** (7): 659-667.

Ottesen E. A., Hooper P.J., Bradley M. and Biswass G. (2008). The global programme to eliminate lymphatic filariasis: health impact after 8 years. *PLoS Neglected Tropical Diseases* **2**: e 317.

Ottesen E.A. (2006). Lymphatic filariasis: Treatment, control and elimination. *Advances in Parasitology* **61**: 395–441.

Ottesen E.A. (2000). The global programme to eliminate lymphatic filariasis. *Tropical Medicine and International Health* **5**: 591-594.

Ottesen E. A., Ismail M. M. and Horton J. (1999). The role of albendazole in programme to eliminate lymphatic filariasis. *Parasitology Today* **15**: 382-386.

Ottesen E. A., Duke B.O., Karam M. and Behbehani K. (1997). Strategies and tools for the control/elimination of lymphatic filariasis. *Bull World Health Organization* **75**: 491-503.

Ottesen E. A. and Ramachandran C. (1995). Lymphatic filariasis infection and disease: Control Strategies. *Parasitology Today* **11**: 129-131.

Ottesen E. A. and Campbell W.C. (1994). Ivermectin in human medicine. *Journal of Antimicrobiology and Chemotherapy* **34**: 195-203.

Ottesen E.A. (1985). Efficacy of diethylcarbamazine in eradicating infection with lymphatic-dwelling filaria in humans. *Clinical Infectious Disease* **7**: 341-356.

Otubanjo O. A., Adeoye G.O., Ibidapo C.A., Akinsanya B., Okeke P., Atalabi T., Adejai E. T. and Braide E. (2008). Adverse reactions from community directed treatment with ivermectin (CDTI) for onchocerciasis and loiasis in Ondo State, Nigeria. *International Journal of Tropical Biology* **56** (4): 1635-1643.

Pedersen E. M. and Mukoko D. A. (2002). Impact of insecticide-treated materials on filarial transmission by the various species of vector mosquito in Africa. *Annals of Tropical Medicine and Parasitology* **96** (2): 91-95.

Person B., Addiss D.G, Bartholomew L.K, Meijer C., Pou V., and Borne van den B. (2006). Health-seeking behaviors and self-care practices of Dominican women with lymphoedema of the leg: implications for lymphoedema management programs. *Filaria Journal* **5**: 5-13.

Plaisier A.P., Stolk W.A., van Oortmarssen G. J. and Habbema J.D. (2000). Effectiveness of annual ivermectin treatment for *Wuchereria bancrofti* infection. *Parasitology Today* **16**: 298-302.

Plaisier A.P., Subramanian S., Das P.K., Souza W., Lapa T., Furtado A.F., Van der Ploeg C.P., Habbema J.D., and van Oortmarssen G.J. (1998). The LYMFASIM simulation program for modeling lymphatic filariasis and its control. *Methods of Information in Medicine* **37**: 97-108.

Rajan T.V. (2000). Lymphatic Filariasis: A historical perspective. In Lymphatic Filariasis.Vol. 1. Imperial College Press, editor. T.B. Nutman, London. 1- 4.

Ramaiah K. D., Kumar Vijay K. N., Ravi R. and Das P.K. (2005). Situational analysis in a large urban area of India prior to launching a programme of mass drug administration to eliminate lymphatic filariasis. *Annals of Tropical Medicine and Parasitology* **99** (3): 243-252.

Ramaiah K. D., Das P. K., Michael E. and Guyatt H. (2000). The economic burden of lymphatic filariasis in India. *Parasitology Today* **16**: 251-253.

Ramaiah K.D., Das P.K., Appavoo N.C. Ramu K., Augustin D.J., Kumar K.N.V., et al (2000a). A programme to eliminate lymphatic filariasis in Tamil Nadu State, India: Compliance with annual single dose mass treatment and some related operational aspects. *Tropical Medicine International and Health* **5**: 842-847.

Ramaiah K. D., Guyatt H., Ramu K., Vanamail P., Pani S.P. and Das P.K. (1999). Treatment costs and loss of work time to individuals with chronic lymphatic filariasis in rural communities in south India. *Tropical Medicine and International Health* **4:**19-25.

Ramaiah K. D., Ramu K., Guyatt H., Kumar K.N. and Pani S.P. (1998). Direct and indirect costs of the acute form of lymphatic filariasis to households in rural areas of Tamil Nadu, south India. *Tropical Medicine and International Health* **3**:108-115.

Ramaiah K. D., Kumar K.N., Ramu K., Pani S.P. and Das P.K. (1997). Functional impairment caused by lymphatic filariasis in rural areas of south India. *Tropical Medicine and International Health* **2**: 832-838.

Ramaiah K. D., Kumar K.N. and Ramu K. (1996). Knowledge and beliefs about transmission, prevention and control of lymphatic filariasis in rural areas of south India. *Tropical Medicine and International Health* **1**: 433-438.

Ramu K., Ramaiah K. D., Guyatt H. and Evans D. (1996.) Impact of lymphatic filariasis on the productivity of male weavers in a south Indian village. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **90**: 669-670.

Ramzy R.M., El Setouhy M., Helmy H., Ahmed E.S., Abd Elaziz K.M., Farid H.A. Shannon W.D. and Weil G.J. (2006). Effect of yearly mass drug administration with diethylcarbamazine and albendazole on bancroftian filariasis in Egypt: a comprehensive assessment. *Lancet* **367**: 992-999.

Rao C. K. and Sharma S.P. (1986). Control of bancroftian filariasis in India. *Journal of Communicable Diseases* **18**: 276-282.

Remme J.H.F. (1995). The African programme for onchocerciasis control: Preparing to launch. *Parasitology Today* **11**: 403-406.

Richards F. O. Jr., Eberhard M.L., Bryan R.T., McNeeley D.F., Lammie P.J., McNeeley M.B., Bernard Y., Hightower A.W. and Spencer H.C. (1991). Comparison of high dose ivermectin and diethylcarbamazine for activity against bancroftian filariasis in Haiti. *American Journal of Tropical Medicine and Hygiene* **44**: 3-10.

Routh H. B. and Bhowmik K.R. (1993). History of elephantiasis *International Journal of Dermatol*ogy **32**: 913-916.

Schlemper B.R. Jr., Steindel M., Grisard E.C., Carvalho-Pinto C.J., Bernardini O.J., de Castilho C.V., Rosa G., Kilian S., Guarneri A.A. Rocha A., Medeiros Z. and Ferreira Neto J.A. (2000). Elimination of bancroftian filariasis (*Wuchereria bancrofti*) in Santa Catarina State, Brazil. *Tropical Medicine and International Health* **5**: 848-854.

Schultz G.W. (1988). A study of Bancroftian filariasis on the islands of Batan and Rapu, Philippines**.** *Southeast Asia Journal of Tropical Medicine and Public Health* **19** (2): 207-214.

Simonsen P. E., Meyrowitsch D.W., Makunde W.H. and Magnussen P. (1995b). Selective diethylcarbamazine chemotherapy for control of Bancroftian filariasis in two communities of Tanzania: compared efficacy of a standard dose treatment and two semi-annual single dose treatments. *American Journal of Tropical Medicine and Hygiene* **53**: 267-272.

Singh D.P., Rathore S., Misra S., Chatterjee R.K., Ghatak S. and Sen A.B. (1985). Studies on the causation of adverse reactions in microfilaraemic host following diethylcarbamazine therapy (Dipetalonema viteae in Mastomys natalensis). *Tropical Medicine and Parasitology* **36** (1): 21-24.

Srividya A., Das P.K., Subramanian S., Ramaiah K.D., Grenfell B.T, Michael E. and Bundy D.A. (1996). Past exposure and the dynamics of lymphatic filariasis infection in young children. *Epidemiology and Infection* **117**:195-201.

Stone D. (1989). Cultural crossroads of community participation in development: a case from Nepal, Human Organization **48**: 206-313.

Stroebe W. (2000). Moderators of the stress-health relationship In: Stroebe W. Social psychology and health. Philadelphia, PA: Open University Press; 236-273.

Talbot J.T., Viall A., Direny A., de Rochars M. B., Addis D., Streit T., Mathieu E. and Lammie P. J. (2008). Predictors of compliance in mass drug administration for the treatment and prevention of lymphatic filariasis in Leogane, Haiti. *American Journal of Tropical Medicine and Hygiene* **78** (2): 283-288.

UNISON Organizing for Health and Safety (2003). Guide for administration of medicine for health and safety representatives Communication Department, London.

UNDP/WORLD BANK/WHO (2000). Special Programme for Research and Training in Tropical Diseases (TDR/IDE/RP/CDTI/00.2) Report of a Multi-Country Study: Community- Directed Treatment of Lymphatic Filariasis in Africa **1-6**: 35-41.

UNDP/WORLD BANK/WHO (1999). Special Programme for Research and Training in Tropical Diseases Situational Analysis for a Multi-Country Study on Management of Lymphoedema and Acute Adenolymphangitis in Africa. Allepy, India and Accra, Ghana.

Wamae C.N., Njenga S.M., Kisingu W.M., Muthigani P.W. and Kiiru K. (2006). Community-directed treatment of lymphatic filariasis in Kenya and its role in the national programmes for elimination of lymphatic filariasis. *African Journal of Health Sciences* **13**: 69-79.

Wamae C.N., Njenga S.M., Ngugi B., Mbui J. and Gatika S.M. (2004). Comparative evaluation of diethylcarbamazine citrate (DEC), albendazole and a combination of the two drugs, in the treatment of bancroftian filariasis in Kwale district, Kenya. Abstract # B/044/04, In: Abstracts of the 25th African Health Sciences Congress, Kenya Medical Research Institute, Nairobi, Kenya, October 4 - 8, 2004.

Wamae C.N., Gatika S.M., Roberts J.M. and Lammie P.J. (1998). *Wuchereria bancrofti* in Kwale District, Coastal Kenya: Patterns of focal distribution of infection, clinical manifestations and anti-filarial IgG responsiveness. *Parasitology* **116** (2): 173-182.

Wamae C.N., Gatika S.M., Roberts J.M. and Lammie P.J. (1997). *Wuchereria bancrofti* in Kwale District, Coastal Kenya: Patterns of focal distribution of infection, clinical manifestation and anti-filarial IgG responsiveness. *Parasitology* **116**: 173-182.

Wanji S., Tendongfor N., Nji T., Esum M., Che J.N., Nkwescheu A., Alassa F., Kamneng G., Enyong P., Taylor M., Hoerauf A. and Taylor D. (2009). Community-directed delivery of doxycycline for the treatment of onchocerciasis in areas of co-endemicity with loiasis in Cameroon. *Parasites & Vectors* **2**: 2-39.

Webber R. H. (1979). Eradication of *Wuchereria bancrofti* infection through vector Control *Transactions of Royal Society of Tropical Medicine and Hygiene* **73**:722-724.

Weerasooriya M.V., Yahathugoda C.T., Wickramasinghe D., Gunawardena K.N., Dharmadasa R.A., Vidanapathirana K.K., Weerasekara S.H. and Samarawickrema W.A. (2007). Social mobilization, drug coverage and compliance and adverse reactions in a Mass Drug Administration (MDA) Programme for the Elimination of Lymphatic Filariasis in Sri Lanka. *Filaria Journal* **6**: 6-11.

Wijers D. J. and Kiilu G. (1977). Bancroftian filariasis in Kenya III. Entomological investigations in Mambrui, a small coastal town, Jaribuni, a rural area more inland (Coastal Province). *Annals of Tropical Medicine and Parasitol*ogy **71**: 333-345.

Wijers D. J. and Kinyanjui H. (1977). Bancroftian filariasis in Kenya II. Clinical and parasitological investigations in Mambrui, a small coastal town, and Jaribuni, a rural area more inland (Coast Province). *Annals of Tropical Medicine and Parasitology* **71**: 333-345.

Wijers D.J. (1977). Bancroftian filariasis in Kenya I. Prevalence survey among adult males in the Coast Province. *Annals of Tropical Medicine and Parasitology* **71**: 313-331.

World Health Organization (2010). Community-directed interventions for priority health problems in Africa: Results of a multi-country study **88**: 481-560.

World Health Organization (2009). Global Programme to Eliminate Lymphatic Filariasis. *Weekly Epidemiological Record* **84**: 437–444.

World Health Organization (2008). Global Programme to eliminate lymphatic filariasis: progress report on mass drug administration. *Weekly Epidemiological Record* **83** (37): 333-341.

World Health Organization (2007). Global Programme to eliminate lymphatic filariasis. *Weekly Epidemiological Record* **82**: 361-380.

World Health Organization (2006). Global Programme to Eliminate Lymphatic Filariasis. *Weekly Epidemiological Record* **81**: 221-232.

World Health Organization (2005). Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation unit level. WHO/CDS/CPE/CEE/2005.50.

World Health Organization (2004). Lymphatic filariasis: progress of disability prevention activities. *Weekly Epidemiological Record* **79**: 417-424.

World Health Organization (2002). Lymphatic Filariasis Elimination Programme. Training module for drug distributors in countries where lymphatic filariasis is not co-endemic with onchocerciasis.

World Health Organization (2000c). Operational guidelines for rapid mapping of Bancroftian filariasis in Africa, World Health Organization.

World Health Organization (2000b). Health systems: Improving Performance. The World health Report 2000.WHO, Geneva.

World Health Organization (2000a). Eliminate filariasis: Attack poverty. A green light from the Global Alliance. World Health Organization, Geneva.

World Health Organization (2000). Preparing and Implementing a National Plan to Eliminate Lymphatic Filariasis (in countries where onchocerciasis is not co-endemic). **1-2:**11-15.

World Health Organization (1999). Building partnerships for lymphatic filariasis: strategic plan. World Health Organization.WHO/FIL/99-198, Geneva.

World Health Organization (1998). Lymphatic Filariasis: Reasons for hope.

World Health Organization (**1997).** Elimination of lymphatic filariasis as a public health problem WHA 50/1997/REC/1, World Health Organization.

World Health Organization (1995). World Health Report 1995. World Health Organization, Geneva. pp 118.

World Health Organization (1994). Lymphatic Filariasis Infection & Disease: Control Strategies. World Health Organization, 1994.

World Health Organization (1987). Control of lymphatic filariasis. A manual for Health personnel World Health Organization. pp 89.

World Health Organization (1986). *Ottawa Charter for Health Promotion*. World Health Organization, Geneva.

World Health Organization (1985). Community Involvement for health development: report of the Interregional meeting, Brioni, Yugoslavia, 9-14 June 1985, Geneva: WHO.

Yirga D., Deribe K., Woldemicheal K., Wendafrash M. and Kassahun W. (2010). Factors associated with compliance with community directed treatment with ivermectin for onchocerciasis control in Southwestern Ethiopia. *Parasites & Vectors* **3**: 3-48.

Yodder P. S. (1997). Negotiating relevance, belief, knowledge and practice in international health projects. *Medical Anthropology Quarterly* **11:** 131-146.

Zagaria N. and Savioli L. (2002). Elimination of lymphatic filariasis: a public-health challenge. Annals of Tropical Medicine and Parasitology 96 Suppl **2:** S3-13.

APPENDICES

Appendix 1: Interviewer-based Questionnaire for Household Survey

Date: _____

ID: _____

District: _____

Village: _____

Household no: _____

Instructions:

- This form should be used for interviews to Household heads.
- If the participant refuses to answer a question, circle the number of the question and do not mark any answers for that question.
- After obtaining informed consent, read the following instructions to the participant:

"I am going to ask you questions about the Filariasis control program, your willingness to take the drugs and to continue taking the treatment. Some questions about your household members focusing on the control program will be asked to you. Please answer the questions as honestly as you can remember. Your information will be kept private and this form will not have your name anywhere, you will be identified by a number only. If you have any questions or do not understand what I am asking you at any time, please ask for clarification. Some questions may prove embarrassing to you.

Please remember that you do not have to answer any questions that you do not want to answer and you may discontinue the interview at any time. Do you have any questions before we begin?"

Socio-Demographic Characteristics

1. Sex Male ( ) Female ( )

2. Age in Years_____

3. Marital Status

Single
Currently Married (Tick) Polygamous ( ) Monogamous ( )
Divorced
Widow/widower

4. Level of Education (Tick)

Never attended school:
Did not complete primary school:
Completed primary school but did not complete secondary school
Completed secondary school:
Further studies after secondary school
Others, specify _____

5. Main occupation (Tick)

Peasant farmer:
Small business (kiosk, kibanda):
Big business (shop):
Housewife
Salaried worker (teacher, police, chief):
Fisherman:
Casual laborer:
Others, specify_____

6. Religion (Tick)

Christian
Islam
Non-practicing
Others, specify_____

Proxy Measures for Socio-economic Characteristics

7. Presence of latrine in the homestead (Tick) Yes ( ) No ( )

7a, If yes in 7, state type

Flush
Traditional pit latrine
Ventilation Improved Pit (VIP) latrine
No facility, bush, field
Others, specify _____

b, Share toilet with other households (Tick) Yes ( ) No ( )

8. Type of roofing material of the house (Tick)

Grass thatch, *makuti*
Tin cans
Corrugated iron sheet:

Brick/gall sheet
Concrete
Tiles
Others, specify _____

9. Type of flooring material (Tick)
Earth, mud, dung, sand
Wood planks
Palm, bamboo
Polished wood
Ceramic tiles
Cement
Carpet
Others, specify _____

10. Type of cooking fuel (Tick)
Electricity
Gas
Kerosene
Charcoal
Firewood straw
Dung
Others, specify_____

11. Sources of drinking water (Tick)
Piped into dwelling
Piped into compound/plot
Public tap
Open well in compound/plot
Covered public well
Spring
River, stream
Pond, lake
Dam
Rainwater
Bottled water
Others, specify_____

12. Time to water source (Tick)
Less than 15 minutes
More than 15 minutes

13. Water availability (Tick)
Usually available
Several hours per day
Once or twice per week
Infrequent

14. Household owns structure (Tick)
Owns
Pays rent, lease
No rent, with consent of owners
No rent, squatting
Others, specify_____

15. Household owns land on which structure sits (Tick)
Owns
Pays rent, lease
No rent, with owners consent
No rent, squatting
Others, specify_____

16. State of repair of dwelling (Tick)
Completely dilapidated shack
Needs major repairs
Being repaired
Under construction
Others, specify_____

17. How household disposes of kitchen waste and trash (Tick)
Regular collection by government
Infrequent collection by government
Pays for private collection
Composted
Dumps, buries, burns in compound
Dumps in street empty plot
Others, specify_____

18. Possession of durable consumer goods (Tick)
Radio
Television
Refrigerator
Bicycle
Motorcycle
Car/truck
Solar power

Knowledge questions

19. Do you know of anyone in your community who has swollen limbs (lymphoedema?) (Tick)

i. Yes
ii. No

20. How many such people do you know of _____ (Record a number)

21 What do you think are the causes of swollen limbs (Tick)
Witchcraft (1)
Rain (2)
Blood (3)
Mosquitoes (4)
Others, specify_____(5)
Do not know/ no idea (6)

22. Do you know of anyone in your community who has swollen genitals (hydrocele)? (Tick)
Yes (1)
No (2)

23. How many such people do you know of_____ (Record a number)

24. What do you think is the cause of swollen genitals? (Tick)
Witchcraft (1)
Rain (2)
Blood (3)
Mosquitoes (4)
Others, specify_____ (5)
Do not know/ no idea (6)

25. Do you think that you are at risk of getting swollen genitals? (Tick)
Yes (1)
No (2)
Do not know (3)

26. Have you ever heard of Mass Drug Administration for Elimination of Lymphatic Filariasis in your community? (Tick)
Yes (1)
No (2)

26a, If yes in Q26,
How did you learn about the MDA? _____
What information did you get about the MDA?
_____
_____
_____
How frequently do you receive this information in one year? _____
What is your opinion of this source of information?
_____

Drug use

27. Did you take drugs during the last MDA? (2008)
Yes (1)
No (2)
Can not remember (3)

28a. How many times have you taken the LF drugs during MDA? _____
28b. If you have never taken LF drugs during MDA, give your reasons.
_____
_____
_____
_____
_____

29. Did anyone in your household receive the drugs during the last MDA? (Tick)

Yes (1)
No (2)
Do not know (3)

30. How many people over 2 years live in your household? _____ (Record a number)

31. Give me information on the members of your household starting from the oldest to the youngest.

Member	Relation to you	Age	Present at last MDA Y/N/DK	Received Y/N/DK	Swallowed Y/N/DK	Number of tablets **ALB/ DEC**	Side effects **(*code)**
1							
2							
3							
4							
5							
6							

***Code** 0: No Problem 1: Giddiness 2: Fever 3: Headache 4: Vomiting 5: Other (specify)

32. Did anybody have any problem within two days after taking the tablets? (Tick)

Yes (1)
No (2)
Do not know/ cannot remember (3)

The following questions are specific to you

33. Do those around you encourage you and your family to take the medication? (Tick)
Yes (1)
No (2)

34. Do you take alcohol and or drugs? (Tick)
Yes (1)
No (2)
35. Do you think this treatment is necessary for you? (Tick)
Yes (1)
No (2)
36. Do you have trouble swallowing the pill? (Tick)
Yes (1)
No (2)

37. Do you have a problem with the size, number of pills or taste of the pills given to you? (Tick)
Yes (1)
No (2)

38. Would you be interested to take these drugs next time? (Tick)
Yes (1)
No (2)
Do not know (3)

39. If no, why not? (Tick)
They were not distributed in my house or village (1)
Was absent on the day they were distributed (2)
Do not like modern medicine (3)
Is not necessary for me (4)
Fear of reactions/ complications (5)
Have another illness (6)
Others, specify_____ (7)

40. Next time the drug is given, would you want it to be distributed the same way as this last time? (Tick)

Yes (1)
No (2)
Do not know (3)

41. If no, why not? (Tick)

Had to wait for CDD for long hours (1)
CDD did not explain well the need to take the drug and its side effects (2)
CDD did not have enough drugs to give (3)
Poor interaction with the CDD (4)
Others, specify _____ (5)

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 2*:* Semi-structured Interviews with Opinion Leaders

Instructions: This form should be used for in-depth interviews with the opinion leaders. If the participants refuse to answer a question, circle the number of the question and do not mark any answers for that question. After obtaining informed consent, read the following instructions to the participants:
"I am going to ask you questions about the Filariasis control program, so as to collect information on your opinion on compliance or non-compliance with the MDA. Please answer the questions as honestly as you can. Your information which I will write down will be kept private and this form will not have your name anywhere. All the information will be kept confidential until the conclusion of the study when it will be destroyed. If you have any questions or do not understand what I am asking you at any time, please ask for clarification. Some questions may prove embarrassing to you. **Please remember that you do not have to answer any questions that you do not want to answer and you may discontinue the discussion at any time. Do you have any questions before we begin?"**

Face sheet

ID_____

Time_____

Date_____

Name of Interviewer: _____

District_____

Village_____

Socio-Demographic Characteristics

1. Sex Male ( ) Female ( )

2. Age in Years _____

3. Marital Status
   Single
   Currently Married (Tick) Polygamous ( ) Monogamous ( )
   Divorced

Widow/ widower

4. Level of Education (Tick)
Never attended school
Did not complete primary school
Completed primary school but did not complete secondary school
Completed secondary school
Further studies after secondary school
Others, specify_____

5. Main occupation (Tick)
Peasant farmer
Small business (kiosk, kibanda)
Big business (shop)
Housewife
Salaried worker (teacher, police, chief)
Fisherman
Casual laborer
Others, specify_____

6. Religion (Tick)
Christian
Islam
Non-practicing
Others, specify_____

Actual Interview

Questions	**Observations (record non-verbal behaviors)**
1. Could you tell me about the MDA for swolle limbs and swollen genitals in your community? Probe for	
i. Who does it?	
ii. When is it done?	

iii. How is it done?	
Why is it done?	
2. How do people in your community know about MDA for swollen limbs and swollen genitals? Probe for	
i. Adequacy of information	
i. Enough time given to understand the information	
iii. Too much or too little information given	
iv. Period between that which the information is give and the drugs are distributed is too soon or too long	
3. How was the participation of your community members in the last MDA for swollen limbs and swollen genitals? Probe for	
Any problems or barriers	
ii. Any facilitation	
4. What would you say about? i. The present way of drug distribution	
ii. The current drug distributors	

5. How can drug distribution in your community be improved?	

THANK YOU VERY MUCH FOR YOUR COOPERATION

Post Interview comment

In this part of the interview the interviewer should write notes that detail his/her feelings, interpretations and other comments. This should be done immediately after conducting the interview

Appendix 3: Semi-structured Interview with Community Members who are LF Patients

Instructions: This form should be used for in-depth interviews with the opinion leaders. If the participants refuse to answer a question, circle the number of the question and do not mark any answers for that question. After obtaining informed consent, read the following instructions to the participants:
"I am going to ask you questions about the Filariasis control program, so as to collect information on your opinion on compliance or non-compliance to the MDA. Please answer the questions as honestly as you can. Your information which I will write down will be kept private and this form will not have your name anywhere. All the information will be kept confidential until the conclusion of the study when it will be destroyed. If you have any questions or do not understand what I am asking you at any time, please ask for clarification. Some questions may prove embarrassing to you. **Please remember that you do not have to answer any questions that you do not want to answer and you may discontinue the discussion at any time. Do you have any questions before we begin?"**

Face sheet

ID_____

Time_____

Date _____

Name of Interviewer: _____

District_____

Village_____

Socio-Demographic Characteristics

1. Sex Male ( ) Female ( )

2. Age in Years _____

3. Marital Status
Single
Currently Married (Tick) Polygamous ( ) Monogamous ( )

Divorced
Widow/ widower

4. Level of Education (Tick)
Never attended school
Did not complete primary school
Completed primary school but did not complete secondary school
Completed secondary school
Further studies after secondary school
Others, specify_____

5. Main occupation (Tick)
Peasant farmer
Small business (kiosk, kibanda)
Big business (shop)
Housewife
Salaried worker (teacher, police, chief)
Fisherman
Casual laborer
Others, specify_____

6. Religion (Tick)
Christian
Islam
Non-practicing
Others, specify_____

Actual Interview

Questions	Observations (record non-verbal behaviors)
1. Please tell me for how long you have been having swollen limbs and or genitals. Probe for	
i. The causes of the disease	
ii. The signs and symptoms of the disease	

2. Could you tell me about the MDA for swollen limbs and swollen genitals? Probe for	
i.Who does it?	
ii When is it done?	
v.How is it done?	
iv. Why is it done?	
3. How do you know about MDA for swollen lim and swollen genitals? Probe for	
Adequacy of information	
Enough time given to understand the information	
Too much or too little information given	
Period between that which the information is give and the drugs are distributed is too soon or too lo	
4. How was your participation in the last MDA fo swollen limbs and swollen genitals? Probe for	
Any problems or barriers	
Any facilitation	

5. What would you say about? The present way of drug distribution	
The current drug distributors	
6. How can drug distribution in be improved?	

THANK YOU VERY MUCH FOR YOUR COOPERATION

Post Interview comment

In this part of the interview the interviewer should write notes that detail his/her feelings, interpretations and other comments. This should be done immediately after conducting the interview

Appendix 4: Semi-structured Interview Guide with Community Drug Distributors

District: _____

Name of Village: _____

Date: _____

Name of interviewer: _____

ID: _____

Socio demographic characteristics

Sex: _____

Age: _____

Designation: _____

Education: _____

Religion: _____

Selection process

1. How were you selected as a drug distributor?

_____
_____

2. Are there any special reasons as to why you agreed to distribute drugs?

_____
_____

Training

3. Did you undergo any training for the drug distribution?

_____

4. Who trained you?

_____

5. What were the content, duration, and place of training?

_____

Collection of drugs

6. How many drugs did you require?

_____

7. How many drugs did you get?

_____

8. From where did you collect the drugs?

_____

9. Did you face any problems in collecting the drugs?

_____

9 a. If yes, describe the nature of the problems.

_____

_____

_____

Mode of drug distribution

10. How did you go about the drug distribution? (Probe for the number of households supposed to cover, those covered, number of days used etc)

_____

_____

_____

11. How do you know that all the people were given drugs and consumed them?

_____

12. Were all sections of the community covered by the drug distribution?

_____

13. Did anybody help you in the distribution? (Probe for who and type of assistance given)

_____

_____

_____

14. Did you face any difficulty? If yes, describe.

_____

15. How did you resolve the difficulties?

_____

16. What suggestions do you have for improving the drug distribution?

_____

17. Would you be willing to take part in the distribution next time? If yes, or no, elicit reasons.

_____

_____

Management of side effects

18. Did people report any problems after taking the drugs?

_____

19. What problems specifically?

_____

20. How were these problems managed?

_____

20a. Who managed these problems?

_____

Record maintenance

21. Did you maintain any records regarding the drug distribution?

_____

If no, elicit
reasons._____

_____

_____

22. If yes, can you show us some of these records? (Interviewer to take notes on type of records kept).

_____

_____

_____

_____

23. Did you face any problems in making these records? If yes, what problems?

_____

_____

_____

_____

24. How did you resolve them?

_____

_____

_____

Behavior Change Communication (BCC)

25a.Was the community that you distributed drugs to informed about the MDA?

_____

b. If yes, how did they get informed?

_____

_____

c. Were you involved in informing them?

_____

d. Do you think that the materials used to inform were adequate for their understanding?

_____
_____
_____

Incentives

25a.What kind of support or incentive do you receive from the community in your role as a CDD? (Tick)

Financial
Moral
Food
Nothing
Others, specify _____

25b. If you received moral support from the community, whom did you receive it from? (Tick)

Village leader
District LF Coordinator
Village LF Coordinator
Health Committee
Others, specify _____

25c. Who would you say has been most supportive?

_____

25d. What did they do in particular?

_____
_____
_____

25e. Who would you say has been least supportive?

_____

25f. What do you think they had in their powers to do but failed to do so in your support?

_____
_____

26. Is the two-day period of MDA a satisfactory length of time for distribution of the drugs to your community? (Tick)

Yes
No

27. If no, what length of MDA do you think is satisfactory? _____days

28. If yes, what makes you say so? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 5: Semi-structured Interview Guides with Health Workers

File Name: _____

Name of Village: _____

Date: _____

Type of Village: PHC/HSC/RHC/Dispensary

Name of interviewer: _____

Questionnaire ID: _____

Sex: _____

Designation: _____

Role of the health worker

1. What were the activities assigned to you in the drug distribution programme in your area?

_____

2. Who assigned these activities to you?

_____

3. Elaborate on what activities you actually carried out in the village.

_____

_____

_____

_____

4. Did you undergo any training for the assigned role before the drug distribution?

_____

5. Could you tell us the details of training?

_____

_____

_____

_____

_____

6. Was the training adequate to undertake the job assigned to you for the programme?

_____

If not, why?

_____
_____
_____

Information, Education and Communication

7. Describe the efforts made by you to educate the community on mass drug distribution

_____
_____
_____
_____

8a. What were the issues/topics covered during the IEC efforts.

_____
_____
_____
_____

Probe whether any effort was made in informing the community on the side effects, describe the message conveyed?

_____
_____
_____
_____

8b.Who designed the messages?

_____

What were the ways of communicating the information to the community?

_____
_____
_____
_____

9. How did you sensitize the community on ComDT?

_____
_____

9a.How many times did you have to visit the community?

9b.Did you face any problems in sensitizing the community to the concept of ComDT?

_____
_____

Drug distribution

10a. Could you describe how the drugs were collected and where they were stored before distribution?

_____

_____

_____

10b.Was any problem faced in the collection and storage? If yes, please explain the nature of the problem and how it was sorted out?

_____

_____

_____

10c.How many drug distributors were involved from this village?

_____

10d.For how many days was the drug distributed in your village?

_____

10e.Was the drug given at any particular time of the day, if so why?

_____

10f.Did all eligible persons in the village receive the drug?

_____

10g.If not, which section of the village got left out and why?

_____

_____

_____

_____

Side effects

11a. Did you come across people with side effects following drug distribution?

_____

After how many days of getting the side effect did people come to you for help?

_____

11b. Explain the nature of side effects?

_____

_____

11c.How were the side effects managed?

_____

11d.Did you play any role in the management of side effects? If yes, explain

_____

_____

_____

Record maintenance

12a. Who maintained the records on drug distribution?

_____

12b.What details were recorded?

_____

_____

_____

Suggestions for the improvement of ComDT

13a. What did you feel about the implementation of mass drug administration in the village?

_____

13b.What were the problems faced in mass drug distribution?

_____

13c.Do you have any suggestions for the improvement of mass drug distribution?

_____

_____

13d.What were the reactions of the community to the present drug distribution method?

_____

_____

_____

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 6: Focus Group Discussion with Community Members (women, men and youth (male, female) groups)

Instructions: This form should be used for FGDs for the community members. If the participants refuse to answer a question, circle the number of the question and do not mark any answers for that question. After obtaining informed consent, read the following instructions to the participants:
"I am going to ask you questions about the Filariasis control program, so as to collect information about your knowledge of LF and opinion of MDAs. Please answer the questions as honestly as you can remember. Your information which will be tape recorded will be kept private and this form will not have your name anywhere. If you have any questions or do not understand what I am asking you at any time, please ask for clarification. Some questions may prove embarrassing to you Please remember that you do not have to answer any questions that you do not want to answer and you may discontinue the discussion at any time. Do you have any questions before we begin?"

Socio-Demographic Characteristics

Village:			Moderator:		
District:			Note taker:		
Date of FGD:			Time start:		
Location of FGD:			Time stop:		
Participants at start			Debrief notes		
Participants at stop					
Participant identified by number according to sitting arrangement)	Age	Sex	Ed (yrs)	Religion	Occupation
1					
2					

3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Focus Group Questions

1. What are the common diseases in your village? If swollen genitals (hydrocele) and swollen limbs (lymphoedema) are not mentioned, probe
What about swollen limbs?
What about swollen genitals?
2. What causes swollen limbs?
3. What causes swollen genitals?
4. Who are normally at risk of getting swollen limbs?
5. Who are normally at risk of getting swollen genitals?
6. How severe/dangerous can swollen limbs and genitals be?
7. Tell me about MDA for swollen limbs and swollen genitals in your community.
Probe about
Length of MDA
Mode of drug distribution and
Interaction with drug distributor
8. How do people in your village feel about?
The length of MDA
9. How do people in your village learn about the MDA?
(Probe about the sources of information and their sufficiency in informing the communities about MDA)
(Probe about the frequency of informing the communities about MDA)
10. Have you and your village members been taking the drugs during the MDAs?
11. How many times have you and your village members taken these drugs?
12. Do you know of people from your village that had problems (within 2 days) after taking the drugs?
13. Did people from your village have problems with the drugs? (Probe about size, number and taste of the drugs)
14. Would your village members be interested in taking the drugs next time they are given?
15. Next time the drugs are distributed would you want them distributed as in the last time?

16. What can be done to support the CDD?

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 7: Self Administered Questionnaire for Medical Officer/ District LF Coordinator

Date: _____
ID: _____
District: _____
Name of interviewer: _____
Sex of the respondent: _____
Age: _____
Designation:_____
Area assigned to work in Health Facility: _____
Religion: _____
Place: _____

1. Are you aware of a filariasis control program in your district?

2. Have you been involved in this program?

3. If you have been involved, can explain how you have been involved?

4. What are the recent steps taken in your concerned area for control of filariasis?

5. Was any health plan for filariasis control made by you in your area?

6. Please give details on the IEC materials developed for this mass treatment?

7. Please give details on the training given to health workers for undertaking mass chemotherapy?

8. What steps have you taken to sensitize the communities for mass drug administration?

9. Describe the process of drug procurement and storage for mass drug administration in your area?

10. Could you describe the process of drug distribution at the village level?

11. Were other government functionaries involved in the distribution of drugs?

11a. Who were involved?

11b. How were they involved?

11c. How well did that work?

12. Was anybody outside the health services including NGOs and CBOs involved in the drug distribution, if so in what way?

12a. How well did this work?

13. What are the problems faced in implementing mass drug administration? How are these problems resolved?

13a. Who resolves these problems?

14. What were the supervision mechanisms for the distribution?

14a. How well did this work?

15a What were the processes of documentation and reporting?

15b. How well did this work?

16. What are the suggestions for improvement for next year?

17. Would you like to be involved next year?

17a. How would you like to be involved?

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 8: Questionnaire for the National Programme Manager

Date: _____

Sex: _____

Age: _____

Designation: _____

1. Who are the key organizations involved in the elimination of this disease via mass distribution of drugs etc?

_____
_____
_____

2. What is the drug name and who manufactures it?

_____

3. Is the drug donated and if not, what is the cost?

_____

4a.What are the target regions for the drug distribution?

4b. What is the criteria for selection?

_____
_____
_____

5a.What are target districts in each region?

_____
_____
_____

5b. How are they decided?

_____
_____
_____

6a. What are the target villages in each district?

_____
_____
_____

6b. What is the criteria for selection?

_____
_____
_____

7a. What are the current regions, districts and villages being treated for the disease right now?_____
_____
_____

7b. What is the criteria for selection?

_____
_____
_____

8. What are the national and regional treatment target numbers?

_____

9.What is the prevalence per region and per district?

_____

10. How many years has the program existed?

_____

11a.How many years of mass drug administration have occurred per region?

_____

11b. Per District?

_____

11c. Per village?

_____

12. What is the percent coverage needed for the program in each region?

_____

13. Who are the target groups for the drug?

_____

13a. How are they targeted?

_____

14. Burden of Disease: The Economic costs to the country?

_____
_____
_____

15. Burden of Disease: Those at risk?

_____

16. Describe the sources of funding by donor

_____
_____
_____

17. What are the projected funding needs of the program in the future?

_____
_____
_____
_____

18. Describe the distribution system from Drug Company to the person receiving the pills.

---

19. Management and Accountability: Describe the management from the village level up within the program.

_____
_____
_____
_____

20.What are the reporting requirements at each level: National, Regional, District, Village?

_____
_____
_____

21. What are the major strengths of the organization of the program?

_____
_____
_____

22. What are the major weaknesses of the organization of the program?

_____
_____
_____

23. How much variability exists between districts for this distribution system?

_____
_____
_____

24. What have been the major challenges in scaling up?

_____
_____
_____

25. What have been the major challenges of the drug distribution?

_____
_____

_____
_____

26. Besides MDA, what are the other components of the program?

_____
_____
_____

27. Distribution System-Advantages: Financial

_____
_____
_____

28. Distribution System- Advantages: Technical

_____
_____
_____

29. Distribution System –Advantages: Social/Cultural

_____
_____
_____
_____

30. Distribution System-Limitations: Financial

_____
_____
_____

31. Distribution System- Limitations: Technical

_____
_____
_____

32. Distribution System -Limitations: Social/Cultural

_____
_____
_____
_____

33. What is the number of drug distributors currently employed by the program?

_____

34. What is the per diem rate for these drug distributors?

_____

35.How many days do they receive the per diem?

_____

36. How many days does training take place?

_____

37. How many days does MDA take place?

THANK YOU VERY MUCH FOR YOUR COOPERATION

Appendix 9: KEMRI Scientific Steering and Ethical Review Clearance

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200 NAIROBI, Kenya
Tel: +254 (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax +254 (020) 2720030,
E-mail: director@kemri.org; info@kemri.org Website: www.kemri.org

ESACIPAC/SSC/2435 **20th February, 2008**

Doris W. Njomo
ESACIPAC

REF: SSC No.1077 (2nd Amended) – Social-economic and behavioral factors that influence compliance with treatment in the National Programme for Elimination of Lymphatic Filariasis in Kenya

I am pleased to inform you that the above mentioned proposal in which you are the PI, was approved for implementation by the KEMRI Scientific Steering Committee (SSC), during its 143rd SSC meeting held on 5th February, 2008 and has since been forwarded to the Ethical Review Committee (ERC) for consideration.

The SSC however, advises that work on this project can only start when ERC approval is received.

C. Mwandawiro, PhD
SECRETARY, SSC

In Search of Better Health

KENYA MEDICAL RESEARCH INSTITUTE

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KEMRI/RES/7/3/1 **MARCH 31, 2008**

FROM: **SECRETARY, KEMRI/National Ethical Review Committee**

THRO': **Dr. N Wamae,**
CENTRE DIRECTOR, CMR
NAIROBI

Forwarded 09/04/08

TO: **Doris Njomo (CMR) (Principal Investigator)**

RE: **SSC No. 1077 (2nd Am):** Social, economic and behavioral factors in adherence to treatment in the National Programme for elimination of lympahtic filariais in Kenya.

Dear Madam,

This is to inform you that during the 152nd meeting of KEMRI/National Ethical Review Committee held on 25th MARCH 2008, the amendments for the above mentioned study were reviewed.

The Committee noted the following amendments:

1. That Drs. Wamae and Mwandawiro have been dropped from the investigators list with their approval
2. That Drs. Amuyunzu-Nyamongo and Magambo have been added to the list of investigators
3. That the alternative objectives on page 9 have been deleted

The above changes do not change the risk status to the research participation and are granted approval. You may proceed with your study.

Respectfully,

R.C.Kithinji

R. C. Kithinji,
For: Secretary,
KEMRI/NATIONAL ETHICAL REVIEW COMMITTEE

Appendix 10: Informed Consent Form

Title of Study: Factors influencing compliance with mass treatment in the National Programme for the Elimination of Lymphatic Filariasis in Kenya

Sponsor: UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR)

Introduction

You are asked to participate in a social research study on lymphatic filariasis. Filariasis is a disease caused by parasites that are spread from one person to another by mosquitoes. When the parasites enter human beings during mosquito bites, they move into vessels called lymphatic vessels, where they grow into thread-like adult worms. If not diagnosed and treated promptly, filariasis can lead to severe disability due to the resulting swelling of the limbs and genitals. The Government of Kenya through the Ministry of Public Health and Sanitation with support of the international body called World Health Organization (WHO) has decided to eliminate lymphatic filariasis as a public health problem by giving treatment to all persons living in areas where the disease occurs. The purpose of this consent form is to give you information that might help you to decide whether to participate in the study or not. **The research will take about 6 months**. You are allowed to ask questions related to the study and implications on your part.

Purpose of study

The recommended treatment in Kenya is a combination of two drugs namely, diethylcarbamazine (DEC) and albendazole given once a year to all individuals living

in endemic areas. Currently, persons from your community selected by the community members with the help of village leaders and trained by health personnel are being used to administer drugs to village members. The current study's aim is to find out information based on family income, parental education, occupation, community social status and factors such as perception towards disease state, treatment/drug and to persons selected to give out the drugs that influence the patient's loyalty to the treatment plan in the national programme for elimination of lymphatic filariasis. The results of this study will provide the Ministry of Public Health and Sanitation with information that may help come up with mechanisms to improve on the method of giving out the drugs in order to increase the number of those persons who receive and swallow the medicine.

Procedures to be followed

Field assistants will be recruited from within your village through the village leaders. They will be trained on how to conduct field survey related to the national programme for elimination of filariasis. As a community member the field workers will ask you to give information on your knowledge about drug administration, your participation in the MDA, and your willingness to continue taking the drugs. All the information you give will be written down and kept confidential. This process will run for about forty five minutes.

Risks

There is no risk of participation in this study. You will not be expected to give your names to the person collecting data from you. You will be asked for the names of the members of your household though only the initials will be recorded.

Benefits

The aim of this study is to find out the problems that affect the patient's loyalty to treatment for filariasis. The information you give will help come up with improvement measures aimed at raising the level of patients' loyalty to the treatment. In the long run you and the members of your community will not be at risk of getting swollen limbs and genitals. The treatment also has benefits of removing intestinal worms.

Assurance of confidentiality

Your identity and other records about you will remain confidential and will not appear when we present this study or publish its results. You will receive a copy of the consent form.

Storage of data

The data will be stored in secure cabinets and computers with password/s and will only be accessible to the investigators. The data will be stored for a period of up to five years after completion of the study before it is destroyed.

Right to refuse or withdraw

It is important that you understand the following general principles that will apply to all participants in the study:

1. Participation is entirely voluntary.

2. You may withdraw from this study at any time without penalty or loss of benefits. Please feel free to ask any questions that you may have. Do you agree to participate?

I acknowledge that this consent form has been fully explained to me in a language that I understand and had the opportunity to ask questions which have been answered to my satisfaction. I agree voluntarily to participate in this study and understand that I have the right to withdraw at any time without penalty.

Participant's name: _____

Participant's signature or thumb print:_____Date: _____

Study No.: _____

Name of witness: _____

Signature of witness: _____ Date: _____

Investigator's signature: _____ Date: _____

Contact: If you have questions in future, please contact The Secretary, KEMRI/National Ethical Review Committee, P. O. Box 54840-0020, Nairobi; Telephone 020-2722541 or Ms. Doris W. Njomo, Kenya Medical Research Institute (KEMRI), Eastern and Southern Africa Centre of International Parasite Control (ESACIPAC), Telephone 0722373650.