PREVALENCE OF WUCHERERIA BANCROFTI ANTIGENEMIA AND ASSOCIATED FACTORS AMONG CHILDREN OF SCHOOL AGE BORN AFTER INITIATION OF MASS DRUG ADMINISTRATION WITH IVERMECTIN AND ALBENDAZOLE IN RUFIJI DISTRICT, TANZANIA

By

Jones Clarer, Bsc EHS

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Science in Parasitology and Medical Entomology of Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
October, 2012

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled Prevalence of *Wuchereria Bancrofti* antigenemia and associated factors among children of school age born after initiation of Mass Drug Administration in Rufiji District, Tanzania in partial fulfillment of the requirement for the degree of Masters of Science in Parasitology and Medical Entomology of the Muhimbili University of Health and Allied Sciences.

……

Dr D. S. Tarimo MD, MSc TDC (Dar), PhD (Denmark**)**

(Supervisor)

……

Date

DECLARATION AND COPYRIGHT

I, Jones Clarer, declare that this dissertation is my own original work, and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature……

Date…….

This dissertation is copyright material protected under the Berne convention, the copyright Act 1966 and other international and national enactments, in that behalf on intellectual property. It may not be reproduced by any means, in full or in part, except for short extracts in fair dealings, for short extracts in fair dealing, for research or private study, critical scholarly review or discourse with an acknowledgement, without written permission of the Directorate of Postgraduate studies, on behalf of both the author and the Muhimbili University of Health and Allied Sciences.

© :Muhimbili University of Health and Allied Sciences, October, 2012

ACKNOWLEDGEMENT

This dissertation is the result of the help I received from School of Public Health and Social Sciences, Muhimbili University of Health and Allied Sciences, Parasitology and Medical Entomology department, Ministry of Health and Social Welfare, The University of Dodoma, Rufiji Distict administrators, Neglected Tropical Disease Program and my beloved family.

I would like to sincerely thank my supervisor Dr D. S. Tarimo, for supervising and mentoring me through this process. His commitment and support to this work was second to none, I highly appreciate that.

I would like to pay special tribute to the entire department of Parasitology and Entomology, MUHAS for their endless moral and material support throughout the proposal development, data collection and analysis. My Special appreciation goes to the Parasitology and Entomology course coordinator, Prof Kihamia C.M, for his support and guidance during the process.

I would like to extend my gratitude and thanks to my beloved husband, Dr Sunday for always providing a shoulder for me to lean on, my children Alfred, Abby and Austin for their understanding and allowing mom's time be consumed during the period of my study.

I would like to acknowledge my brother Jones for his help during proposal development and data analysis and my young brother Ackson for his endless support during my stay in Dar es Salaam.

An appreciation goes to employer, The University of Dodoma for supporting me throughout the study, with special thanks to my immediate boss, Professor Ainory Gesase, the Principal of the College of Health and Allied Sciences, The University of Dodoma.

I would like to appreciate the support and encouragement offered by my classmates during the study period.

DEDICATION

This work is dedicated to my Beloved Husband, Dr. Sunday A. Dominico, our sons Alfred and Austin and our daughter Abby, for their moral, spiritual and material support throughout this study.

TABLE OF CONTENTS

CERTIFICATION i
DECLARATION AND COPYRIGHT ii
ACKNOWLEDGEMENT iii
TABLE OF CONTENTS v
LIST OF ABBREVIATIONS vi
ABSTRACT. viii
1.0 INTRODUCTION 1
1.1 Background Information 1
1.2 Problem Statement 5
1.3 Study questions 5
1.4 Objectives of the Study 6
1.4.1 General Objective 6
1.4.2 Specific Objectives 6
1.5 Study Rationale 6
2.0 LITERATURE REVIEW 7
3.0 METHODOLOGY 12
3.1 Description of the Study area. 12
3.2 Study design 13
3.3 The study population 13
3.4 Sample size estimation 13
3.5 Sampling procedures 14
3.6 Data Collection Instrument 15
3.7 Data Collection procedures 15
3.8 Data Processing and Analysis 16
3.8.1 Dependent variables 16
3.8.2 Independent variables 17
3.9 Ethical considerations 17
3.10 Study Limitations and Delimitations 17
4.0 RESULTS 18
4.1: 1 Social-demographic characteristics of respondents 18
4.1: 2 Social-demographic characteristics of children 19
4.2. Prevalence of Wuchereria bancrofti antigenaemia among school aged children. 19
4.3: Awareness of lymphatic filariasis among community 21

4.4 Knowledge on mass drug administration 22
4.5 Participation in MDA 23
4.6 Compliance with MDA 24
4.7 Treatment coverage during MDA in Rufiji district. 25
5.0 DISCUSSION 26
5.1 Prevalence of Wuchereria bancrofti antigenaemia among school aged children born after initiation of MDA 27
5.2 Community knowledge on Lymphatic filariasis 27
5.3 Community knowledge on the MDA program 28
5.3.1 Relationship between knowledge of MDA programme and community participation in the programme 29
5.4 Coverage of MDA program 30
5.5 Other findings 30
6.0 CONCLUSION AND RECOMMENDATION 31
6.2 Recommendations 32
6.0. REFERENCES 33
Appendix 1: Informed Consent Form – English Version 38
Appendix 2; Questionaire- English version 40
Appendix 3: Blood analysis form 45
Appendix 4; Questionaire- Kiswahili version 46
Appendix 5: Ethical clearance 51

LIST OF ABBREVIATIONS

AIDS Acquired Immunodeficiency Syndrome

CFA	Circulating Filarial Antigens
DEC	Diethylcarbamazine
ICT	Immunochromatographic Tests
LF	Lymphatic Filariasis
MDA	Mass Drug Administration
MUHAS	Muhimbili University of Health and Allies Sciences
NLFEP	National Lymphatic Filariasis Elimination Programme
NTD	Neglected Tropical Disease
WHO	World Health Organization

ABSTRACT.

Background: The National Lymphatic Filariasis (LF) Elimination Programme use Ivermectin and Albendazole mass drug administration (MDA) for the control of LF. Screening children of school age has successfully been used for mapping geographical distribution of LF worldwide. The implementation of MDA for LF in Rufiji district started in 2002 and up to 2011, nine rounds had been administered. The prevalence of LF after MDA was not known, thus this study aimed to screen children born during the period of programme implementation in order to assess the transmission status.

Objective: This study aimed to determine the prevalence of *Wuchereria bancrofti* antigenaemia and associated factors among school age children born after the initiation of mass drug administration in Rufiji District.

Methodology: A descriptive cross sectional study involving heads of household and school age children born during the implementation of the MDA program was carried out in Rufiji district. Blood samples were drawn from 413 standard one pupils. CFA was tested from the blood sample by using ICT cards in order to establish prevalence of *W.bancrofti*. A total of 270 heads of household were interviewed so as to establish the relationship between coverage, knowledge and prevalence of bancroftian filariasis.

Results A total of 413 children between the age of 6 and 9 years were tested for CFA, 59 (14.3%) being positive for *Wuchereria bancrofti*. Two thirds (66.8%) of the children did not take ivermectin and albendazole during the 2011 MDA. Prevalence of *Wuchereria bancrofti* was lower in younger children (6.4%) than older ones (40.4%). Prevalence of *Wuchereria bancrofti* was significantly high (70.8%) in children who did not swallow tablets than in those who swallowed the tablets (29.2%), (P = 0.015). Though the larger majority of households (97.0%) had heard of the disease, only 57.0% knew it was transmitted by mosquitoes, while 56.4% had no adequate knowledge on the disease and proper use of drugs. The study also found out that respondents have different cultural beliefs on the cause of the disease and there was improper drug distribution during MDA.

Conclusion The prevalence of *Wuchereria bancrofti* in Rufiji is still high despite the ongoing elimination programme. Poor knowledge on the disease transmission,

cultural beliefs and improper drug distribution were associated with the sustained high prevalence.

1.0 INTRODUCTION

1.1 Background Information

Lymphatic filariasis (LF) due to *Wuchereria bancrofti* is a disease of major public health significance, affecting millions of people in the tropical areas of Africa, India, South and Central America (Michael *et al*. 1996). The clinical manifestations of LF like elephantiasis, hydrocele and acute filarial fever often cause considerable incapacity to the affected individuals with consequent loss of income and social and psychological stress (Simonsen *et al*, 2004).

Lymphatic filariasis is transmitted by night biting mosquitoes of genera *Anopheles* and *Culex*. In sub-Saharan Africa the most important species of mosquitoe vectors are *Culex quinquefasciatus*, widespread across urban and semi-urban areas and *Anopheles gambiae* mainly in rural areas (Simonsen, 2009).

Mosquitoes carry *Wuchereria bancrofti* larvae. During a blood meal, larvae in the infectious stage get on the skin and enter through the mosquito's bite. The larvae then travel to and lodge in the lymphatic vessels, where they develop into adult worms, which live between 6-8 years (WHO, 2005). They damage the lymphatic vessels, which in some people causes fluid build-up and swelling of the lymphatic system. The adult worms mate and produce millions of sheathed microfilariae which migrate into the lymph and blood channels.

When another mosquito bites the host, it picks up the microfilariae. Inside the mosquito, the microfilariae lose their sheaths and work their way through the mosquito's body until they can lodge in its thoracic muscles. In the thoracic muscles of the mosquito, the microfilariae develop into larvae and pass through two more larval stages until they reach the infective third stage. The larvae in this infective stage travel to the mosquito's proboscis. When the mosquito bites another human, the *Wuchereria bancrofti* larvae enter through the wound and begin the cycle in the new host (Simonsen, 2009).

Wuchereria bancrofti is fairly poorly transmitted by mosquitoes, and on average a dozen bites is necessary before an infection becomes patent. Since the mosquitoes

are not efficient transmitters of *Wuchereria bancrofti* a relative prolonged stay of a person in endemic area is usually required for acquisition of infection. It takes repeated bites from infected mosquitoes over several months or even years before lymphatic filariasis will develop (Rwegoshora *et al* 2005). The interval between acquisition of infective larvae from a mosquito bite and detection of microfilariae in the blood is approximately 12 months in duration. The adults of *Wuchereria bancrofti* reside in lymphatics and can survive for approximately five years, occasionally longer, producing circulating filarial antigens. (Simonsen, 2009).

In order to eliminate LF one of the strategies is interrupting transmission of the parasite that causes lymphatic filariasis by using mass drug administration to deliver annual treatment to all people living in endemic areas who are at risk of the disease (WHO, 2011).

Lymphatic filariasis (LF), the second most common vector-borne parasitic disease after malaria, is found in over 80 tropical and subtropical countries. WHO estimates that 120 million people are infected with the parasite, with one billion at risk. These figures are certain to be revised upwards because global prevalence mapping has not yet been completed (Ottesen, 2000). According to WHO, LF is the second most common cause of long-term disability after mental illness (Ottesen *et al*, 1997). One-third of people infected with LF live in India, a third live in Africa and the remainders live in the Americas, the Pacific Islands, Papua New Guinea and South-East Asia (Molyneux *et al*, 2005)

In 1997, a World Health Assembly resolution called for the elimination of LF. Public health interventions thus far have focused on interrupting the transmission of the parasite through the use of mass drug administration campaigns (MDAs). This approach reduces both the transmission of infection and the morbidity, the assumption is that once the community has been treated long enough, levels of microfilariae will remain below that required to sustain the transmission (Rwegoshora *et al* 2005. This period has been estimated to be four to six years, corresponding to the usual reproductive lifespan of the adult parasite (Simonsen *et al*, 2004). The MDA programmes deliver community-wide doses of diethylcarbamazine and albendazole, or albendazole and ivermectin, once annually for a period of four to

six years. (WHO; 1994, 2002). The goal is to eliminate lymphatic filariasis as a Public Health problem by 2020. The two strategies to achieve this goal are: the interruption of transmission of filarial infection through yearly rounds of Mass Drug Administration (MDA) using a combination of 2 drugs (Albendazole and Diethylcarbamazine or Albendazole and Ivermectin) for at least 5 years and to control the LF morbidity to alleviate and prevent the suffering and disability of affected individuals. (WHO, 1999)

Lymphatic filariasis (LF) is endemic throughout the United Republic of Tanzania. The figures for Tanzania mainland show that 34 million people are at risk of infection and it is estimated that 6 million people have debilitating manifestations of the disease. The endemicity varies from being highly endemic along the coast with antigenemia levels of 45–60%, to low endemicity in the areas of Western Tanzania with endemicity of 2–4%, and varying endemicity in the regions in between, i.e. central Tanzania, the southern Highlands and north and northwestern Tanzania. The levels of disease in the country are much higher than initially recorded and work is being carried out to calculate more accurate figures (Malecela *et al*, 2009).

Tanzania's National Lymphatic Filariasis Elimination Programme (NLFEP) began in 1997 following a World Health Assembly (WHA) resolution which declared that lymphatic filariasis would be eliminated as a public health problem by 2020. (Malecela *et al*, 2009). The Tanzania LF programme launched its first mass drug administration (MDA) with ivermectin and albendazole in 2000 when 45,000 people were treated. The programme now covers six regions and 34 districts, and 9.2 million people have been treated in the eight years since its inception. The goal of the NLFEP is to apply annual MDA with a combination of ivermectin (150–200 µg/kg) and albendazole (400 mg) to all individuals aged 5 years and above in selected programme areas. It has previously been shown in Tanzania that this treatment regimen drastically reduces the *W. bancrofti* microfilarial load (Simonsen *et al*, 2004).

Early studies in Rufiji indicated that LF had a severe detrimental socioeconomic impact on patients, particularly when acute filarial attacks (AFAs) would keep them in bed for up to three days unable to work and, thus, adversely affecting their

productivity (Gasarasi *et al*, 2000). According to the NTD program reports, the prevalence of Lymphatic filariasis by ICT prior to MDA implementation was on minimum 49%.

Children are most susceptible to acquire infection because of lack of immunity and high exposure to infective larvae in an endemic region. These infections, established in childhood, may act as the reservoir for the future disease later in life (Mandal, 2010).

The use of new sensitive and highly specific diagnostic tools detecting CFA released by adult *Wuchereria bancrofti* parasite have shown that many children acquire the infection earlier than hitherto thought and that often a considerable proportion of young chidren are CFA positive (Lammie, 1994). Thus screening of young school children has successfully been used for mapping and geographical distribution of LF (Onapa *et al*, 2005). As reduced transmission will lead to reduced acquisition of infection it has been more over suggested to screen young children for assessing the effectiveness of transmission intervention during LF elimination programmes (WHO, 2005). Children born after the onset of MDA will be of particular interest to provide an evaluation sample on the interruption of transmission (Simonsen *et al*, 2011).

The purpose of the study was to determine the prevalence of *Wuchereria bancrofti* antigenaemia among school age children born after initiation of Mass Drug Administration and associated factors in Rufiji District. It involved understanding of the relationship between knowledge and participation in MDA, coverage of MDA and community awareness on bancroftian filariasis after mass treatment with Ivermectin and Albendazole conducted in Rufiji district between August/September 2002 and August/September 2011.

1.2 Problem Statement

The problem of filarial lymphoedema dates back in history, and there is no known cure for this debilitating condition. Two essential program components were envisioned in Rufiji, for lymphatic filariasis (LF) elimination: mass drug administration to interrupt parasite transmission, and care for those who already suffer from lymphedema.

Transmission of LF can be interrupted by annual mass treatment with drugs that target microfilariae, the stage of the parasite that circulates in the blood. WHO guidelines shows that 4 to 6 rounds of annual MDA with ivermectin and albendazole are enough to reduce the prevalence of lymphatic filariasis to less than 1% if the coverage is exceeding 65% of the total population and 80% of the eligible population.

Mass drug administration in Rufiji District has been administered for 9 consecutive years starting from 2001 and during the period of the study it was still going on while the prevalence of bancroftian filariasis was not known.

This derived the need to determine the prevalence of lymphatic filariasis in children born after initiation of MDA in order to assess the transmission status of LF and monitor the progress towards the elimination of lymphatic filariasis.

Therefore the study determined the prevalence of *Wuchereria bancroftian* antigenaemia among school-age children born after initiation of the program as a monitoring tool of the program.

1.3 Study questions

This study aimed at addressing the following questions:

(i) To what extent are CFA present in children born during the programme implementation?
(ii) Does the community have knowledge on Lymphatic filariasis?
(iii) What is the coverage of MDA in Rufiji?
(iv) Does the community have knowledge on the MDA initiatives in Rufiji?

(v) How does the knowledge of MDA programme influence community involvement and participation in the programme?

1.4 Objectives of the Study

1.4.1 General Objective

To determine the prevalence of *Wuchereria bancrofti* antigenaemia and associated factors among school age children born after the initiation of mass drug administration in Rufiji District.

1.4.2 Specific Objectives

(i) To determine prevalence of *Wuchereria bancrofti* antigenaemia among school aged children born after initiation of MDA in Rufiji.
(ii) To assess the community knowledge on Lymphatic filariasis
(iii) To assess the coverage of MDA in Rufiji district
(iv) To assess the community knowledge on the MDA in Rufiji.
(v) To assess the relationship between knowledge of MDA programme and community involvement and participation in the programme

1.5 Study Rationale

The study established the prevalence of Bancroftian filariasis in Rufiji district after nine round of mass drug administration with ivermectin and albendazole which aims at interrupting the transmission of *Wuchereria bancrofti* to be used for further studies on LF in the area.

The study also identified factors which may be associated with sustained high prevalence of Bancroftian filarias for the purpose of improving the performance of the Neglected Tropical Diseases (NTD) program.

The findings from this study also provided information on the progress of the NTD program in Rufiji District and they will help key Policy and decision makers in NTD program to strengthen the efforts.

2.0 LITERATURE REVIEW

Lymphatic filariasis, commonly known as elephantiasis, is a neglected tropical disease caused by the nematodes *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*. Infection occurs when filarial parasites are transmitted to humans through mosquitoes.

Wuchereria bancrofti which is the cause of bancroftian filariasis live in the lymphatic vessels and lymph glands , particulary those of the inguinal region and lower limbs where they may remain alive for 6- 8 years. (Zagaria, 2002)

Lymphatic filariasis is transmitted by different types of mosquitoes for example by the *Culex* mosquito, widespread across urban and semi-urban areas; *Anopheles* mainly in rural areas, and *Aedes*, mainly in endemic islands in the Pacific. In general *Anopheles gambiae* and *Anopheles funestus* are the major vectors of the disease. (Simonsen, 2009)

Mosquitoes carry the *Wuchereria bancrofti* larvae. During a blood meal, larvae in the infectious stage get on the skin and enter through the mosquito's bite. The larvae then travel to and lodge in the lymphatic vessels, where they develop into adult worms, which live between 6-8 years. They damage the lymphatic vessels, which in some people causes fluid build-up and swelling of the lymphatic system (WHO, 2005).

The adult worms mate and produce millions of sheathed microfilariae which migrate into the lymph and blood channels. When another mosquito bites the host, it also picks up the microfilariae. Inside the mosquito, the microfilariae lose their sheaths and work their way through the mosquito's body until they can lodge in its thoracic muscles.

In the thoracic muscles of the mosquito, the microfilariae develop into larvae and pass through two more larval stages until they reach the infective third stage. The larvae in this infective stage travel to the mosquito's proboscis. When the mosquito bites another human, the *Wuchereria bancrofti* larvae enter through the wound and begin the cycle in the new host. It takes repeated bites from infected mosquitoes over

several months or even years before lymphatic filariasis will develop (Simonsen, 2009).

LF causes a wide spectrum of clinical and subclinical disease. Approximately two-thirds of infected individuals show no overt evidence of disease, but when tested demonstrate some degree of parasite-associated immunosuppression, and many show evidence of renal dysfunction. The remaining third suffer from the chronic manifestations of LF – chronic lymphoedema, elephantiasis and hydrocele. Further, those infected with LF suffer the debilitating effect of acute filarial attacks that last from five to seven days and may occur two to three times each year (Ottesen, 2000). Chronic filarial disease has serious social and economic effects. Those afflicted with elephantiasis and hydrocele are often socially marginalized and poor. Acute attacks and chronic disability cut economic output and increase poverty (WHO, 1999).

Lymphatic filariasis (LF), the second most common vector-borne parasitic disease after malaria, is found in over 80 tropical and subtropical countries. WHO estimates that 120 million people are infected with the parasite, with one billion at risk. These figures are certain to be revised upwards because global prevalence mapping has not yet been completed (Ottesen 2000). According to WHO, LF is the second most common cause of long-term disability after mental illness (Ottesen *et al* 1997). One-third of people infected with LF live in India, a third live in Africa and the remainders live in the Americas, the Pacific Islands, Papua New Guinea and South-East Asia (Molyneux *et al* 2005).

In 1997, a World Health Assembly resolution called for the elimination of LF. Public health interventions thus far have focused on interrupting the transmission of the parasite through the use of mass drug administration campaigns (MDAs).

The MDA programmes deliver community-wide doses of diethylcarbamazine and albendazole, or albendazole and ivermectin, once annually for a period of four to six years (WHO, 2002). The goal is to eliminate lymphatic filariasis as a Public Health problem by 2020. The two strategies to achieve this goal are: the interruption of transmission of filarial infection through yearly rounds of Mass Drug Administration (MDA) using a combination of 2 drugs (Albendazole and

Diethylcarbamazine or Albendazole and Ivermectin) for at least 5 years and to control the LF morbidity to alleviate and prevent the suffering and disability of affected individuals (WHO, 1999).

Although the MDAs rarely completely clear the *W. bancrofti* infection from the treated individual, it is assumed that the reduction in the microfilarial load in the endemic population will lead to a simultaneous reduction – or even elimination – of transmission. Hence the term "transmission interruption" has been adopted for this strategy. Monitoring and regular evaluation of the effect of the control efforts is important in order to be able to quantify the impact, to make evidence based programme adjustments, and to eventually make a decision to stop the activities when the goal has been reached (Michael, 2004).

Since the launch of the programme, there has been consistent and steady increase in the number of countries implementing MDA from 12 in 2000 to 59 in 2010 with the total number of population treated under MDA from 2.9 million to more than 500 millions. 17 countries out of the 53 countries have already completed five or more rounds with 100% of geographical coverage. A disability management programme is also being implemented in 27 countries. During the period of 2000 - 2010 about 3.4 billion treatments were delivered to more than 900 million of individuals in 53 countries (WHO, 2011).

Lymphatic filariasis (LF) is endemic in many parts of the United Republic of Tanzania. The figures for Tanzania mainland show that 34 million people are at risk of infection and it is estimated that 6 million people have debilitating manifestations of the disease (Malecela *et al* 2009). The endemicity varies from being highly endemic along the coast with antigenemia levels of 45–60%, to low endemicity in the areas of Western Tanzania with endemicity of 2–4%, and varying endemicity in the regions in between, i.e. central Tanzania, the southern Highlands and north and northwestern Tanzania (Malecela *et al*, 2008).

Tanzania's National Lymphatic Filariasis Elimination Programme (NLFEP) began in 1997 following a World Health Assembly (WHA) resolution which declared that lymphatic filariasis would be eliminated as a public health problem by 2020. The

Tanzania LF programme launched its first mass drug administration (MDA) with ivermectin and albendazole in 2000 when 45,000 people were treated. The programme now covers six regions and 34 districts, and 9.2 million people have been treated in the eight years since its inception.

The Tanzania LF Elimination Programme has a number of strategies. These include MDA, lymphoedema management, hydrocelectomies (surgery for scrotal swellings caused by *Wuchereria bancrofti*) and vector control through the use of bednets and the reduction of mosquito breeding sites. (Malecela *et al* 2010)

All ages are susceptible to filarial infection. Clinical manifestation and acute presentations of lymphatic filariasis increase in prevalence with age. The prevalence of filarial hydrocele also increases with age. Although filarial infection in endemic areas is generally acquired in childhood, the disease may take years to manifest before being diagnosed clinically in early adulthood. Therefore, in endemic areas, up to 50% of the population may have subclinical infection and may develop pathologic sequelae.

Children are most susceptible to acquire infection because of lack of immunity and high exposure to infective larvae in an endemic region. These infections, established in childhood, may act as the reservoir for the future disease later in life (Mandal, 2010). The use of new sensitive and highly specific diagnostic tools detecting CFA released by adult *Wuchereria Bancrofti* parasite have shown that many children acquire the infection earlier than hitherto thought and that often a considerable proportion of young children are CFA positive (Lammie, 1994). Thus screening of young school children has successfully been used for mapping the geographical distribution of LF (Onapa *et al*, 2005) As reduced transmission will lead to reduced acquisition of infection it has been more over suggested to screen young children for assessing the effectiveness of transmission intervention during LF elimination programmes (WHO, 2005). Children born after the onset of MDA will be of particular interest to provide an evaluation sample on the interruption of transmission (Simonsen *et al*, 2011).

It had never been an easy task to study lymphatic filariasis because the accurate diagnosis of active infection could be made essentially only by detecting microfilariae in the blood of infected individuals; and in most parts of the world the nocturnal periodicity of the parasite meant that such blood examinations had to be carried out between 10:00 PM and 02:00 AM, a time period evoking little enthusiasm from either the affected population or the responsible health worker. Thus, the development of assays to detect circulating antigen released by living adult parasites and remaining at stable levels in the circulation both day and night (Weil *et al*, 1987, Lammie, 1994) has opened up many avenues related to surveillance and monitoring that were almost completely closed before. There are two monoclonal antibody-based assays for detecting circulating filarial antigen (CFA) now available, one in an ELISA format (especially suitable for laboratory analysis of samples collected in the field (Chanteau , 1994) and the other in a card-test format (suitable for evaluation either in the laboratory or in the field (Weil, 1997).

Since these CFA assays detect not only microfilaraemic individuals but many with amicrofilaraemic, 'cryptic' infections their diagnostic sensitivity is greater than anything available previously, and, indeed, they have become the new 'gold standard' for diagnosing lymphatic filariasis caused by *Wuchereria bancrofti* infection (Weil G*et al* ,1987). CFA assays convert from 'positive' to 'negative' generally within 12 months after the infections have been cured (McCarthy *et al,* 1995). This important observation implies that these tests can play important roles in monitoring the success of large-scale programmes to eliminate lymphatic filariasis (Nicolas, 1997).

Studies in Rufiji indicated that LF had a severe detrimental socioeconomic impact on patients, particularly when acute filarial attacks (AFAs) would keep them in bed for up to three days unable to work and, thus, adversely affecting their productivity (Gasarasi *et al*, 2000). According to the NTD program reports, the prevalence of Lymphatic filariasis by ICT prior to MDA implementation was on minimum 49%.

The current study aimed to determine the prevalence of *Wuchereria bancrofti* antigenaemia and associated factors among school age children born after the

initiation of mass drug administration in Rufiji District. This is very important in monitoring the bancroftian elimination programme.

3.0 METHODOLOGY

3.1 Description of the Study area.

The study was conducted in Rufiji District, Tanzania from April to May 2012. This area was chosen because of the high prevalence of lymphatic filariasis prior to initiation of lymphatic filariasis elimination program which was 49% as well as the period of MDA with ivermectin and albendazole which is 9 rounds by the time when this study was conducted and therefore it was important to determine if the transmission of *Wuchereria bancrofti* has been interrupted.

Rufiji district extends between latitudes 7.47° and 8.03°S and longitudes 38.62° and 39.17°E. It is one of the six districts of the Coast region with 6 divisions, 19 wards, divided into 94 registered Villages and 385 hamlets. According to the 2002 Tanzania Census, the population was 203,102.

The district has 55 health facilities: 2 hospitals (1 government and 1 mission), 5 government health centres, 44 government dispensaries, and 4 non-government dispensaries. A private dispensary based at Kibiti offers the services of a mobile clinic in some parts of the district. Over-the-counter drugs are available from many private shops and kiosks in the villages.

Health services reports from the District Medical Officer's office shows Lymhatic filariasis is the second parasitic infection affecting people of Rufiji after malaria. Other infections include waterborne diseases, such as cholera and diarrhea. Major causes of mortality included acute febrile illnesses (including malaria), acute lower-respiratory infections, tuberculosis, AIDS, and perinatal illnesses.

According to NTD program, the prevalence of Lymphatic filariasis was 49% prior to initiation of the program and it the main cause of disfigurement and disablement. MDA started in 2002 and it has been an ongoing exercise which is done every year.

3.2 Study design

The study adopted a descriptive cross section research design in which data was collected at a single point a particular time using questionnaires, and interviews were conducted with heads of households. Also blood samples from children between the age of 6 and 9 years were collected.

3.3 The study population

There were two study populations; children of school age 6 – 9 years borne after the initiation of MDA in whom prevalence of *W.bancrofti* CFA was assessed, the other study population comprised of heads of households from the same area in whom issues of coverage and compliance were assessed.

3.4 Sample size estimation

The sample size was determined using precision criterion determination of the sample size. The study involved two different sample sizes as it involved two study populations.

The following expression was used to estimate the sample.

$$n = \left(\frac{1.96}{d}\right)^2 \Pi(1-\Pi)$$

The sample size for children.

n = Sample size

1.96 = point of the standard normal distribution in this case corresponding to 95% confidence level

d = marginal error which is 5%, =0.05

$\prod$ = prevalence of LF in Rufiji before MDA. = 0. 49

$$n = \frac{(1.96)^2 \times 0.49 (1-0.49)}{(0.05)^2}$$

$$= 384.006$$

$$\approx 384$$

Non participant rate = 10%

Therefore n = (10% x 384) + 384

= 422.4, ≈ 423.

The sample for household heads

Where n = Sample size

1.96 = point of the standard normal distribution in this case corresponding to 95% confidence level

d = marginal error which is 5%, =0.05

$\prod$ = Coverage of MDA. = 0. 8

$$n = \frac{(1.96)^2 \times 0.8 (1-0.8)}{(0.05)^2}$$

$$= 245.86$$

$$\approx 246$$

Non participant rate = 10%

Therefore n = (10% x 246) + 24.6

= 270.6 ≈ 271.

Hence the sample size was 423 children between the age of 6 and 9 and 271 household heads.

3.5 Sampling procedures

Simple random sampling technique was used. The sampling procedures were categorized into two in order to obtain two study populations. The following strategies were followed.

1. Simple random sampling to obtain 5 Wards namely Mchukwi, Bungu, Kibiti, Mahege and Mbwara.
    a. Simple random sampling to obtain one school from each ward. The schools obtained were Mchukwi primary school from Mchukwi ward, Magombela primary school from Bungu Ward, Mwangia primary school from Kibiti Ward, Nyanjati Primary school from Mahege Ward and Mbwara Primary School from Mbwara Ward.
    b. Systematic sampling to obtain children where as 423 standard one pupils were recruited.

2. Grab sampling (convenient sampling) was used to obtain 270 heads of households in the area where the schools were found.

3.6 Data Collection Instrument

Prevalence of *W. bancrofti* antigenia was determined by using immunochromatographic test (ICT) cards and then filled in the form together with the age, sex and if the child took the drugs in the last round of MDA.

Community understanding on the MDA and the relationship between understanding of MDA program and community participation in the program was assessed by using interviewer based questionnaires, these elicited personal details and information about drug administration and knowledge, attitude and practices with regard to the MDA programme.

3.7 Data Collection procedures

Data were collected from the individuals living in Rufiji district and the NTD coordinator who are in MDA programme through interview schedule containing both closed and open-ended question and checklists.

Collection of finger prick blood sample and examination using ICT cards for CFA were used as a diagnostic tool for determining the presence of filarial infection and for monitoring the progress of control program.

Procedure in blood collection followed the standard operating procedure for MDA and Post MDA Surveillance Survey of Lymphatic Filariasis Support Center. The steps involved; cleaning the finger to be pricked with an alcohol swab and then the finger was allowed to dry. By using sterile lancets the internal side of the finger was pricked and the lancet discarded, finally the blood was placed on the kit card for the results to be read.

The ICT cards were used to determine the CFA. This is a rapid test card which is specific for *Wuchereria bancrofti* circulating filarial antigens. A hundred microlitre finger prick blood was added to the sample pad of the card. The pad contains a gold-labeled polyclonal ant filarial antibody that binds to the filarial antigen from the blood. When the card is closed the pad touches a nitrocellulose strip. The antibody-antigen complex move to the strip and are trapped by immobilized anti-filarial monoclonal antibody in the strip coating. The results were read in 10 minutes and appear as a pink test line (in case of positive) next to control pink line that appears in all valid cards. Thus, blood sample from negative antigen individuals showed one pink line while those from positive antigen individuals showed two pink lines. This was used as a diagnostic tool for determining the prevalence of bancroftian filariasis in children less than ten years of age.

3.8 Data Processing and Analysis

Data collected was coded, entered into computer, cleaned and analyzed using SPSS 16.0 version computer software. Chi square was used to test the association of variable considering a P-value less than 0.05 to be statistically significant. Results are presented in frequency tables

3.8.1 Dependent variables

Prevalence of *Wuchereria bancrofti* antigenemia among children from 6 years to 9 years.

3.8.2 Independent variables

The independent variables in this study were:-

- Community knowledge and awareness of LF
- Community knowledge on MDA
- Community compliance to MDA
- Community participation in MDA
- Sex of repondents
- Education level of respondents

3.9 Ethical considerations

This study was reviewed, approved and ethical clearance obtained from Muhimbili University of Health and Allied Sciences Research Ethical Review Board. Permission to conduct the study was requested also from the Rufiji district administrative authorities,

Meetings with the village leaders were conducted before the study period in the national language (Swahili, which is widely spoken and understood in the area) to inform them about the study contents and implications and to obtain their cooperation. The meeting included information about individuals' right to withdraw from participation during any part of the study without negative consequences. Prior to any blood sampling from the children, consent was obtained from the parents where as children were given the informed concert forms to take to their parents which were filled by the parents/ guardians to allow the children participation. Permission to conduct the study in the schools was obtained from the District Education Officer and teachers. The oral consent to participate from heads of households was recorded on the questionnaire.

3.10 Study Limitations and Delimitations

This study had one limitation; some children resisted giving blood sample thinking that a lot of blood was to be withdrawn from them and fear of the pain. This was resolved by collecting a small drop of the finger prick blood as well as using pricker which are less painful. Also consent seeking from the child and ensuring that ethical considerations with regard to the study were met.

4.0 RESULTS

4.1: 1 Social-demographic characteristics of respondents

A total of 270 heads of households were interviewed of which 35.2% were males while 64.8% were females. The mean age was found to be 35 years with the youngest being 21 years while the oldest reported was 60 years. The results also show that 41.5% of the respondents had primary education, 31.9% had attained secondary education while 14.8% had not gone to school. The results show 46.7% of the respondents interviewed are employed either in the formal or non-formal sector while 32.6% and 20.7% are farmers and business persons respectively. Table 1a shows the demographic and socio economic characteristics of respondents.

Table 1a: Social-demographic characteristics of respondents (heads of households), N=270

Variable	Response	n	%
Sex	Male	95	35.2
	Female	175	64.8
	Total	**270**	**100.0**
Age group	Under 30	102	37.8
	30-49	128	47.4
	50-69	40	14.8
	Total	**270**	**100.0**
Marital status	Married	95	36.3
	Cohabiting	8	3.1
	Divorced	8	3.1
	Widow/widower	40	15.3
	Single	111	42.4
	Total	**262**	**100.0**
Education level	Not gone to school	40	14.8
	Primary education	112	41.5
	Secondary education	86	31.9
	Post secondary education	32	11.9

	Total	**270**	**100.0**
Occupation	Farmer	88	32.6
	Employee	126	46.7
	Business man/woman	56	20.7
	Total	**270**	**100.0**

4.1: 2 Social-demographic characteristics of children

The children tested for *Wuchereria bancrofti* antigenaemia were those born after the initiation of the MDA, the mean age were found to be 8 years. Out of 413 children 236(57.1%) were females (table 1b below). The minimum age was 6 years while the maximum was 9 years.

Table 1b: Social-demographic characteristics of children N=413

Variable	Response	n	%
Sex	Male	177	42.9
	female	236	57.1
	Total	**413**	**100.0**
Age (in years)	6	31	7.5
	7	146	35.4
	8	121	29.3
	9	115	27.8
	Total	**413**	**100.0**

4.2. Prevalence of *Wuchereria bancrofti* antigenaemia among school aged children.

A total of 413 children were tested and the results indicated 14.3% were positive with *Wuchereria bancrofti* antigen. It was also reported that two third (66.8%) of the children did not take ivermectin and albendazole during the 2011 mass drug administration. Blood test results indicated that there is no significant different between sex of the child ((χ^2 = 0.010 df =1; p = 0.922) and being infected with LF, this implies that to be infected with LF is not determined by sex of an individual. Infection was found to be associated with age of a child (p=0.015). Results showed statistically difference between younger (6 years) and order children (9 years).

Prevalence was found to be lower in younger children (6.4%) as compared to older ones (40.4%). Prevalence was very high in children not swallowing tablets (70.8%) as compared to those swallowing the tablets. (p = 0.015).

Table 2a: Blood examination results for *Wuchereria bancrofti* antigenemia and children participation in MDA

Variable	Response/Result	n	%
Blood test	Positive	59	14.3
	Negative	354	85.7
	Total	**413**	**100.0**
Swallow tablets	Yes	137	33.2
	No	276	66.8
	Total	**413**	**100.0**
Swallow last year	Yes	137	33.2
	No	276	66.8
	Total	**413**	**100.0**

Table2b:Age of student and blood examination results for *Wuchereria bancrofti* antigenemia

Variable	Positive (%)	Negative (%)	Total (%)
Age (in years)			
6	3 (9.7)	28(90.3)	31 (100)
7	14(9.6)	132(90.4)	146(100)
8	18(14.9)	103(85.1)	121(100)
9	24(20.9)	91(79.1)	115(100)
Total	**59 (100)**	**354**	**413**

Table 2c: children swallowing ivermectin and albendazole and blood examination results for *Wuchereria bancrofti* antigenemia

Variable	Positive (%)	Negative (%)	Total (%)
Swallowing the drugs last year			
Yes	**17 (28.8)**	**122(34.5)**	**139 (33.7)**
No	**42 (71.2)**	**232 (65.5)**	**274 (66.3)**
Total	**59 (100)**	**354 (100)**	**413 (100)**

4.3: Awareness of lymphatic filariasis among community

Table 3 below shows the results on awareness where it was reported that majority (97%) of the respondents interviewed have heard of the disease. However the transmission of the disease is fairly understood where as 57.3% reported that the transmission is through mosquitoes, 18.3% reported that men acquire the disease (mainly hydrocele) through having sex with a woman during menstruation period while the same proportion (18.3%) said that they do not know the mode of transmission. A small proportion (6%) said that stepping in stagnant water causes the elephantiasis of the lower limbs. The results indicated that there is a statistically significant relationship between the level of education one has attained and awareness of the MDA program and hence participation in the program ($\chi^2 = 11.63$ df =3; p = 0.009).

Table 3: Awareness of Lymphatic Filariasis among Community

Variable	Response	n	%
Aware of LF	Yes	262	97.0
	No	8	3.0
	Total	**270**	**100.0**
Transmissions of LF	Through mosquitoes	150	57.3
	Having sex during menstruation period	48	18.3
	I don't know	48	18.3
	Stepping in stagnant water	16	6.1
	Total	**262**	**100.0**
Reducing mosquitoes reduces incidents of LF	Yes	158	60.3
	No	16	6.1
	I don't know	88	33.6
	Total	**262**	**100.0**
Symptoms of LF	Hydrocele	112	42.7
	Swelling of limbs (elephantiasis)	106	40.5
	Joint pains	19	7.3
	Acute adenolymphangitis attacks	25	9.5
	Total	**262**	**100.0**
Any family members with LF	Yes	48	18.3
	No	214	81.7
	Total	**262**	**100.0**
Complications of filariasis	Reduced labour force in the community	67	25.6
	Swelling of body parts	19	7.2
	Recurring fever	56	21.4
	I don't know	43	16.4

	Deaths	54	20.6
	Absenteeism in schools	23	8.8
	Total	**262**	**100.0**
Prevent transmission of LF	Ant-mosquito measures	24	9.2
	Taking anti-filarial drugs	161	61.4
	I don't know	51	19.5
	Stay away from infected people	9	3.4
	Never sex with a woman during her period	17	6.5
	Total	**262**	**100.0**

4.4 Knowledge on mass drug administration

Table 4 below shows that 71.7 % of the respondents interviewed are aware of the LF- intervention/program. It was also found that 53.1% are aware of the presence of community-based LF intervention in their area. The main source of information on the LF-MDA was found to be health workers (25.7%), radio (25.1%) and village leaders (21.1%)

Table 4: knowledge on mass drug administration

Variable	Response	n	%
Any Community-Based LF intervention	Yes	144	53.3
	No	119	44.1
	I don't know	7	2.6
	Total	**270**	**100.0**
Aware of Lymphatic Filariasis MDA	Yes	194	71.9
	No	76	28.3
	Total	**270**	**100.0**
Source of information on LF MDA	Friend/neighbor	4	2.1
	Radio	49	25.3
	Television	23	11.9
	Leaflets/magazines	27	13.8
	Health worker	50	25.8
	Village leaders	41	21.1
	Total	**194**	**100.0**
Frequency of taking ivermectin and albendazole	After one year	210	77.8
	I don't know	60	22.2
	Total	**270**	**100.0**
Eligibility of taking drugs during MDA	Everyone in the community	245	90.7
	An affected person	25	9.3
	Total	**270**	**100.0**

4.5 Participation in MDA

The study results indicate that more than a half (60.3%) of respondents interviewed had participated in the LF-MDA. Reasons for participating were found to be resulting from awareness of the program (33.8%), people being afraid of getting infected with the disease (28.2%), and preventing coming generation (26.8%) while a small proportion (11.3%) participated because they were infected of the disease. It was reported that the most effective aspect of drug distribution in the MDA program was the door-to-door drug distribution (81.1%) while the major weakness was community not well educated on disease and proper use of drugs (56.4%) Chi square was used to test the associations between awareness and participation in the program. The results showed a very strong association ($\chi^2 = 144.928$ df =1; $p < 0.0001$).

Table 5: Community participation in MDA

Variable	Response	n	%
Participated in LF-MDA	Yes	158	60.3
	No	104	39.7
	Total	**262**	**100.0**
Reasons to participate	After getting awareness about the program	53	33.5
	I was affected by the disease	18	11.4
	I was afraid of getting infected by the disease	45	28.5
	Wanted to prevent transmission to coming children/generation	42	26.6
	Total	**158**	**100.0**
Like most about MDA	Easy access to drug distribution area	20	12.7
	Door-to-door drug distribution	128	81.0
	Do not wait long to get drugs/services	10	6.3
	Total	**158**	**100.0**
Dislike about MDA	Delay of working equipments	23	14.6
	Delay of information to reach the beneficiaries	46	29.1
	Community/users not well educated on disease & use of drugs	89	56.3
	Total	**158**	**100.0**

4.6 Compliance with MDA

The results shows that 51.6% of the respondents interviewed had swallowed the ivermectin and albendazole. Of those who swallowed the drugs, 50.4% have swallowed once and 80.4% swallowed the drugs in 2011 which was a round just before the study (Table 6).

Table 6: Reported community compliance with MDA

Variable	Response	n	%
Swallow anti-LF tablets	Yes	135	51.5
	No	127	48.5
	Total	**262**	**100.0**
Reasons for not swallowing	I am afraid of the side effects	14	11.2
	I did not have that opportunity	7	5.6
	I was not around during distribution	41	32.9
	I am not aware	43	33.6
	I had never been infected by the disease	22	16.8
	Total	**127**	**100.0**
Times ever swallowed	Once	68	50.4
	More than once	67	49.6
	Total	**135**	**100.0**
Last swallowed drugs	Last year	109	80.7
	I had never swallowed	20	14.8
	I don't remember	6	4.5
	Total	**135**	**100.0**

4.7 Treatment coverage during MDA in Rufiji district.

The reported coverage for the MDA program was obtained from the District Neglected Disease coordinator; table 7 bellow shows the NTD coverage report for all the 9 rounds. In 2005 MDA was not implemented due to delayed funds from the donors, this led to poor performance in the 2006 since sensitization was not well done. In 2010 the coverage was low significantly because drug distribution was done during the rainy season when people were busy with their agricultural activities.

Table 7. Mass Drug Administration Coverage

Year	Targeted population	Took drugs	%
2011	170606	150133	88.0
2010	166682	113677	68.2
2009	**162848**	**130279**	**80.0**
2008	**159103**	**115350**	**72.5**
2007	**155443**	**116583**	**75.0**
2006	**151868**	**85046**	**56.0**
2005	**MDA WAS NOT DONE**		
2004	**144962**	**136267**	**94.0**
	141628	**123216**	**87.0**

2003 2002	**138370**	**75135**	**54.3**

5.0 DISCUSSION

Screening of young school children have successfully been used for mapping geographical distribution of LF (Onapa *et al*, 2005). As reduced transmission will lead to reduced acquisition of infection, it has been more over suggested to screen young children for assessing the effectiveness of transmission intervention during LF elimination programmes (WHO, 2005).

To determine the prevalence of *Wuchereria bancrofti* antigenaemia among school age children born after the initiation of mass drug administration and associated factors in Rufiji District, 423 school children were tested for CFA.

This study found that the prevalence of *Wuchereria bancrofti* antigenemia was still high despite the LF elimination programme being implemented in the area for 9 rounds. The factors associated with sustained high prevalence were found to be community non-compliance to MDA, Poor community knowledge on the importance of participating in the programme, as well as those involved in drug distribution not following the procedures of MDA drug distribution. Studies done in Haiti and Egypt also showed that some variables, such as the coverage of the target population, the drug regimen employed, and the integration of vector control measures are associated with LF continuing ransmision (Boyd *et al*, 2010, El-Setouhy *et al* 2007).

5.1 Prevalence of Wuchereria bancrofti antigenaemia among school aged children born after initiation of MDA

The observed prevalence of *W.bancrofti* CFA of 14.4% in children of school age indicates that transmission of *W.bancrofti* has continued despite the MDA intervention. This is in line with the number of family members (18.3%) with LF manifestations as compared to 81.7% not having any family member with LF manifestations. According to NTD reports, prevalence of LF prior to initiation of MDA was 49% and thus, there is a drop in the prevalence. However based on this study finding, the observed prevalence is still high since the prevalence was expected to be below 1% after 9 rounds of MDA. Circulating Filarial Antigen (CFA) prevalence decrease more slowly following MDA and it is expected that at the sixth round of yearly MDA the CFA would be reduced by 98%. (Weil *et al*, 1987, Lammie, *et al* 1994). The slow decrease in CFA can be explained by the fact that treatment with the ivermectin-albendazole combination has little or no immediate lethal effect on the adult worms.

Blood test results indicates that there is no significant difference between sex of the child ($p = 0.922$). This implies that to be infected with LF is not determined by sex of an individual. A relative prolonged stay in endemic area is usually required for acquisition of infection. It takes repeated bites from infected mosquitoes over several months or even years before lymphatic filariasis will develop (Rwegoshora *et al*, 2005). This is also supported by the study findings where infection was found to be associated with age of a child ($p = 0.015$). Prevalence was found to be lower in younger children (6.4%) as compared to older ones (40.4%).

Prevalence was high in children not swallowing tablets (70.8%) as compared to those swallowing the tablets ($p=0.015$). However, since the adult population provides most of the microfilariae for transmission, the treatment coverage in the children may not have a major impact on the overall transmission.(Simonsen *et al*, 2011). But this might be related to compliance at family level since the drugs are distributed door to door and the children are supposed to take the drugs at home.

5.2 Community knowledge on Lymphatic filariasis

The results shows that majority (97%) of the respondents interviewed knows the

disease. This implies that the disease is common in the area, However the transmission of the disease is fairly understood where as 57.3% reported that the transmission is through mosquitoes, 18.3% reported that men acquire the disease (mainly hydrocele) through having sex with a woman during menstruation period while the same proportion (18.3%) reported that they do not know the mode of transmission. A small proportion (6%) reported that stepping in stagnant water causes the elephantiasis of the lower limbs. The success of the LF elimination programme including MDA implementation, achievement of high coverage and disability prevention/alleviation will largely depend on community awareness, involvement and support. All available ways and means of information, education and communication (IEC) and all avenues of advocacy will need to be used to ensure the highest reach of the programme to the population (WHO, 2010). Community understanding on the mode of transmission of the disease is important in order to attain desirable participation in the program. The results indicate that there is a statistically significant relationship between the level of education one has attained and awareness of the MDA program and hence participation in the program. Therefore, there is a need to design means of educating the community which will be user friendly to all the members of the community including those who have not gone to school.

5.3 Community knowledge on the MDA program

Knowledge on MDA results shows that 71.7 % of the respondents interviewed are aware of the LF- intervention/program. This implies that the program had been effective to some extent in sensitizing and reaching all beneficiaries of MDA in the study area as it had gone for 9 rounds at the time when the study was conducted. It was also found out that 53.1% are aware of that there is a community-based LF intervention in their area. The main source of information on the LF-MDA was found to be health workers (25.7%), radio (25.1%) and village leaders (21.1). The goal of MDA is to eliminate LF by 2020 therefore community knowledge on the targets and the strategies to be used is very important since this will lead to community acceptance, involvement and ownership of the programme which is important in attaining the goal and sustainability. A study from Haiti reported a high level (91%) of coverage of the MDA programme after creating community

awareness (Mathieu *et al*, 2004).

5.3.1 Relationship between knowledge of MDA programme and community participation in the programme

Community participation plays an important role in MDA since the community is main target in the elimination of LF. Among other factors, the single most important biological criterion favoring successful elimination of an infectious agent is that humans be essential for the organism's 'life-cycle'; i.e., the organism does not multiply freely in the environment and has no significant non-human vertebrate host that could serve as a reservoir for infection of humans (Ottesin 2009). This study indicates that majority (60.3%) of respondents interviewed had participated in the LF-MDA. Reasons for participating were found to be resulting from awareness of the programme (33.8%), people being afraid of getting infected with the disease (28.2%), and preventing coming generation (26.8%) while a small proportion (11.3%) participated because they were infected of the disease. However, the proportion of individuals who participated is not enough to meet the WHO recommended coverage which is above 65%. Thus this may be associated with the persistence of LF regardless of nine rounds of MDA. It was found out that the most effective aspect of the MDA programme was the door-to-door drug distribution (81.1%) while the major weakness was community not well educated on disease and proper use of drugs (56.4%). This also may have contributed to the observed high prevalence. There is a strong association between awareness and participation in MDA where as the findings shows that readiness to participate in the programme is determined by the education level of an individual which in turn depends on the degree of awareness of the program ($p=0.000$). Participation is further influenced by the sex of individuals; results indicate that there is difference between sex and participation in the program. Men (63.2%) have participated more in the program than women (58.9%). This implies that participation in the MDA programme is determined by sex of an individual. Consequently, the higher MDA participation reported for males is encouraging news for the LF program since the hydrocele which is clinical manifestation in men with Bancroftian filariasis is associated with stigma. Furthermore, it is obvious that men are more stigmatized with the disease compared to females and this explains why men are more compliant to MDA. The lower participation in females also correlated with other studies in Haiti, Sri Lanka

and India (Joseph *et al* 2010). It has been speculated that the higher rates of non-compliance in women could be due to the fact that the drugs are not distributed to pregnant women. (Mathieu, 2004)

5.4 Coverage of MDA program

The reported coverage of MDA for all 9 rounds on average was 75% and for last round it was 88% and this report based on the number of tablets distributed as well as the number of people who took the drugs. The results reveal that 51.6% of the respondents interviewed had swallowed the anti-LF ivermectin and albendazole. According to WHO, the success of MDA largely depends on achieving high coverage and compliance in each of the implementation units as defined by the country. The national authorities should aim at covering the entire eligible population and target a coverage exceeding 65% of the total population and 80% of the eligible population, with a minimal gap between the reported and actual coverage. The study revealed poor community compliance with MDA where as 65% of the respondents who swallowed the tablets took them only once. Also the study identified several factors that predict compliance with MDA programmes as well as barriers to it. Previous evaluations identified similar barriers to compliance, such as fear of side effects, lack of perceived benefit and lack of knowledge on the occurrence of the MDA (Ramaiah *et al*, 2000, 2006; Babu and Kar 2004; Babu and Mishra 2008), and motivating factors for compliance, such as desire to prevent LF (Ramaiah *et al*, 2006; Babu and Mishra, 2008). The study results indicates that there is a statistically significant relationship between the level of education one has attained and awareness of the MDA programme and hence participation in the programme (χ^2 = 11.63 df =3;). Compliance to the MDA was as well found to be influenced by sex of the respondents (p = 0.007). There association between sex and adherence to MDA is statistically significant (p=0.007). Results reveal a significant difference, as men (63.2%) comply more with MDA requirements than women (45.3%). This may be due to the clinical manifestation of the disease where as hydrocele is more pronounced and men are scared of the disease hence their compliance.

5.5 Other findings

During the interviews with the community it was found that there was a marked difference between the NTD Programme report and community reported coverage.

The reason was due to the individuals involved in drug distribution not following the required procedure of the programme. The programme requires that the drugs be swallowed while the person who is distributing the drugs is still there to witness. However, in some cases the drugs were left at houses for the household dwellers to swallow without being witnessed.

6.0 CONCLUSION AND RECOMMENDATION

6.1 **Conclusion**

This study found that prevalence of *Wuchereria bancrofti* in Rufiji is still high regardless of ongoing elimination program. Community non-compliance to MDA is one of the factors associated with the sustained high prevalence. Poor knowledge on the disease transmission, cultural beliefs and drug distributors not following the protocols are also associated with the observed prevalence.

Efforts to interrupt transmission and eliminate LF as a public health problem depend on effective mass chemotherapy campaigns and other public health strategies, including vector control where appropriate. However, to increase the success of elimination strategies, the socio-cultural understandings of affected community groups are pivotal in achieving sustainability, local participation and ownership.

Proper supervision of each activity and close monitoring and evaluation is important and should be built into all aspects, activities and all stages of the programme. This would include assessing results of mapping, microfilarial prevalence before and after MDA, reported and actual coverage, mid-term assessment/evaluation and impact assessment, including impact of social mobilization, disability alleviation and other activities.

6.2 Recommendations

1. The community should be sensitized repeatedly throughout the year by means of inter-personal communication by motivated front line health workers as well as mass media communication strategy regarding the LF and MDA. This will create awareness and knowledge of the disease as well as the elimination programme.

2. There is a need for an effective education programme focusing on LF transmission and prevention. The central necessity of community involvement in developing educational strategies that reflect local understandings and interpretations of the disease should not be overlooked.

3. The programme should educate the drug distributors on the importance of witnessing persons taking the pills in order to minimize the gap between the official reported coverage and the community surveyed coverage. It is important that the pills are swallowed infront of the distributor.

4. Future research should be directed toward the development of strategies to motivate noncompliant persons.

6.0. REFERENCES

Addiss DG, Beach MJ, Streit TG, Lutwick S, LeConte FH, Lafontant JG, Hightower AW and Lammie PJ (1997). Randomized placebo controlled comparison of ivermectin and albendazole alone and in combination for *Wuchereria bancrofti* microfilaraemia in Haitian children. *Lancet* **350**: 480–484.

Babu, B.V. & 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 BV & 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 Societyof Tropical Medicine and Hygiene 102, 1207–1213.

Boyd A, Won KY, McClintock SK, Donovan CV, Laney SJ, et al. (2010) A Community-Based Study of Factors Associated with Continuing Transmission of Lymphatic Filariasis in Leogane, Haiti. *PLoS Negl Trop Dis* 4(3): e640.

Cao WC, Van der Ploeg CP, Plais AP, van der Sluijs IJ and Habbema JD (1997). Ivermectin for chemotherapy of bancroftian filariasis: A meta-analysis of the effect of single treatment. *Trop. Med. Int. Hlth.* **2**:393–403..

El-Setouhy M, Abd Elaziz KM, Helmy H, Farid HA, Kamal HA, et al. (2007) The effect of compliance on the impact of mass drug administration for elimination of lymphatic filariasis in Egypt. *Am J Trop Med Hyg* 77: 1069–1073.

Gasarasi DB, Premji ZG, Mujinja PG and Mpembeni R (2000), Acute adenolymphangitis due to Bancroftian filariasis in Rufiji District, South East Tanzania. *Acta Topica* 75(1): 19–28

Lammie PJ, Hightower AE, Eberhard ML (1994). Age specific antigenemia in Wuchereria bancrofti exposed population. *Am J Trop Med Hyg* ;51:348-55

Lammie PJ, Hightower AW and Eberhard ML (1994). Age-specific prevalence of antigenemia in a *Wuchereria bancrofti*-exposed population. *Am. J. Trop. Med. Hyg.* **51**: 348–355.

Malecela MN, Kilima P, Mackenzie CD (2008) Implementation and management of lymphatic filariasis control and elimination programmes: the Tanzanian experience. In: Simonsen PE, Malecela MN, Michael E, Mackenzie CD, editors. Lymphatic filariasis research and control in Eastern and Southern Africa. Copenhagen, Denmark: *DBL – Centre for Health Research and Development*. pp. 112–123. ISBN:87-91521-08-4.

Malecela MN, Lazarus WM, Mwingira U, Mwakitalu E, Makene L, Kabali C. (2009). Eliminating lymphatic filariasis: a progress report from Tanzania. J Lymphoedema ;4: 10-2

Mandal, N.N., Bal, M.S., Das, M.K., Achary, K.G. and Kar, S.K, 2010. Lymphatic filariasis in children: age dependent prevalence in an area of India endemic for Wuchereria bancrofti infection. *Tropical Biomedicine* 27(1): 41–46

Mathieu, E., Lammie, P.J., Radday, J., Beach, M.J., Streit, T. & Wendt, J. (2004). Factors associated with participation in a campaign of mass treatment against

lymphatic filariasis, in Leagane, Haiti. *Annals of Tropical Medicine and Parasitology* **98:** 703-714.

McCarthy JS, Guinea A, Weil GJ and Ottesen EA (1995). Clearance of circulating filarial antigen as a measure of the macrofilaricidal *Towards Eliminating Lymphatic Filariasis* 215 activity of diethylcarbamazine in *Wuchereria bancrofti* infection. *J. Inf. Dis.* **172**: 521–526.

Michael E, Bundy D.A, Grenfell, B.T. (1996), Reassessing the global prevalence and distribution of lymphatic filariasis. *Parasitology* 112, 409-428

Michael E, Malecela-Lazaro MN, Maegga BTA, Fischer P, Kazura JW (2006) Mathematical models and lymphatic filariasis control: monitoring and evaluating interventions. *Trends Parasitol* 22: 529–535.

Michael E, Malecela-Lazaro MN, Simonsen PE, Pedersen EM, Barker G, et al. (2004) Mathematical modelling and the control of lymphatic filariasis. *Lancet Infect Dis* 4: 223–234

Molyneux, D.H, Zagaria N., 2002, Lymphatic filariasis elimination progress in global programme development. *Ann Trop Med. Parasitol*. 96, s15-s40

.

Nicolas L, Plichart C, Nguyen LN and Moulia-Pelat J-P (1997). Reduction of *Wuchereria bancrofti* adult worm circulating antigen after annual treatments of diethylcarbamazine combined with ivermectin in French Polynesia. *J. Inf. Dis.* **175**: 489–492.

Onapa AW, Simonsen PE, Baehr I, Pedersen EM. Rapid assessment of the geographical distribution of lymphatic filariasis in Uganda, by screening of schoolchildren for circulating filarial antigens. *Ann Trop Med Parasitol*;99:141-53

Ottesen EA (1994). The human filariases: New understandings, new therapeutic strategies. *Curr. Opin. Infect. Dis.* **7**: 550–558.

Ottesen EA, (2000). The global programme to eliminate lymphatic filariasis. *Trop Med Int Health*; 5: 591-4.

Ottesen EA, Duke BO, Karam M and Behbehani K (1997). Strategies and tools for the control/elimination of lymphatic filariasis. *Bull. World Health Organ.* **75**: 491–503.

Ottesen EA, Hooper PJ, Bradley M, Biswas G (2008) The Global Programme to Eliminate Lymphatic Filariasis: Health impact after 8 years. PLoS Negl Trop Dis 2: 317

Ottesen EA (2006). Lymphatic filariasis: treatment, control and elimination. Adv *Parasitol* ; 61:395-441

Simonsen PE, 2009. Filariases. In:Cook GC, ZumlaAI,editors. Manson's Tropical Diseases, 22nd edition, Hacourt Private Limited New Delhi, India: 84 pp 1477-1513.

Simonsen PE,Magesa SM, Derua YA, Rwegoshora RT, Malecela MN, Pedersen EM (2011). Lymphatic Filariasis Control in Tanzania: Effect of Repeated Mass Drug Administration with Ivermectin and Albendazole on Infection and Transmission, *International Health* 3. 184-187

Simonsen PE, Magesa SM, Dunyo SK, Malecela-Lazaro MN, Michael E (2004) The effect of single dose ivermectin alone or in combination with albendazole on *Wuchereria bancrofti* infection in primary school children in Tanzania. *Trans R Soc Trop Med Hyg* 98: 462–472

Weil GJ, Jain DC, Santhanam S, Malhotra A, Kumar H, Sethumadhavan KV, Liftis F and Ghosh TK (1987). A monoclonal antibody-based enzyme immunoassay for detecting parasite antigenemia in bancroftian filariasis. *J. Inf. Dis.* **156**: 350–355.

Weil GJ, Kastens W, Susapu M, Laney SJ, Williams SA, et al. (2008). The impact of repeated rounds of mass drug administration with diethylcarbamazine plus albendazole on bancroftian filariasis in papua new Guinea. *PLoS Negl Trop Dis*

Weil GJ, Lammie PJ and Weiss N (1997). The ICT filariasis test: rapid format antigen test for diagnosis of bancroftian filariasis *Parasitol. Today* **13**: 401–404.

WHO, 2005. Monitoring and epidemiology assessment of the program to eliminate lymphatic filariasis at implementation unit level. Geneva: World Health Organisation; WHO/CDS/CPE/CEE/2005.50.

WHO; 2011. Managing morbidity and preventing disability in the Global Programme to Eliminate Lymphatic Filariasis: Geneva, WHO Position Statement.*Weekly Epidemiological Record* N°51/52, 2011, 86:581–588

WHO; 1994.Lymphatic filariasis: infection and disease. Control strategies. Report of a consultative meeting held at the Universiti Sains Malaysia, Penang. Geneva

WHO; 1999.Building partnerships for lymphatic filariasis — strategic plan. Geneva.

WHO; 2002. Lymphatic filariasis: the disease and its control. Fifth report of the WHO expert committee on filariasis. Geneva.

Zagaria N. Savioli, L. 2002, Elimination of Lymphatic filariasis: a public health challenge. *Ann Trop Med. Parasitol* 96, S3-S13.

Appendix 1: Informed Consent Form – English Version

Title: Prevalence of *Wuchereria bancrofti* antigenemia among children of school age born after initiation of mass drug administration and associated factors in Rufiji district.

Principal Investigator: Clarer Jones, Post graduate Student at MUHAS pursuing Masters of Medical Parasitology and Entomology.

Address: Muhimbili University of Health and Allied Sciences, P.O BOX 65011, DAR ES SALAAM.

Introduction

This Consent Form contains information about the research named above. In order to be sure that you are informed about being in this research, we are asking you to read (or have read to you) this Consent Form. You will also be asked to sign it or make your mark. We will give you a copy of this form. This consent form might contain some words that are unfamiliar to you. Please ask us to explain anything you may not understand.

Reason for the Research

You are being asked to allow your child take part in research to determine the presence of the infection of filariasis among children between the age of 6 and 9 after Mass Drug Administration and associated factors in Rufiji district.

General Information about Method.

The research will include collection of finger prick blood sample and examination using ICT cards for determination of infection. The examination will be done on the spot and the results will be recorded.

Your Part in the Research
If you agree to allow your child to be in the research, he/she will be asked to allow us to collect finger blood for examination and then she/he will be asked some few questions related to the study which will be filled in the laboratory form. Your part in the research will last soon after blood sample collection.

Possible Risks
There is no risk associated with the study, however your child will feel little pain due to the finger prick and this will last in few seconds and the bleeding will not prolong.

Possible Benefits
If your child participates and she/he is found to have the infections efforts will be made to arrange ways for him/her to get the treatment on the right time. The findings from this study will be communicated to The Lymphatic elimination program for further actions. You are free to decide if you want your child to be in this research.

Confidentiality
We will protect information about you and your child taking part in this research to the best of our ability. You will not be named in any reports. However, the staff of NTD may sometimes look at the research records. Someone from NTD might want to ask you questions about being in the research, but you do not have to answer them if you don't feel like.

Leaving the Research
You may leave the research at any time. If you choose to take part, you can change your mind at any time and withdraw.

If You Have a Problem or Have Other Questions
If you have a problem that you think might be related to taking part in this research or any questions about the research, please call Clarer Jones, 0784506568.

Your rights as a Participant
This research has been reviewed and approved by the IRB of Muhimbili University of Health and Allied Sciences. An IRB is a committee that reviews research studies in order to help protect participants. If you have any questions about your rights as a research participant you may contact Prof M. Abood,The chairperson of IRB OF MUHAS, Tel +255 2150302, P.O BOX 65001 Dar Es Salaam.

Volunteer agreement
The above document describing the benefits, risks and procedures for the research titled (*name of research*) has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction.

I agree to allow my child to participate as a volunteer

Date……. Signature or thumb print……

I don't agree to allow my child to participate as a volunteer

Date……. Signature or thumb print……..

If volunteers cannot read the form themselves, a witness must sign here:
I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

Date Signature of Witness

Appendix 2; Questionaire- English version

Title: Prevalence of *Wuchereria bancrofti* antigenemia among children of school age born after initiation of mass drug administration and associated factors in Rufiji district

I am a postgraduate student undertaking the Master of Medical Parasitology and Entomology at the school of Public Health and Social Sciences Muhimbili University of Health and Social Sciences. The findings from this study will give additional information regarding effectiveness of the lymphatic filariasis elimination programme. All data will be handled confidentially.

Questionnaire number_____

Date _____

Name of interviewer _____

Name of the village _____

Household number_____

Time: _____

DEMOGRAPHIC CHARACTERISTICS

1. **Age** _____
2. **Sex**_____
3. **Marital status**

[1.] Married
[2.] cohabiting
[3.] Divorced / Separated
[4.] Widowed
[5.] Single

4. **What is your level of education?**

[1.] None
[2.] Primary
[3.] Secondary
[4.] Tertiary education
[5.] Other specify_____

5. **What is your occupation?**

[1.] Crop farming
[2.] Pastoralist/Animal production
[3.] Fishing
[4.] Employed
[5.] Business

[6.] Others (Specify)……..

I. KNOWLEDGE ON LYMPHATIC FILARIASIS

6. Have you ever heard of lymphatic filariasis?

[1.] Yes

[2.] No

7. How does one acquire lymphatic filariasis?

.....

..

.....

8. Does reducing the population of mosquitoes help to reduce lymphatic filariasis?

[1.] Yes

[2.] No

[3.] Don't know

9. What are the symptoms/ signs of lymphatic filariasis? (Do not read answers, circle all that apply)

[1] Hydrocele

[2] Swelling of limbs (elephantiasis)

[3] Joint pains

[4] Acute adenolymphangitis attacks

[5] Others.....

10. Are there any members of this household with hydrocele/elephantiasis (*use local terms where possible*)?

[1] Yes

[2] No

11. Mention any complication of filariasis that you know.

.....

12. **What can you do to prevent lymphatic filariasis infection?**

[1] Anti- mosquito measures

[4] taking ant filarial drugs

[3] Other: _____

II. KNOWLEDGE ON MASS DRUG ADMINISRATION

13. Are there any community-based lymphatic filarisis interventions organized by the village government/Health Committee?

[1] Yes
[2] No

14. Have you ever heard of lymphatic filariasis MDA?

[1] Yes
[2] No

15. Where did you hear about lymphatic filariasis MDA? (*tick all unprompted responses*)?

[1] Heard from friend or neighbour
[2] Heard about it on the radio
[3] Heard about it on the television
[4] Saw poster or pamphlet
[5] Heard about it from health worker
[6] Other (specify).....

16. How often do people take ant filarial drugs in Lymphatic filariasis MDA?

.....

17. Who is eligible to take tablets during MDA?

.....

111. PARTICIPATION IN MDA

18. Have you ever participated in the MDA?

[1] Yes (*Go to no. 19)*
[2] No. Give reason.....

19. Why did you participate in the lymphatic filariasis MDA?

[1] Told to by a health worker, radio or television spot
[2] Concerned about the disease
[3] Worried about transmission
[4] Wanted to prevent transmission to future children

20. What did you like about the MDA?

[1] Easy to get to distribution site

[2] House-to-house distribution
[3] Knowledgeable distributors
[4] No long wait for drugs
[5] Received other information or services

21. What didn't you like about the MDA?

.....

……

1V COMPLIANCE WITH MDA

22. **Do you swallow tablets like these from MDA?** *(Show the tablets)*
[1] Yes (*go to 24)*
[2] No (*go to 23*)

23. Reasons for not swallowing the drugs
[1] Fear of side effects
[2] Don't have access
[3] Not around during distribution
[4] Others_____
[5] I don't know

24. How many times have ever you swallowed the drugs?
[1] Once
[2] More than one time
[4] Don't remember

25. When did you last swallow the drug?
[1] Last year
[3] I have never swallowed
[2] I don't remember

Appendix 3: Blood analysis form

a) Student's Particulars

1.0. School's name _____

2 .0. Name: _____-_____-_____

3.0. Sex: Male ☐ - Female ☐

b) Blood examination – ICT card

Results

Positive	**Negative**

c) Participation in Lymphatic Filariasis MDA

1. Do you swallow the tablets like these that are given out?

[1] Yes

[2] No

2. Did you swallow the drugs like this last year?

[1] Yes

[2] No

Name of Principal investigator (P.I): _____

Signature _____ Date ___/ ____/ _____

Appendix 4; Questionaire- Kiswahili version

DODOSO

Mada: kiwango cha maambukizi ya vimelea vya ugonjwa wa matende na mabusha miongoni mwa watoto wenye umri wa kwenda shule ambao walizaliwa baada ya Mpango wa utoaji wa dawa kwa umma katika wilaya ya Rufiji

Ninaitwa Clarer Jones, ni mwanafunzi wa shahada ya uzamili kwenye chuo cha Afya Muhimbili. Nafanya utafiti wa Kiwango cha maambukizi ya ugonjwa wa matende na mabusha kwa watoto wa umri wa kwenda shule waliozaliwa baada ya kuanza kwa mpango wa kugawa dawa za kuzia maambukizi katika Wilaya ya Rufiji

Matokeo ya utafiti huu yatatoa taarifa za nyongeza kwenye ufanisi wa mpango wa kutokomeza ugonjwa wa matende na mabusha. Takwimu zote zitatunzwa kwa usiri.

Nambari ya Dodoso_____

Tarehe_____

Jina la muulizaji _____

Jina la kijija_____

Nambari ya nyumba_____

Muda: _____

I. TAARIFA BINAFSI

1. **Umri _____**
2. **Jinsia_____**
3. **Hali ya ndoa**

    1] Nimeoa/olewa
    2] Ninaishi na mwenza
    3] Tumetengana
    4] Mjane/ mke wangu kafariki
    5] sijaoa/olewa

4. **Kiwango cha elimu**
    1] sijasoma
    2] elimu ya msingi
    3] elimu ya sekondari
    4] elimu ya juu
    5] nyingine (*taja*)_____

5. **Unafanya kazi gani?**
    1] mkulima wa mazao
    2] mfugaji
    3] mvuvi
    4] mwajiriwa
    5] mfanyabiashara
    6] nyingine (*taja*)……..

II. ELIMU KUHUSU UGOJWA WA MATENDE NA MABUSHA

6. **Umeshawahi kusikia kuhusu ugonjwa wa matende na mabusha**
   1] ndio
   2] hapana

7. **Mtu anawezaje kupata matende na mabusha**

   .....
   ....

   .....
   ....

8. **Je, kupunguza uwingi wa mbu kunaweza kuasadia kupunguza matende na mabusha?**
   1] ndio
   2] hapana
   3] sijui

9. **Dalili za matende na mabusha ni zipi?(** *usisome, weka alama kwenye jibu alilotoa)*
   [1] mabusha
   [2] kuvimba miguu
   [3] kuumwa viungo
   [4] homa za mitoki
   [5] nyingine (taja).....

10. Je, katika kaya hii, kuna mtu yeyote mwenye matende au busha?
   [1] ndio
   [2] hapana

11. Orodhesha madhara yoyote ya ugonjwa wa matende na mabusha uyajuayo
.....

12. **Je unapaswa kufanya nini ili kuzuia maabukizi ya matende na mabusha**
   [1] kuangamiza mbu kwa njia mbalimbali
   [2] kumeza dawa za kuzuia matende na mabusha
   [3] nyingine, itaje.....

III. ELIMU KUHUSU MPANGO WAUTOAJI DAWA KWA UMMA

13. **Kuna juhudi yoyote inayohusisha mapambano dhidi ya matende amabayo inaratibiwa na serikali ya kijiji au kamati ya Afya?**
   [1] ndiyo
   [2] hapana

14. umeshawahi kusikia kuhusu Mpango wa utoaji dawa za matende na mabusha kwa umma?
   [1] ndiyo

[2] hapana

15. Je, ulisikia wapi kuhusu mpango wa utoaji wa dawa za matende na mabusha kwa umma **(*weka alamakwenye majibu yanayohusika*)?**

[1] kutoka kwa jirani au rafiki
[2] kwenye redio
[3] kwenye runinga
[4] kwenye vipeperushi na vijarida
[5] kutoka kwa mfanyakzi wa afya
[6] kutoka vyanzo vingine, vitaje.....

16. Ni kila baada ya muda gani jamii hutumia dawa za kujikinga dhidi ya matende na mabusha kupitia mpango wa utoaji dawa kwa umma?

.....

17. Kwa maoni yako ni nani anayestahili kumeza vidonge kwenye mpango wa utoaji dawa kwa umma?

.....

111. USHIRIKI KWENYE MPANGO WA UTOAJI WA DAWA ZA MATENDE NA MABUSHA KWA UMMA

18. Umeshawahi kushiriki kwenye mpango wa utoaji wa dawa kwa umma?

[1] ndiyo
[2] hapan. Toa sababu.....

19. Kama jibu la swali 18 ni ndio hapo juu, kwa nini umeshiriki kwenye mpango wa utoaji dawa za matende na mabusha kwa umma?

[1] niliambiwa na mfanyakzi wa umma, au runinga, au redio.
[2] nimewahi kuhusika na ugonjwa
[3] nilikuwa na wasiwasi kuhusu maambukizi
[4] nilkuwa nzazuia maabukizi kwa watoto wajao

20. Ni kitu gani ulikipenda kuhusumpango wa ugawji wa dawa za matende na mabusha?

[1] urahisi wa kufika kwenye eneo la usambazaji
[2] usambazaji wa nyumba kwa nyumba
[3] ujuzi wa wasambazaji
[4] hakuna usubiriaji wa dawa wa muda mrefu
[5] kupokea taarifa na huduma za ziada
[6] nyingine, eleza…….

21. Ni kitu gani huhukipenda kuhusu mpango wa utoaji wa dawa kwa umma?

Eleza……
…..
……
….

1V HALI YA KUKUBALIANA NA MPANGO WA UTOAJI DAWA ZA MATENDE KWA UMMA

22. Je, umeshawahi kumeza vidonge vilivyotolewa na Mpango wa Utoaji wa Dawa za Matende kwa umma?

[1] ndiyo (*angalia swali la 24)*
[2] hapana (*angalia swali la 23*)

23. Toa sababu za kutokumeza dawa

[1] kuogopa madhara
[2] kutokuwa na fursa
[3] kutokuwepo wakati wa usambazaji
[4] nyingine, eleza_____
[5] sijui

24. Tafadhali taja ni mara ngapi umeshawahi kumeza dawa?

[1] Mara moja
[2] zaidi ya mara moja
[4] sikumbuki

25. Mara ya mwisho umemeza dawa lini?

[1] mwaka jana
[3] sijawahi kumeza
[2] sikumbuki

Appendix 5: Ethical clearance