MASS DRUG ADMINISTRATION COVERAGE AND DETERMINANTS OF DRUG UPTAKE FOR ELIMINATION OF ONCHOCERCIASIS IN ULANGA DISTRICT

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Master of Science in Applied Epidemiology

Muhimbili University of Health and Allied Sciences

October 2019

Muhimbili University of Health and Allied Sciences

School of Public Health Social Sciences

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By

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A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master of Science in Applied Epidemiology of the

Muhimbili University of Health and Allied Sciences

October 2019

CERTIFICATION

The undersigned certify that I have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ‘’ ***MASS DRUG ADMINISTRATION COVERAGE AND DETERMINANTS OF DRUG UPTAKE FOR ELIMINATION OF ONCHOCERCIASIS IN ULANGA DISTRICT’’,*** in partial fulfillment of the requirements for the degree of Master of Science in Applied Epidemiology of Muhimbili University of Health and Allied Sciences.

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DECLARATION

AND

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ACKNOWLEDGEMENT

First and fore most I'm grateful to the Almighty God for blessing me with the gift of health, energy, wisdom and passion throughout the process of developing this research work.

I convey my sincere and innermost gratitude to Dr. Dinah Gasarasi and Dr. Ahmed Abade, my supervisors, for their tireless efforts and dedicating time and expertise in coaching and guiding me through the entire process of this work.

Furthermore, I would also like to extend my heartfelt appreciation to the rest of the teaching and administrative staff of the MUHAS School of Public Health and Social Sciences for their instruction, constructive criticism and guidance that steered me towardsthe accomplishment of this work.

I acknowledge staff from Tanzania Field Epidemiology and Laboratory Training program (FELTP) for the tireless support in the development of this work, but also financing most of the research cost.

I would also like to express my sincere appreciation to the National NTD Control Program for the advice and logistical support in the electronic data collection process and providing an extension storage space in their Database. I appreciate the support from Mr. Alfa Malishehe for his ICT technical support in configuring data collection tools into mobile devices that made data collection process easier. Thanks to Mr. Isaac Njau From NTDCP for incredible moral support and Mr. Akili Kalinga from NIMR for technical support in development of this research work.

I equally extend my acknowledgement to my study participants and research assistants for their time and willingness to participate, their contribution is highly valued.

Special thanks to my family and my lovely wife Elizabeth O. Kiboko, and my Son Gedaliah for their patience, love and encouragement that gave me strength to strive this far.

Lastly but not least, the accomplishment of this study could not be possible without assistance from my FELTP Cohort 10 classmates, relatives and friends, whom I may not mention all of them here, but I am indebted to you all.

DEDICATION

This dissertation is dedicated to the following people who have inspired and supported me through this process and throughout my life.

A profound gratification goes out to my lovely wife Elizabeth Oscar and my son Gedaliah A.K, whose endless support patience, love, and encouragement empowered me to reach this far.

To my loving mom, Rosemary A. Kalinga whose interest in my study, safety and welfare was manifested by her frequent phone calls. She has always been reason for my desire to aspire for excellency independence, confidence, and personal sacrifice.

To my brother Mr. Frances Mhidze and my Father Mr. Selya A. Kuyokwa who keep me grounded and love me unconditionally.

To late father, Benard Mhidze, who departed during my third year of undergraduate study. His enthusiasm for life and unconditional love and support inspired me to this far. How I wish he could have stayed around to see as I reach this far.

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ABBREVIATIONS

APOC	African- Program for Onchocerciasis Control
CDDs	Community Drug Distributors
CDTI	Community Directed Treatment with Ivermectin
DMO	District Medical Officer
ESPEN	Expanded Special Project for the Elimination of Neglected Tropical Diseases in Africa
FLHW	Front Line Health Worker
IMA	Interchurch Medical Aid
MDA	Mass Drug Administration
MoHCDGEC	Ministry of Health, Community Development Gender, Elderly and Children
MUHAS	Muhimbili University of Health and Allied Sciences
NIMR	National Institute for Medical Research
NTDs	Neglected Tropical Diseases
NTDCP	Neglected Tropical Diseases Control Program
OCP	Onchocerciasis Control Program
PCT	Preventive chemotherapy
PA	Public address
TFELTP	Tanzania Field Epidemiology and Laboratory Training Program
WHO	World Health organization

DEFINITION OF TERMS

Foci	A confined Onchocerciasis transmission area; it can cover more than 1 district and sometimes more than 2 regions
Household	Unit headed by a male or female with his/her dependents and spouse and who share a cooking pot or eating in a same place
Predictor	Factors that influences an individual in the community to participate and eventually swallow drug during community drug distribution
Drug uptake	A direct observed swallowing of drugs during community drug distribution in MDA programs
Onchocerciasis elimination	The effective application of control activities leading to a sustained interruption in transmission of onchocerciasis leading to reduction of infection and transmission to the extent that interventions can be stopped within a defined transmission zone, but post-intervention surveillance is still necessary
Jingle	A premade audio message designed for sensitization and preparation of the community for community drug distribution. It can be broadcasted through radio or public address car.
CDTI strategy	This strategy involves delivering the treatment drugs for onchocerciasis to households using community volunteers commonly known as Community Drug Distributors (CDDs)
Transmission zone	A geographical area, where transmission of O. volvulus occurs by locally breeding vectors
Treatment coverage	Is the percentage of population taking the drug in a given area during a given MDA
OV16	Antigen Precursor – Onchocerca volvulus

Abstract

Background: Ulanga district is one of the areas with high Onchocerciasis endemicity in Tanzania and has been implementing MDA interventions for the past 20 years. However, current reports indicate high prevalence of Onchocerciasis in both human and vector species probably because of poor treatment coverage. Interruption of transmission for elimination of Onchocerciasis requires 100% geographical coverage in all active transmission areas, achieve necessary MDA treatment coverage and demonstrate transmission interruption among vector species. However, treatment coverage gives a picture at community level and does not necessarily guarantee good adherence to drug uptake at individual level in the community.

Aim: This study was designed to assess treatment coverage and explore determinants of drug uptake during MDA program that may uncover specific areas of effort concentration

Material and Methods: A cross-sectional community-based study using a multistage cluster sampling method was carried out in Ulanga district, Morogoro region from April-June 2019. Study participants were randomly selected from households and interviewed using a structured questionnaire. Key informant interview targeting frontline health workers and community drug distributors (CDD) were carried out. Data from community registers was collected using a checklist. Measures of central tendency and dispersion (mean and standard deviation) were summarized using continuous variables while categorical variables were assessed using frequency and proportions. Bivariate and Multivariate analysis were performed to determine factors associated with MDA uptake through modified Poisson regression. Prevalence Ratio (PR) was used as a measure of association while p-value and χ^2 were used as measures of statistical significance.

Results: A total of 502 participants were recruited during the study period. The mean age was 37.8 years ±15 SD. From the community register, low treatment coverage of 47.1%, 61.5%, 63.3% and 68% were documented for Mawasiliano, Uponera, Isongo and Togo villages respectively. Coverage from community survey was 68%, 83%, 84% and 79% for Mawasiliano, Uponera, Isongo and Togo villages respectively. These coverages are below the optimal recommended coverage by WHO (85%) for successful transmission interruption. Drug uptake were 3.9 times higher among participants aged ≤ 24 years compared to those above 44yrs [PR = 3.9(95% CI:1.9-8.3), $p < 0.05$)]. Living in the village for at least a year

increased the chances of drug uptake [PR = 3.4 (95% CI:2.4-4.8), p <0.05)]. Those who believed in prevention effects of Ivermectin increased chances to drug uptake during MDA [APR = 13.4(95% CI:2.9-60.9)], p<0.05), while fear of restriction from drinking alcohol after taking drugs was attributable to decreased drug uptake [APR = 12(95% CI: 2.4-60.9), p<0.05)]. Other important determinates of drug uptake were workload and inadequate incentives for CDDs.

Conclusion and recommendation: This study has highlighted low coverage of drug uptake as recorded in the community drug distribution register, which indicates that the effectiveness of the MDA activities was not up to the recommended level. There is a need to capitalize on post MDA mop up campaign on poor coverage areas and coverage review surveys immediately after MDA campaign so that there could be alignment between the reported data and actual treatment coverage reported in the community register. Also intensifying awareness of the benefits of ivermectin in Onchocerciasis control as well as to address the community misconceptions and of fear of the drug side effects need to be implemented.

CHAPTER ONE

1. INTRODUCTION

1.1. Background information

Onchocerciasis, also known as river blindness is a vector-borne parasitic disease caused by a, *Onchocerca volvulus*, and transmitted by the bites of black flies belonging to *Simulium species*(1). The flies breed in fast-flowing waters of streams and rivers, most notably in Africa, and in Tanzania in particular (2). Onchocerciasis Control focuses on Community Directed Treatment with Ivermectin (CDTI) strategy consisting of yearly mass drug administration of Ivermectin. Multiple studies show evidence of significant improvement in the ivermectin treatment coverage during MDA which have contributed to successful transmission interruption and prevalence reduction in some endemic areas (3–5). Despite the evidence that MDA can eliminate Onchocerciasis with repeated annual or semiannual treatment with Ivermectin, the success to elimination requires 100% geographical coverage in all areas in which transmission occurs. Attain and maintain the recommended MDA treatment coverage and demonstrate the interruption of transmission among vector species (6).

Conceptual framework of onchocerciasis elimination process emphasizes treatment coverage as one of the important factors to be taken into consideration when developing the control and elimination framework(6). However, treatment coverage gives a picture at community level and does not necessarily guarantee good adherence to drug uptake by individuals in the community. Evidence from numerous studies show that, the individuals who don't take ivermectin each year may provide sources of reinfection for their communities (7). The challenge of drug uptake in the situation of onchocerciasis is affected by the fact that, in the framework of MDA all residents in the high-risk population even those who are apparently in good health must take the drugs. Similarly, ivermectin uptake is accompanied by conditions such as requiring individuals to stop alcohol intake the day of treatment. Potential side effects such as exhaustion resulting in reduced productivity make some people refrain from taking the drugs (6,8–10).

Onchocerciasis continues to be an important public health problem in Tanzania. It is among the five most prevalent Neglected Tropical Diseases (NTDs) targeted for elimination in the

country (11,12). Substantial progress in the control of the diseases has been made and a goal to eliminate Onchocerciasis by 2025 has been set (13). Nevertheless, to achieve elimination goal community adherence to drug uptake during MDA campaign is of paramount importance. It is for this reason that; understanding of the factors that influence people's decision to either take or not take the drugs during MDA is critical, in the context of accelerated efforts to eliminate the disease. Likewise, it is important to have further documentation about the significance of the balance of the main factors related to adherence and compliance to drug uptake in the framework of onchocerciasis elimination including strengthening overall MDA program.

Ulanga District in Morogoro region is one of the Onchocerciasis foci in Tanzania which since 1960s, was known for its high endemicity. Inception of annual Ivermectin MDA using vertical distribution strategy in 1994 and CDTI strategy in 1998 has been applied in the control initiatives(14). Despite sustained MDA in the area for two decades transmission is still ongoing raising uncertainty on its ability to control and eventually eliminate the disease (15). In a study to evaluate progress towards Onchocerciasis elimination in Africa, Mahenge focus was highlighted to have remained with high Onchocerciasis nodule prevalence. However, overall prevalence was found to have dropped from 78.7% when MDA was started to 8.3% in 2009 with maximum village prevalence of about 22% (16). Similarly, Mbando *et al*, 2017 reported village prevalence of Onchocerciasis nodule in the surveyed village within Ulanga to be 2.3% while the positivity rate for Antigen Precursor – *Onchocerca volvulus* (OV16) rapid test was 76.5% and the risk of transmission among children aged 6-9 years was found to be 20.7% (17). Other studies have highlighted the existence of other complications associated with the treatment with IVM for prolonged periods, such as increased prevalence of Epilepsy and the nodding syndrome. (17). Likewise, a study to evaluate black fly vectors and transmission of *Onchocerca volvulus* by Adam et al, 2017 revealed that the black flies carried infective parasites and the infection rates were clearly above the threshold for interruption of transmission (0.05%) (18).

It is important to have further documentation on treatment coverage and factors that drives community participation in MDA and individual drug uptake during MDA program within the context of the Onchocerciasis elimination Program in Ulanga district. Therefore, this study was designed to assess the coverage and determinants for drug uptake for Ivermectin MDA in

Ulanga district in order to gather appropriate evidence to inform all stakeholders involved in the endeavor to fight Onchocerciasis in the country.

1.2. Problem Statement

Despite twenty successive MDA campaigns in Ulanga with mean annual coverage above 78% (below the WHO recommended coverage of at least 80%), reports indicate high prevalence of Onchocerciasis in both human and vector species. Evidence for continued active transmission among children aged 6-9 years implies high risk of transmission within the community. Presence of infective vectors with infection rates clearly above the threshold for interruption of transmission (0.05%) indicates high prevalence of microfilaria in the community suggesting that implementation of MDA campaign has not been successful (17).

Under such circumstance it is important to explore the details of the reported coverage and understand the driving forces among the at-risk population that must be treated and accept to take the drug during MDA. This study was therefore designed to assess treatment coverage and explore determinants of drug uptake during MDA program, that may uncover specific areas of effort concentration. It intended to provide the basis for understanding the best way to attain and sustain optimal MDA coverage in Ulanga district towards 2025 Onchocerciasis elimination target as was ratified by the country.

1.3. Conceptual framework

Onchocerciasis is a parasitic disease caused by an infection with the worm *O. volvulus* whose filarial larvae are transmitted by black flies (Simulium spp.). The adult female worms are encapsulated in the subcutaneous tissue in human body creating visually noticeable nodules. The microfilariae released (up to 1000 a day) provoke itching, dermatitis and may result into irreversible blindness once left un-treated(2). Ivermectin the drug that is used to treat the diseases, has a twofold mechanism of action; primarily it kills the microfilariae and then it inhibits their release by the adult female worm for several months up to maximum of 2 years after a single dose treatment (19). Although Ivermectin has a strong impact on reducing transmission, it is not lethal to adult worms. Hence infected people have to be treated annually for at least 15 years to keep the parasites at the lowest level and reduce chances of transmission(20).

Several factors can be associated with compliance and uptake of drugs during MDA programs. Some of those factors could be related to socio-demographic characteristics of the drug recipients as well as CDDs* attitude during MDAs. They may also be related to perceived level of risks and benefits of the Onchocerciasis and MDA program by the drug recipient population. The later and the later factors can be implicated to influence drug uptake. Similarly factors such as community sensitization and individual memories about the diseases effects and drugs side effects based on previous MDA can be attributed to reduced or increased drug uptake (21).

On the other hand, program delivery factors such as appropriate support from program staff at drug distribution level during MDA, sufficient drug supply and provision of appropriate training and incentives to community drug distributors could likewise have an influence drug uptake by individuals within community **(Figure 1)**

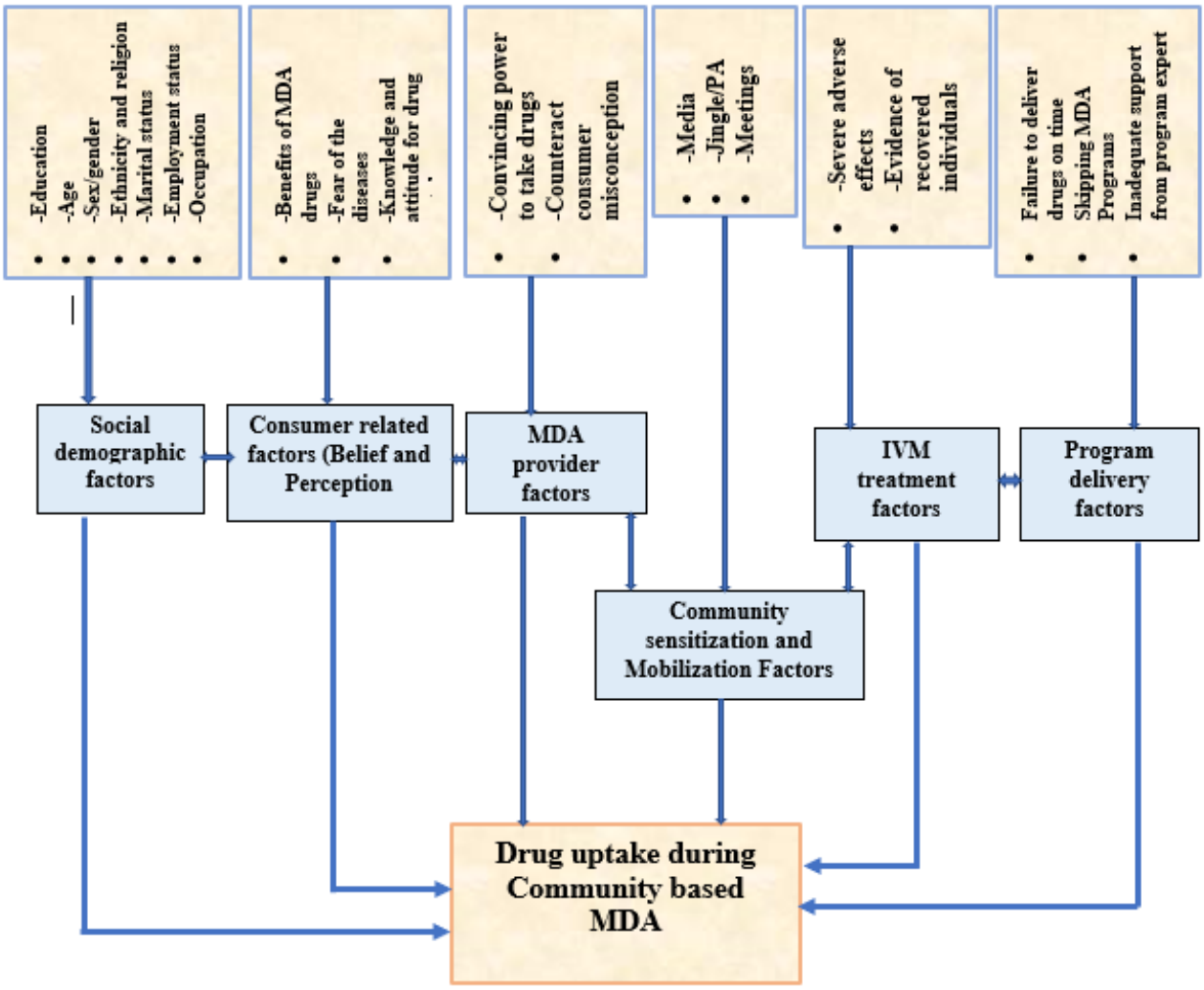


Figure 1: Conceptual framework for the factors that may influence individual compliance to drugs during MDA

1.4. Significance of the Study

The findings from this study intended to provide the basis for understanding the best way to attain and sustain optimal MDA coverage in Ulanga district towards elimination goal as was ratified by the country. It saves as benchmark to inform the NTD control program at all levels and other potential stakeholder's areas of effort intensification when planning further intervention in the pursuit to Onchocerciasis elimination in the country. Factors affecting MDA implementation will inform planning for effective MDA to achieve optimal treatment coverage and reduce systematic noncompliance to accelerate efforts to shift from control to Onchocerciasis elimination goal

1.5. Research questions

1.5.1. Main Research question

What is the Mass Drug Administration Coverage and determinants of individual drug uptake in the MDA program in Ulanga district?

1.5.2. Specific questions

i. What is the role of Socio demographic factors in determining community adherence to drug uptake?
ii. What are the village specific MDA coverage levels and are there any variation between village coverage and district reported coverage?
iii. What are the program factors that influence ivermectin uptake by individual community members in Ulanga district?
iv. Are there any community drug distributor's factors that affect drug uptake by the community during MDA program?
v. What are perceived disease and drug impact factors that influence drug uptake by the community during MDA Program?

1.6. Objectives of the study

1.6.1. Broad objective

To assess Mass Drug Administration Coverage and determinants of individual drug uptake in the MDA program in Ulanga district

1.6.2. Specific objectives

2. To determine the influence of socio-demographic characteristics of the study population in drug uptake in selected villages of Ulanga district
3. To assess the MDA coverage as reported in the community registers in selected villages of Ulanga district
4. To assess the program expert support, awareness creation and drug supply system for ivermectin distribution during MDA in selected villages in Ulanga district`
5. To assess community drug distributors knowledge, selection criteria and incentives package in relation to drug uptake in selected villages of Ulanga district
6. To assess community perceived disease and drug effects that influence drug uptake in selected villages of Ulanga district

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Epidemiology, Parasite Life Cycle and Public Health Context

Onchocerciasis also known as “river blindness” is one of the Neglected Tropical Diseases (NTDs) that constitute a public health problem. It is caused by the filarial worm *Onchocerca volvulus* transmitted by repeated bites of infected black flies (Simulium spp.). These blackflies breed along fast-flowing rivers and streams, close to remote villages located near fertile land where people rely on agriculture. In the human body, the adult worms produce embryonic larvae (microfilariae) that migrate to the skin, eyes and other organs. When a female blackfly bites an infected person during a blood meal, it also ingests microfilariae which develop further in the blackfly and are then transmitted to the next human host during subsequent bites (1,2,22).

The microfilariae of *Onchocerca volvulus* are transferred from an infected person to the fly when it takes a blood meal. The microfilaria matures into an infective larva in the thorax of the fly after and is transferred back to a human during the fly’s next blood meal. After this transition the larva then migrates to the host’s subcutaneous tissue where it creates a nodule in which it fully mature (2,11).

Infected blackfly (genus *Simulium*) introduces third-stage filarial larvae onto the skin of the human host during a blood meal, where they penetrate into the bite wound (23) In subcutaneous tissues the larvae develop into adult filarial (2), which commonly reside in nodules in subcutaneous connective tissues. Adults can live in the nodules for approximately 15 years (3). The microfilariae are occasionally found in peripheral blood, urine, and sputum but are typically found in the skin and in the lymphatics of connective tissues (4). In a subsequent blood meal, a blackfly ingests the microfilariae (5). After ingestion, the microfilariae migrate from the blackfly’s thoracic muscles (6). Then they develop into first-stage larvae (7) and afterward into third-stage infective larvae (8). The third-stage infective larvae migrate to the blackfly’s proboscis (9) and can infect another human when the fly takes a blood meal and the cycle start again(2,24), (Figure 2).

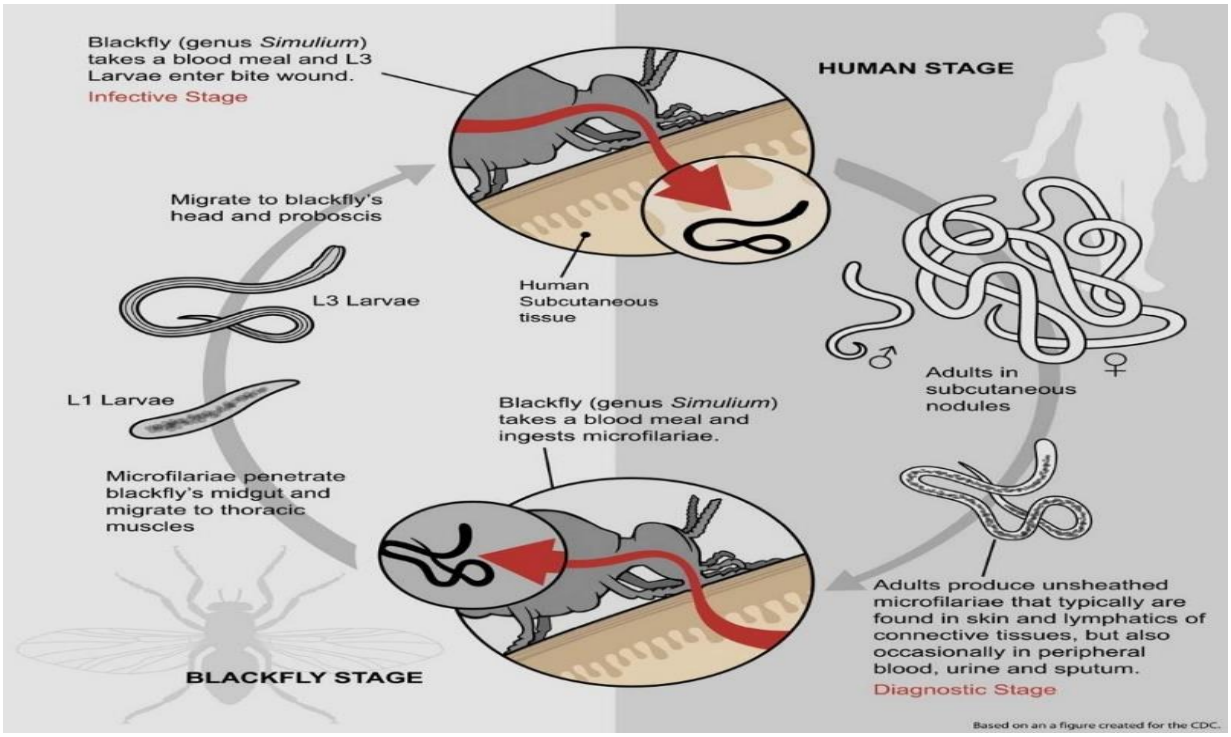


Figure 2: Life Cycle of Onchocerca Volvulus

Symptoms are triggered by the microfilaria, which move around the human body in the subcutaneous tissue and induce intense inflammatory responses when they die. Infected people may show symptoms such as severe itching and various skin changes. Some infected people develop eye lesions which can lead to visual impairment and permanent blindness. In most cases, nodules under the skin forms around the adult worms (18). Onchocerciasis is not a lethal disease however has been implicated with several socio-economic impacts thus contribute to significant public health threat. Severe skin lesions and irreversible blindness caused by untreated microfilaria of onchocerciasis are the most damaging effects of the diseases(25).

Onchocerciasis is commonly a burden to affected households and results to significant decrease in household productivity. The disease is predominantly chronic with low mortality, and occurs mostly in settings with low income, minimal disease awareness and inadequate access to treatment. These imperative characteristics of the disease contribute to its neglect as a precedence public health problem (25). Onchocerciasis has been a significant public health

problem in tropical Africa, Latin America, and the Yemen with over 40 million people infected before the launch of large-scale control.

Socio-economic burden, in terms of disability-adjusted life-years has been largely attributed to lesions of onchocerciasis by several studies. Global Burden of Disease Study estimated that 1.1 million disability-adjusted life-years were lost globally due to onchocerciasis in 2015(24). Studies done in Nigeria, Ethiopia and Sudan on socioeconomic impact of onchocerciasis revealed that onchocerciasis accounted for poor school performance and a higher drop-out rate among infected children as a result of provoking itching, insomnia, visual impairment, social stigma etc.(26). In some other studies it was found that onchocerciasis disease lead to low productivity, low income and higher healthcare related costs among infected adults. Other studies have implicated onchocerciasis with job attrition in west Africa due to ocular lesion leading visual impairment, hence resulting to loss of personal and household economic productivity in majority of the cases(16). Onchocerciasis-related illness has been associated with limited working for an average of 8 and 7 days among patients and caregivers respectively. Impacts of onchocerciasis extend beyond lost productivity cost to treatment cost among the sufferers, whereby studies have indicated that an individual can spend up to 14 USD in seeking medical care which in turn constitute a significant socio-economic burden of the disease in endemic communities(25).

Onchocerciasis can be treated by Ivermectin(20). Ivermectin has a dual mechanism of action: first it kills the microfilaria and secondly it inhibits their release by the adult female worm for a number of months up to 2 years after a single dose treatment(19). For this reason, Ivermectin has a strong impact on reducing transmission. On the other hand, the drug is not lethal to adult worms, and infected persons have to be treated annually for up to 15 years(15,27)

In 1995 when Africa-Onchocerciasis Control Program (APOC) were introduced, about 160 million population were at risk of developing Onchocerciasis of which more than 99 % were living in Africa(16). Following intensive control and expanded risk mapping, about 17 million people are estimated to be infected with Onchocerciasis and 198 million people are living in endemic areas of which 99% still are in 31 sub-Saharan Africa including Tanzania while the remaining 1% are in Sudan and Yemen(22). In 2017 WHO reported that in Tanzania there were about 6,154,018 people that were either infected with Onchocerciasis or living in areas

with high potential of Onchocerciasis transmission. About 27 districts from seven regions of Mbeya, Songwe, Morogoro, Njombe, Ruvuma, Iringa, and Tanga were implicated in the high risk of Onchocerciasis transmission. Thus, these districts were required to be treated with ivermectin through MDA(11).

Combination of both vector control and preventive chemotherapy (PCT) has been widely applied as principle prevention and control methods against Onchocerciasis. Several strategies including aerial spraying have been successfully used to clear vectors and managed to stop transmission in different parts of the world such as West Africa (14,28). These interventions have been used for decades as principle prevention and control methods against Onchocerciasis. The fight against Onchocerciasis is dated to 1974 in West Africa when deliberate effort was made to control blindness attributed to Onchocerciasis in dry savannah zone of 11 West African countries(29). Aerial spraying was done along river stretch to clear vectors and successfully managed to stop disease transmission from the core transmission area(14).

In 1980s, Ivermectin (Mectizan) was made available and introduced to reduce parasite reservoir in affected communities and complimented vector control interventions. Combination of both Mectizan and vector control resulted into elimination of Onchocerciasis both as a public health problem and hindrance to socio-economic development in the former West African Onchocerciasis Control Program (OCP) countries(30). Ivermectin mass chemotherapy was relatively cheap with several other gains compared to conventional vector control, therefore it was adapted and become the method of choice for Onchocerciasis control and later on elimination in all the endemic countries of tropical America and Africa(6,31,32). The basis of the control of Onchocerciasis is therefore through the Community Directed Treatment with Ivermectin (CDTI) strategy. This strategy involves delivering the treatment drugs for onchocerciasis to households using community volunteers commonly known as Community Drug Distributors (CDDs). The CDTI strategy was an initiative of the former APOC and then ESPEN adopted in 1995 in 16 endemic countries including Tanzania and have been inexistence ever since (25). With advancement in research it was established that, it is possible to eliminate Onchocerciasis through annual mass treatment with Ivermectin alone thus efforts to scale up and sustain mass treatment through MDA were initiated throughout

Onchocerciasis endemic countries(4,5,33,34). Elimination of neglected tropical diseases (NTDs) has emerged on the global health agenda and gained prominence with the release of the global plan to combat NTDs by the World Health Organization (WHO). One of the NTDs targeted for elimination is Onchocerciasis. In 2012, WHO issued a roadmap towards the elimination of 17 NTDs, and stakeholders from the public and private sectors pledged to contribute to the control, elimination, and eradication of ten NTDs through the London Declaration on NTDs (35).

The challenges for meeting the ambitious goals for Onchocerciasis elimination by 2025 in a number of endemic countries like Tanzania includes potential emergence of parasite strains with low susceptibility to ivermectin and increased population with systematic non-compliance to Ivermectin which slows down the progress of elimination. However, these challenges could be addressed with new drugs or drug combinations with a higher effect on *Onchocerca volvulus* than ivermectin (36). Several studies are ongoing at different phases, while some have passed trials in animal model thus proceeding with evaluating of safety level and treatment regimen in humans' other studies are yet to evaluate drug efficacy based on animal models (37). Among drugs which have shown promising results in the efficacy and safety and therefore might be more effective than Ivermectin is moxidectin. Other drugs such as Emodepside. Anti-Wolbachia compounds and Flubendazole though effective on microfilaria and/or viability and fertility of O. Volvulus their treatment regimen, safety and cost implication has limited their application at larger scale compared to Ivermectin (36). On the other hand, modelling of the effect of annual mass drug administration suggested that annual MDA of moxidectin can lessen time to onchocerciasis elimination relative to annual CDTI to an extent comparable to that achieved by biannual CDTI in both hyper, meso and hypoendemic areas (38).

2.2. Socio demographic Factors that influence drug up take and non- uptake

Socio-demographic factors such as age and employment status among others have been found to have influence in determining the compliance to ivermectin drugs during MDA (39). Income level, religion and type of occupation as well as land ownership has been linked to increased compliance to drug uptake during MDA program in several countries including Kenya. In some areas increased uptake to drug has been found to be inclined to certain

religious belief such as Christianity. Similarly nature of neighborhood either rural or urban setting has been associated to MDA compliance other part of sub Saharan Africa (40,41).

Social support including family and peer encouragement has been linked to drug uptake in some studies. Having large amount of people in the communities has likewise been a motivating factor towards drug uptake in some other communities in the sense that it stimulate some peer influence among other community members (42). Children sensitization about MDA drug distribution and its significance in improving health has been associated with better community understanding of the impacts of Ivermectin drugs provided through MDA. The evidence shows that it is important for children to be sensitized to adhere to treatment and cascade to their respective families for sustained success of MDA(43).

There several unique social characteristics that define resident of Ulanga community that might be in position to influence either participation in MDA programs therefore comply to drug uptake. Several studies have explored the role of vector in continued transmission of Onchocerciasis despite being in MDA for long time. Serological surveys have been conducted however minimal information has been published to rule out the impact of sociodemographic characteristics in influencing drug uptake, both positively and negatively.

2.3. Community Based MDA Coverage Evaluation

The fight against Onchocerciasis in Tanzania started in 1994 when implementation of mass treatment with ivermectin was introduced as a vertical program that ended in 1997 when the National Onchocerciasis Control Program (NOCP) was established. Community directed treatment with ivermectin (CDTI) strategy was initiated by APOC in 1997 and implemented by NOCP in Mahenge in the same year and later on was scaled up to other foci such as Ruvuma (1998), Tukuyu and Tanga (2000), Kilosa (2003), Morogoro (2004) and Tunduru (2005)(30).

There has been limited literature on MDA coverage evaluation , however several studies show evidence of significant improvement in the ivermectin treatment coverage during MDA, thus contributing to successful reductions in onchocerciasis transmission and prevalence (44). In a study conducted in five local government areas in Nigeria to evaluate treatment coverage for enhanced Mass Drug Administration for Onchocerciasis and Lymphatic Filariasis found there was poor treatment coverage whereby majority of community members had limited

opportunity for MDA. In similar study the coverage was reported to range from 45.4% to 47.2% (45). Likewise, treatment coverage during MDA in several regions of Cameroon has found to be significantly low along 10 years of implementation. However there has been evidence that MDA coverage has been increasing across age group with no significant deferent among different gender(46). Several other studies that have evaluated treatment coverage for MDA program has reported consistently low coverage unlike what reported by programs. WHO has likewise highlighted in its progress report that several countries has failed to attain optimal coverage for MDA for Onchocerciasis control. (47,48)

Despite the available literature on drug coverage, there is still limited information on the authenticity of the treatment coverage reported. Minimal is still known about the validity and consistency of the reported data both in the country, programs have been hardly doing post MDA coverage review for community-based MDA for Onchocerciasis control, and even when is done the information are hardly available for public use.

2.4. Program expert support, awareness creation and drug supply system in drug uptake.

The top down approach in most MDA programs in countries implementing CDTI strategy have been implicated compromise good coverage and the community find they have no role to play in the MDA program apart from selection of CDDs (40,49). In addition the modality of CDD selection in several areas has been attributed to increased or decreased drug uptake and community participation the MDA programs(49). Opinion and perception about ivermectin distribution campaigns has been associated with increased or decreased uptake to drugs(50). In a study conducted in Kenya and Cameroon found that people with negative opinion were less compliant to drug uptake than those who had a positive opinion about the drug distribution campaigns (51,52). Also people with negative perception of community drug distributors have been associated with non-adherence to drug uptake in other parts of Africa (8).

In order to ensure elimination of onchocerciasis, financial and human resources for the following core MDA activities is crucial, the governments need to increase health education, sensitization advocacy and mobilization, training, distribution of ivermectin, supervision, monitoring, and reporting. If those core activities have minimally being done or not done at all may impact implementation and low coverage may be the immediate impact(53). The

organization of the MDA program has great role to play in attracting community to comply to drugs according to study conducted in west Africa(54). It is even suggested that compliance to drug uptake is not limited to seriousness of Onchocerciasis itself, rather the organization of MDA program which is linked by the program performance (8). Experience from Columbia, Ecuador and other Americas countries has shown that factors such as; committed leadership support from National program experts, steady and close interactions with affected communities as well as utilization of community health workers (CHWs) has unquestionably contributed to Eliminate Onchocerciasis(55). Hence WHO certified Columbia (2013), Ecuador (2014), Mexico (2015) and Guatemala (2016) to have eliminated Onchocerciasis.

Record and management of drug supplies are key programmatic factors that MDA performance and coverage are inclined. Delivery of enough drugs for MDA and preparation of the CDD and FLHW workers to be able to compute and summarize MDA data has been a challenge. As CDD are required to fill in the detail for drug compliance may hamper their ability to motivate community to participate in the MDA and take drugs(42). Despite several challenges associated with CDTI implementation in MDA program, there are places which have managed to eliminate Onchocerciasis which is undoubtably inked to high level community acceptance of Ivermectin drugs and therefore good treatment coverage. Studies from countries such as Columbia, Mexico, Ecuador and Guatemala which have managed to eliminate Onchocerciasis have linked elimination success to a number of factors such as; committed leadership support from National program experts, steady and close interactions with affected communities as well as utilization of community health workers (CHWs) (55).

2.5. Influence of Community drug distributors knowledge selection criteria and incentives package in drug uptake

Modality of CDD selection in several areas has been found to influence community participation the MDA programs, on top of that belief on the performance of the CDDs in taking measurement and delivering drugs has likewise been associated with compliance to drugs in other part of sub Saharan Africa(40). Equally, factors such as adverse events of MDA and fear of side effects based on previous experience of side effects from Ivermectin drugs has been linked to non-adherence to the drug used in MDA programs in several studies(56–58). Other factors that have hampered community participation in the MDA programs in countries

with continued Onchocerciasis transmission are; lack of understanding of the differences between treatment and prevention, lack of symptomatic cases, sustainability of the drug distribution, local belief, community life style on alcoholism and not recognizing the roles that community health workers play in sustaining high coverage of the drugs distribution and sustaining MDA program (59–61).

Some studies have also linked good coverage and uptake of drugs during MDA to factors related to CDDs especially attrition, CDDs employment and whether they were selected at community meetings or by the community leaders. Catchment area of the CDD and monetary incentives has likewise influence performance of MDA and subsequent coverage(9). CDDs have the daily economic production activities to sustain their livelihood. Engaging in MDA delivery activities has been shown to significantly reduce their participation too their routine activities. This have a general effect their commitment to drug distribution during MDA especially when MDA is planned during farming period, in turn may impact their delivery MDA uptake among community members at large. The time spent by CDD on NTD Program activities significantly reduces time available for livelihood activities. As more time is spent to complete NTD Program activities, their treatment performance, in terms of validated coverage, however low motivation from program has been reported to reduce CDD morale as they feel undervalued(62). Limited time to distribute drugs and complete treatment results before submitting to the relevant authority have been linked to reduced compliance to dugs by the community, due to the fact that CDDs rush to complete the works within specified time period that focusing on ensuring community members do get the drugs(42,63).

In CDTI and eventually MDA for Onchocerciasis Elimination, monetary incentive packages to CDDs plays a crucial role in their motivation and facilitation of drug uptake. It has been reported that CDD plays important role in improving individual compliance to drugs in the community by their engagement in health education and sensitization. To be able to attain that they need to be well equipped and facilitated. Meanwhile in most MDA programs they in adequately trained thus fails to deliver as expected(64,65). Countries like Uganda, Nigeria and Cameroon which have experienced progressive decrease of Onchocerciasis prevalence in several Onchocerciasis foci due to MDA programs. Information from these area indicate ,increasing people’s understanding about the disease and benefit of MDA program; addressing

misconceptions of MDA and fear of Ivermectin side effects had strong influence on people's participation in Ivermectin drug uptake during MDA programs attributed to good CDDs performance(51).

2.6. Perceived disease and drug effects that influence drug uptake

Perceived risk of developing the disease as well as Family support and method of ivermectin dose determination has been implicated to determine individual compliance to drugs during MDA(10,64,66). A study by Sharmini et al has indicated that prior knowledge and exposure to a person suffered from filarial infection had contribution to individual's compliance to the drugs. Also having personal suffered or cared for a person suffered from filarial infection has been likewise found to be associated with increased compliance to drug uptake during MDA program.(21)

Belief that ivermectin drugs could be dangerous to health as well as the belief that the diseases could be prevented and eliminated in the body by swallowing drugs regularly has been associated with compliance to drugs in other endemic countries such as Malysia, Ethiopia and Ecuador (66,67). Adverse events of MDA and fear of side effects especially based on previous experience of side effects from Ivermectin drug has been attributed to noncompliance to drug uptake during MDA program in some countries(39,56,57). Perception of risk and benefit of MDA, and drug-related concerns such as feeling the drug is unnecessary, general dislike of drugs/swallowing tablets, fear of taking drugs when ill, and most notably, fear of side effects has been found to be associated with compliance to Ivermectin drugs during MDA (51,68). Local belief and community lifestyle on alcoholism in the community has been reported to have impact on non-compliance to drug uptake as it was documented by studies from West Africa, Uganda and Rungwe inTanzania (61).

CHAPTER THREE

3. MATERIAL AND METHODS

3.1. Setting of the study

The study was conducted in Morogoro region within Mahenge Onchocerciasis focus at Ulanga district council. The area is in southeastern Tanzania; it is a mountainous area with fast-flowing perennial rivers which are Luli, Mbalu, Lukande, Mzelezi, Ruaha and Msingizi Rivers that serves as potential breeding sites for black flies. The 2012 population census reported 265,203 people living in Ulanga district. Administratively the district has been divided into 3 divisions and 31 wards whereby each ward has about three and above villages. The district OV16 prevalence stands at 76% and 50% in rural and suburban areas respectively. Evidence of active transmission among children aged 6-9 years has been recorded to be 20.7% (17). (Figure 3)

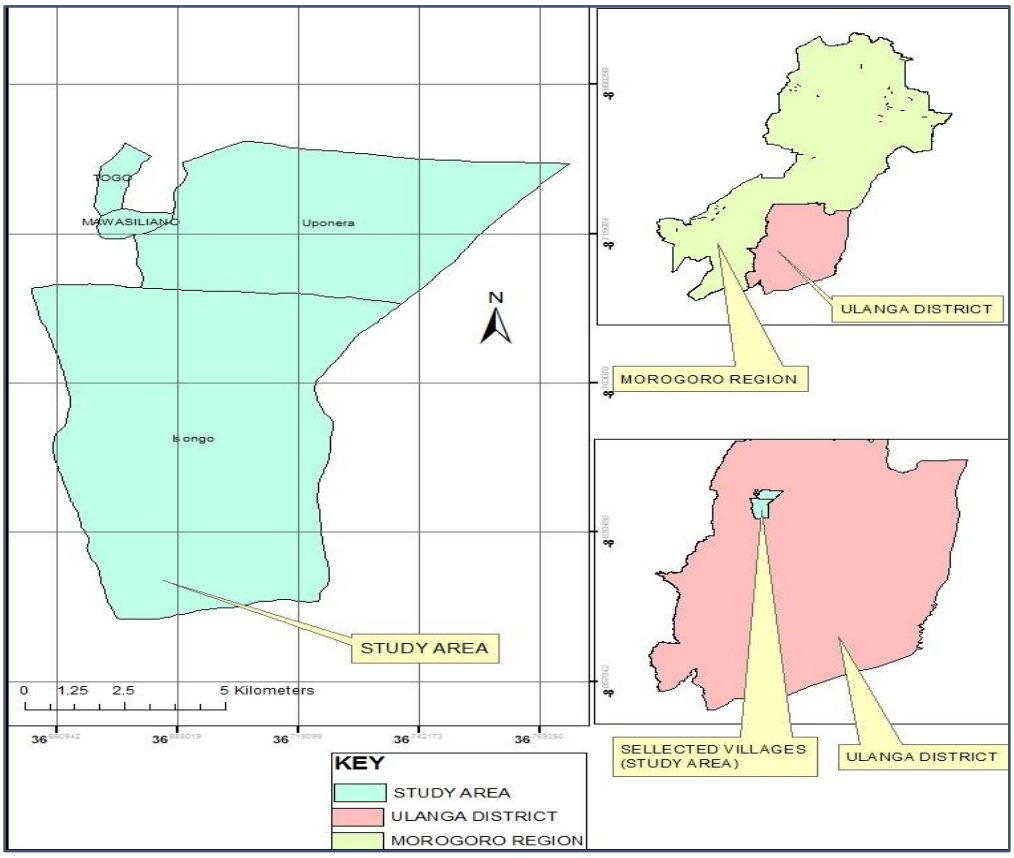


Figure 3: Map Showing the Location of the Study Site in Morogoro Region, Ulanga Disitrict

3.2. Study design

This was a cross-sectional, community-based study designed to determine the determinants of drug uptake and treatment coverage for community-based MDA programs with Ivermectin

3.3. Study population

All individual living in the study area were considered source population for this study. Individuals who were exempted during MDA campaign because of ineligibility such as being below 5 years old, pregnant women, and those with serious health problems were excluded from the study. In order to elicit information from experienced individuals the inclusion criteria were those individuals who had participated in the MDA program for at least one (1) year and who were able explain themselves clearly. The cut off age for inclusion into the study was 15 years.

3.4. The Primary Study Unit

Household members from selected villages and wards within Ulanga district were the study unit for this study. Cluster sampling using Steve Bennett's formula was used to determine the number of clusters/villages that were included in the study. Kish-Leslie Formula for single proportion cross sectional study was used to determine the final study unit (household members). Therefore, respondents for the study were all eligible people from sampled villages and households.

3.5. Sample size and Sampling

3.5.1. Sampling

Multistage cluster sampling method was used. Based on Steve Bennett's formula two wards were selected within the district followed by 4 villages from the wards. However, one selected village was found to be in a separate ward as it was divided from the existing ward. At the village level 6 hamlets were selected and the final cluster was the household. A minimum of 20 households were planned to be visited in each hamlet for the purpose of this study.

The final number of hamlets that was included in the study was calculated according to Steve Bennett's formula as shown below(69).

$$D = 1 + (b - 1) \times roh$$

Where;

D= Design effect,

b= expected number of households covered in each sub-village (20),

roh = Rate of homogeneity among clusters (0.1)

Then;

D= 1+ (20 - 1) x 0.1

D= 2.9

Number of clusters (Hamlet/Sub-village) was calculated using Steve Bennett's formula (69)given below

$$C = \frac{p \times (1-p) \times D}{s^2 x b}$$

Where;

C= Number of clusters (hamlet/sub-villages) that will be included in the study

p = Proportion drug uptake in Ulanga (78%)

D = Design effect (2.9)

s = Level of precision (5%)

b = expected number of households covered in each sub-village (35)

Then;

$$C = \frac{0.78 \times (1-0.78) \times 2.9}{0.05^2 \times 35}$$

C = 5.7 ~ 6

At each sub village/hamlet at least 35 households were selected from the cluster and random sampling technique was used to select the individual household. A maximum of 3 members per household were prospectively recruited in the study until the required sample size was attained

3.5.2. Sample size

The Kish-Leslie Formula for single proportion cross sectional study was used to calculate the anticipated sample size.

Calculation was based on the following assumptions:

(i) The acceptable margin of error to be 6.5%

(ii) The proportion of drug uptake during MDA in Mahenge is 78%(17)

(iii) Design effect to be 2.9 (from the calculation above)

(iv) 95% confidence level

(v) Z= 1.96

The following formula was used to compute the sample size

$$N = \frac{g \times Z^2 P (1-P)}{d^2}$$

$$N = \frac{2.9 \times 1.96^2 \times 0.78 (1-0.78)}{0.065^2}$$

$$N = \frac{2.9 \times 1.96^2 \times 0.78 \times 0.22}{0.065^2}$$

N = 453

After adjusting for non -response rate of 10%, 503 was obtained as the minimum sample size.

3.5.3. Sampling technique

Multistage cluster sampling was used that involved four stages highlighted below

First stage: Ulanga District council was selected as one of the councils in Mahenge Onchocerciasis foci with high active transmission of Onchocerciasis despite ongoing MDA intervention.

Second stage: In the second stage a list of onchocerciasis endemic wards in Mahenge division was obtained from DMO office, two wards were randomly selected.

Third stage: In the third stage, a list of the villages from the selected wards were obtained and four villages were randomly selected. From which, 6 hamlets were selected according to Steve Bennett's formula.

Fourth stages: In this stage, at least 20 households from each selected hamlet were randomly selected with starting point at the center of the hamlet; each eligible household member was prospectively followed until the anticipated sample size of 470 members of the households? was attained.

3.6. Inclusion criteria

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

i. Adult community members, who were 15 years old and above; one to three adult member per household, head of the household by default or the representatives where a household head was not present with other two members that were selected randomly
ii. Consent to participate; and
iii. People who had been residents in the areas in the latest MDA

3.7. Exclusion criteria

i. Household members, below 15 years of age;
ii. Those unwilling to give consent to participate;
iii. Recent migrants into the area

3.8. Variables

3.8.1. Dependent variable

Drug uptake and treatment coverage during MDA programs

3.8.2. Independent Variables

Social demographic characteristics (education, sex, age, marital status), village specific MDA coverage, drug availability, drug supply system, program expert support, CDD knowledge, and incentives, House to house drug distribution with repeated visit, education before drug distribution, high risk perception, perceived effect of the diseases, side effects of the drugs, knowledge about the diseases.

3.9. Data collection methods

3.9.1. Training of Data collectors

Four (4) research assistant were used during data collection and were exposed to one- day training which covered, the overview of the research and data collection methods. This was done before data collection started. All research assistants were trained to use mobile phone-based data collection so that they could easily follow the procedures of data collection and submission.

3.9.2. Pretesting of Study Instruments

A pre-test was conducted to assess the adequacy of the interviewer-based questionnaire and the accuracy of mastering data entry using a mobile phone devise. For the in-depth interviews,

the interviewer role played during the training using the Swahili languages and unclear issues were clarified in the process. This provided an opportunity to assess the ease of understanding of the research tools.

3.9.3. Data collection tools

Data collection tools were translated into Kiswahili version because the study participants were native Kiswahili speakers. Data were collected using mobile devices through Open Data Kit (ODK Collect) application freely available in google play. The Swahili version of questionnaire were uploaded into mobile phone, collected and checked for quality within the respective mobile devises daily. In case of internet failure, all data were checked and retained into the respective mobile devices and transferred to the saver once the internet stabilized. Data completeness and accuracy was checked on daily basis and any ambiguities were immediately addressed the following day.

Data collected using mobile devices through ODK Collect were uploaded to sever daily. All consistency checks were run in the field while the interview was taking place, any ambiguities were immediately addressed.

i) Assessment of MDA coverage as reported in the community registers in selected villages in Ulanga district

To achieve this objective a checklist was used for data abstraction. All CDD registers were reviewed to determine individuals in the community who participated in the MDA for the past MDA campaign. Information from the register were compared to the information in the health facility summary data form and the district summary data form **(**appendix 4).

ii) Determination of the socio-demographic characteristics of the study population and assessment of community perceived disease and drug effects that influence drug uptake in selected villages of Ulanga district

Interviewer administered semi structured questionnaire was used to collect this information in order to answer objective number 2 and 3. The questionnaire had three (3) major parts; part A had 7 questions that explored the socio-demographic characteristics of the participants. Part B of the questionnaire had 13 questions that explored the community perceived disease and drug effects that influence drug uptake especially treatment effects, perceived knowledge, belief and perception about Ivermectin drugs. Part C of the questionnaire had 3 questions that looked

at the program expert support, awareness creation and drug supply system for ivermectin distribution particularly community sensitization both formal and informal in facilitating individual decision on taking of ivermectin drugs during MDA campaign (appendix 2).

iii) Assessment of the program drug supply system and expert support for ivermectin distribution during MDA and community drug distributor's knowledge, selection criteria and incentives package in relation to drug uptake in selected villages of Ulanga district

An in-depth interview was employed during data collection to answer objectives number 4 and 5 above. In –depth interview was conducted to 6 CDDs, One (1) from each selected hamlet, two (2) FLHWs from health facilities in the selected hamlets and Zonal NTD coordinator. Audio recording devises and note taking was used to capture all information during interview (appendix 3)

3.9.4 Data analysis

Data from questionnaire and in-depth interview was analyzed separately and reviewed simultaneously. Results of the analysis were linked during interpretation as a whole(70).

i) Quantitative data

The quantitative data were processed using Epi-Info 7 and STATA version 15 computer software. The responses to open-ended questions such as reasons for MDA drugs uptake and perceived impact of diseases were coded during analysis. Equivalent responses were pooled to arrange the responses in different categories. Two-way tables were used to compare categorical data and the statistical differences in MDA drug uptake were assessed by the $\chi 2$ test and a **p-value** of ≤ 0.05 was considered significant. Multi variate analysis through logistic regression was performed to assess for confounding effects. All the factors with $p<0.25$ under bivariate analysis were subjected to multi variate analysis through Modified Poisson regression to assess confounding effects.

ii) Qualitative data

All In – depth interviews were recorded, transcribed into Swahili, translated to English, then back into Swahili for accuracy of translation. The data was coded using a guide created by Creswell(71). Content analysis was performed manually to describe the content, and results

arranged into category. The unit of analysis was the full script for each interview session. Categories of data were created and grouped to main categories and subcategories.

iii) MDA coverage Data

Data collected through checklist was analyzed and compared between the CDD register to that in the HFSDF for the past three years of MDA implementation. Trends of coverage from both CDD register and HFSDF was summarized using excel sheet.

Figure 4 ummarizes the entire data collection and analysis framework.

3.10. Ethical consideration

3.10.1 Ethics Statement

This study was approved by the Ethical review board of Muhimbili University of Health and Allied Sciences. Permission to collect data was obtained from Regional Administrative Secretary for Morogoro region and later by the District Executive Director for Ulanga District council. A written informed consent was obtained from individual research participants or parent, next of kin, caretaker, or guardian on behalf of all the children who were enrolled in the study.

The participants were informed that they were free to withdraw their participation at any stage of the study. Participants were explained that the study is meant to explore their view about drug distribution campaigns for the sake of improving future drug distribution program for control and elimination of Onchocerciasis disease. To avoid fear associated by the risk of their identification to be disclosed no name of the participant was collected; each participant was provided with a specific code number and the data gathered were kept confidential.

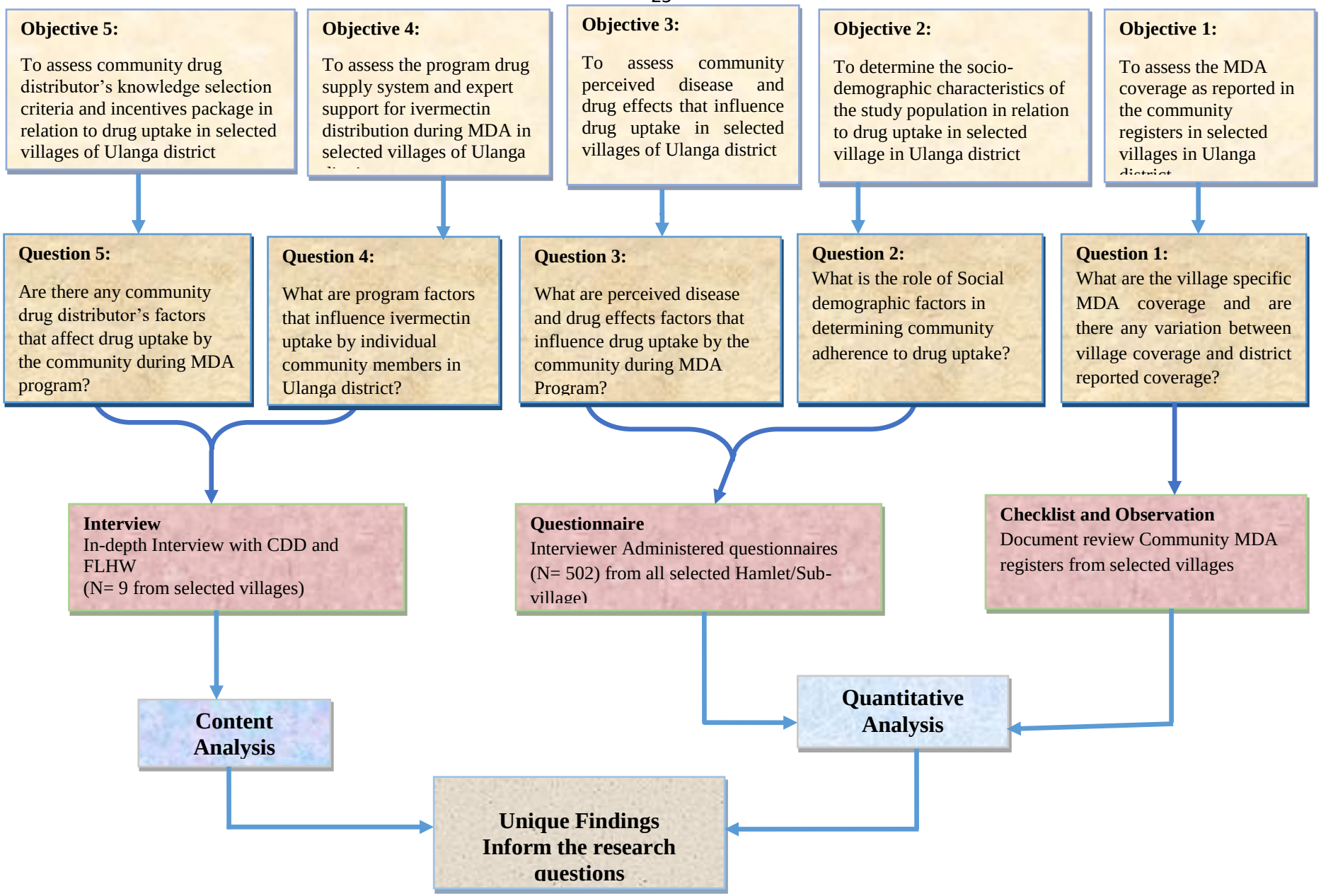


Figure 4: Data collection and analysis framework

CHAPTER FOUR

4. RESULTS

4.1.Background Characteristics of the Study Population

4.1.1. Socio-demographic characteristics

Of 503 study participants who were enrolled into the study 482 participants consented for interviews giving a response rate of 96%. The mean age of the 482 study participants was 37.8 ±15 years (±15 SD) majority being in the age range of 25–34 (25.5 %) years. Females contributed 67% (323) while four hundred and twenty (87.1 %) of the respondents were peasants. The majority (74.5 %) of the participants had primary education whereas 57.7% were married (Table 1).

Table 1 Socio-demographic characteristics of the study participants, Ulanga district (2019)

Variable	Number	Percent
Sex/Gender		
F	323	67
M	159	33
Age		
15 - 24	112	23.2
25 - 34	123	25.5
35 - 44	97	20.1
45 - 54	77	16.0
55 - 93	73	15.2
Education Level		
College	12	2.5
None	23	4.8
Primary	359	74.5
Secondary	88	18.2
Marital Status		
Divorced	7	1.4
Married/Cohabiting	278	57.7
Single	172	35.7
Widow/Widower	25	5.2
Occupation		
Extension Worker	18	3.7
Peasant	420	87.1
Student	20	4.2
SMEs*	24	5.0
Village		
Isongo	125	26
Mawasiliano	125	26
Togo	105	21.7
Uponera	127	26.3

SMEs* = Small and Medium Entrepreneur

4.2.MDA Coverage Review

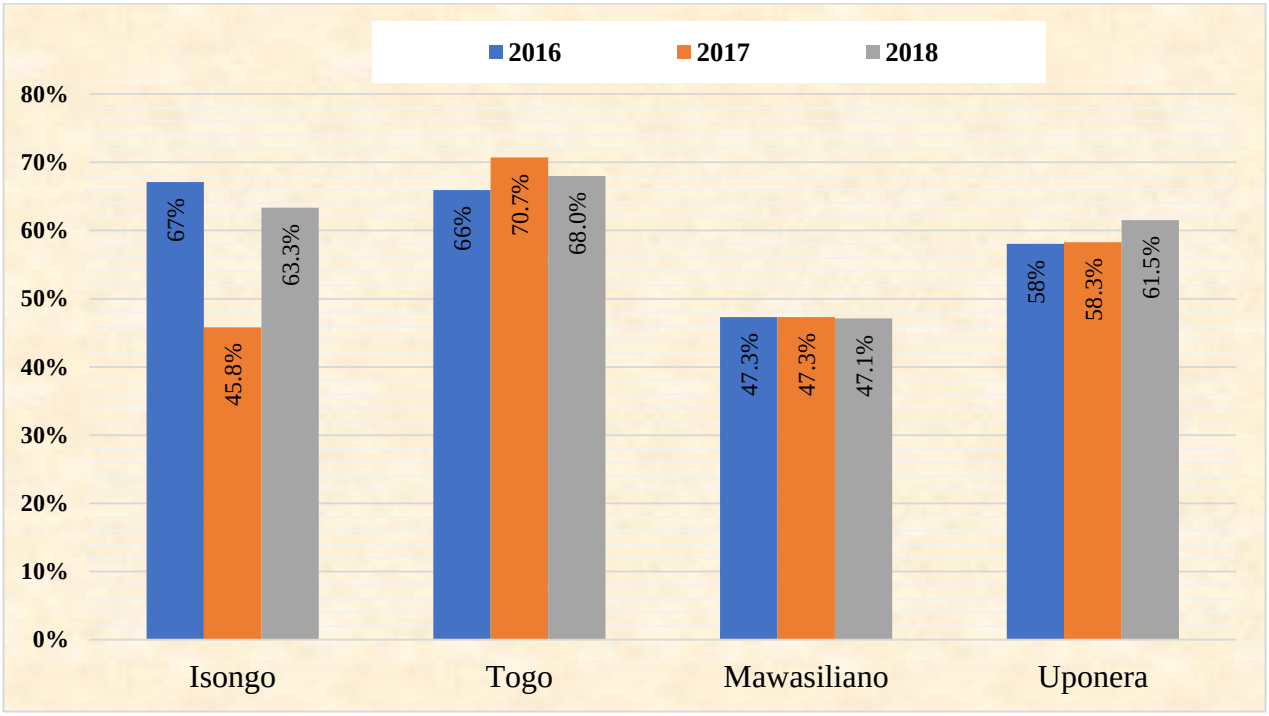
4.2.1. MDA Coverage from register review

Among the four villages Togo had consistent high drug uptake coverage of t 65.9%, 70.7%, and 68. % for 2016, 2017, and 2018 respectively. On the other hand, Mawasiliano had consistently low coverage which was below 50% over the same period. (Table 2 and Figure 5).

Table 2: MDA Coverage from CDD Register Review, Ulanga District (2016-2018)

Trend in MDA Drug Uptake									
Village	2016			2017			2018		
	Population	Uptake (n)	Coverage (%)	Population	Uptake (n)	Coverage (%)	Population	Uptake (n)	Coverage (%)
Isongo	2649	1778	67.1%	4546	2082	45.8%	3861	2445	63.3%
Togo	2382	1570	65.9%	2392	1691	70.7%	2458	1671	68.0%
Mawasiliano	2454	555	47.3%	2530	578	47.3%	2600	599	47.1%
Uponera	2399	1393	58.1%	2467	1438	58.3%	2535	1559	61.5%

Figure 5: Three-year trend of MDA coverage in the selected village in District (2016-2018)



Drug uptake coverage observed in Isongo, Togo and Uponera was significantly different for the three-year period. While there was no significant difference in drug uptake along three-year period for Mawasiliano villages.

In Isongo village, drug uptake was 2.4 times higher in 2017 [PR = 2.41 (2.2-2.3)], While drug uptake in 2018 was 1.2 times higher, [PR = 1.18 (1.1- 1.3)] compared to that of 2016 respectively. On the other hand, In Uponera Village compliance to drug uptake was 0.9 times less in 2018 compare to 2016, [OR = 0.87(0.78-0.96)], (Table 3)

Table 3: Comparison of Drug uptake along three-year period in selected villages in Ulanga District

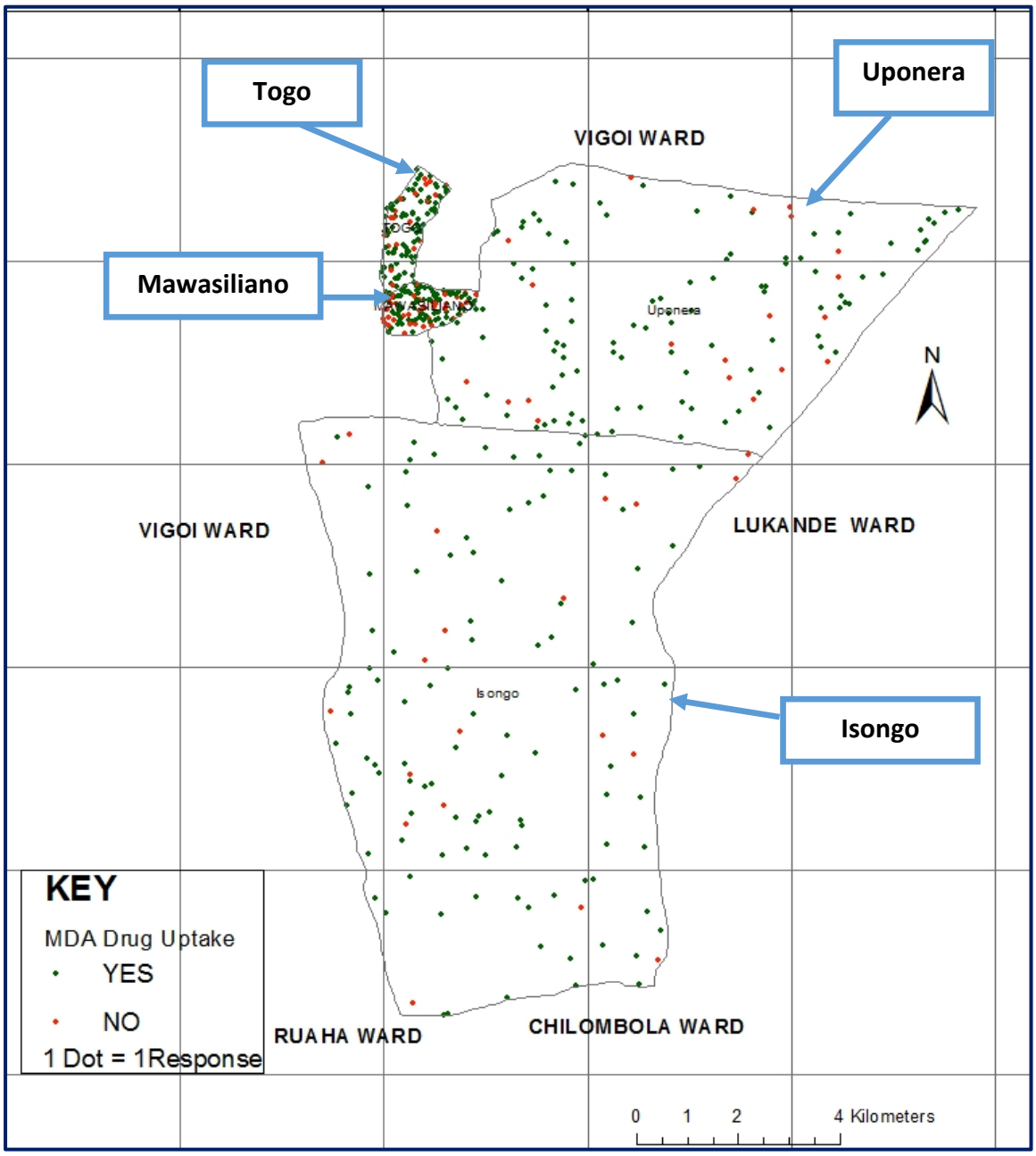
Village	MDA Drug Uptake			
	Yes (%)	No (%)	PR (95%CI)	p-value
Isongo				
2016	1570(67.1)	812(32.9)	1	1
2017	1691(45.8)	701(54.2)	2.41 (2.2-2.3)	0.001*
2018	2018(63.3)	1671(36.7)	1.18 (1.1- 1.3)	0.002*
Togo				
2016	1570(65.9)	812(34.1)	1	1
2017	1691(70.7)	701(29.3)	0.8 (0.7-0.9)	0.003*
2018	1671(68.0)	787(32.0)	0.9 (0.8-1. 0)	0.13
Mawasiliano				
2016	555(22.6)	1899(77.4)	1	1
2017	578(22.8)	1952(77.2)	0.99 (0.86-1.13)	0.85
2018	599(23.0)	2001(77)	0.98 (0.86-1.11)	0.72
Uponera				
2016	1399(58.1)	1006(41.9)	1	1
2017	1438(58.3)	1029(41.7)	0.99 (0.89-1.12)	0.93
2018	1559(61.5)	976(39.5)	0.87(0.78-0.96)	0.02*

4.2.2. MDA coverage from Participants Response

Of the 482 participants who consented to participate in the study about 380 (78.8%) reported that they had taken drug in at least one of the three previous MDA programs. Mawasiliano, Uponera, Isongo and Togo villages had the coverage of 68%, 83%, 84% and 79% respectively. The results show the highest drug uptake coverage was observed in Isongo while Mawasiliano as had the lowest proportion of people who comply to drug uptake of about 68%.

However, in both villages the coverage was below the optimal coverage (85%) recommended by WHO for successful transmission interruption and elimination of the disease. (Figure 6)

Figure 6: The Geographical Distribution of Drug Uptake During MDA among Selected Villages in Ulanga District



4.3.Influence of Socio-Demographic Characteristics of the Study Population on Drug Uptake Compliance

4.3.1. Socio demographic Factors associated with MDA drug uptake in bivariate analysis

Modified Poisson Bivariate regression analysis of this study revealed among the socio-demographic factors; participants' age, marital status, education level, occupation and duration of stay in the village to be significant associated with the drug uptake during MDA.

Drug uptake among participants with secondary education was about two times higher compared to those with primary education [PR = 1.9(95% CI:1.3-2.8)]. While participants who had lived in the district for at least one year their compliance to drug uptake was about three times higher compared to those who had lived in the village for less than a year [PR = 3.4 (95% CI:2.4-4.8)]. Similarly, drug uptake among participants aged 15-24 and 25-34 years was 4 times [PR = 3.9(95% CI:1.9-8.3)] and 3 times [PR = 2.6(95% CI:1.2-5.6)] higher compared to adult population ages 45-54 respectively. Never the less, the results show drug uptake was 2 times higher among un-married participants compared to married ones [PR = 1.6(95% CI:1.1-2.6)]. In addition, drug uptake among students was about 5 times higher [PR = 4.95(95% CI:1.3-19.4)] compared to extension workers within the villages. Compliance to drug uptake among Male and Female participants was found to be statistically similar (Table 4).

Table 4: Spoison ocio demographic Factors associated with MDA drug uptake in bivariate analysis, in Ulanga district, June 2019

Variable	MDA Drug Uptake			
	Yes (%)	No (%)	CPR (95%CI)	p-value
Age:				
15-24	72 (64.3)	40(35.7)	3.9(1.9-8.3)	0.00*
25-34	94 (76.4)	29 (23.6)	2.6(1.2-5.6)	0.02*
35-44	80(82.50)	17(17.5)	1.9(0.8-4.4)	0.12
55 - 93	64(87.7)	9(12.3	1.4(0.5- 3.5)	0.52
45-54	70(90.9)	7(9.1)	1	1
Sex				
Male	127(79.9)	32 (20.1)	1	1
Female	253(78.3)	70(21.7)	1.1(0.7-1.6)	0.69
Education Level:				
None	16 (69.6))	7 (33.4)	1.8(0.9- 3.4)	0.09
Secondary	59 (67.1)	29 (32.9)	1.9(1.3-2.8)	0.001*
College	8(66.7)	4(33.3)	1.9(0.8-4.4)	0.12
Primary	297(82.7)	62(27.3)	1	1
Marital Status				
Married/Cohabiting	230(83)	47(17)	1	1
Not Married	150(73.2)	55(26.8)	1.6(1.1-2.6)	0.008*
Occupation				
Peasant	341 (81.2)	79 (18.8)	1.6 (0.5-6.4)	0.44
SMEs	14(58.3)	10(41.7)	3.8(0.9-15.1)	0.06
Student	9(45)	11(55)	4.95(1.3-19.4)	0.02*
Extension Worker	16(88.9)	2(11.1)	1	1
Duration of stay in the village				
Below one year	10(37)	17(63)	1	1
One year and above	370(81.3)	852(18.7)	3.4(2.4-4.8)	0.00*

CPR = Crude Prevalence Ratio**, SMEs** = Small and Medium Entrepreneur ***** =Significant association

4.3.2. Socio demographic Factors associated with MDA drug uptake in Multivariate analysis

A stepwise modified Poisson regression model was developed that included five exposure variables which are; Age, Education level, Marital Status, Occupation and Duration of stay in the villages. Finally, two independent predictors of drug uptake among social demographic factors were identified to be Age and duration of stay in the village.

Drug uptake among participants aged 15-24 and 25-34 years was 3 times [APR = 2.8(95% CI:1.3-6.2)] and 2 times [APR = 2.3(95% CI:1.04-4.9)] higher compared to adult population ages 45-54 respectively. On the other hand, drug uptake among participants who had lived in the district for at least a year was 2 times higher compared to those who had lived in the district for less than a year. [APR = 2.3(95% CI: 1.5-3.4)] as shown in Table 5

Table 5: Socio demographic characteristic associated with MDA drug uptake in multi variate analysis, in Ulanga district, June 2008

Variable	MDA Drug Uptake					
	Yes (%)	No (%)	CPR (95%CI)	p-value	APR (95%CI	p-value
Age:						
15-24	72 (64.3)	40(35.7)	3.9(1.9-8.3)	0.00*	2.8(1.3-6.2)	0.008*
25-34	94 (76.4)	29 (23.6)	2.6(1.2-5.6)	0.02*	2.3(1.04-4.9)	0.04*
35-44	80(82.50)	17(17.5)	1.9(0.8-4.4)	0.12	1.9(0.8-4.3)	0.13
55 - 93	64(87.7)	9(12.3	1.4(0.5- 3.5)	0.52	1.3(0.5-3.4)	0.53
45-54	70(90.9)	7(9.1)	1	1	1	1
Education Level:						
None	16 (69.6))	7 (33.4)	1.4(0.7- 3.9)	0.25	1.7(0.6-4.6)	0.29
Secondary	59 (67.1)	29 (32.9)	1.1(0.7-1.7)	0.72	1.1(.6-2.2)	0.68
College	8(66.7)	4(33.3)	1.7(0.7-8.2)	0.16	2.1(0.4-10.4)	0.37
Primary	297(82.7)	62(27.3)	1	1	1	1
Marital Status						
Married/Cohabiting	230(83)	47(17)	1	1	1	1
Not Married	150(73.2)	55(26.8)	1.2(1.2-2.8)	0.009*	1.2(0.8-1.7)	0.39
Occupation						
Peasant	341 (81.2)	79 (18.8)	1.9 (0.4-8.2)	0.42	1.8(0.6-5.4)	0.30
SMEs	14(58.3)	10(41.7)	5.7(1.1-30.6)	0.04*	3.2(0.99-10.6)	0.05
Student	9(45)	11(55)	9.8(1.8-54.3)	0.009*	2.9(0.9-9.8)	0.09
Extension Worker	16(88.9)	2(11.1)	1	1	1	1
Duration of stay in the village						
Below one year	10(37)	17(63)	1	1	1	1
One year and above	370(81.3)	85(18.7)	7.4(3.3-16.7)	0.0001*	2.3(1.5-3.4)	0.00*

APR = Adjusted Prevalence Ratio**, CPR =** Crude Prevalence Ratio**, SMEs*** = Small and Medium Entrepreneur

Perceived Disease and Drug Effects and their Influence on Drug Uptake in Selected Villages of Ulanga District)

4.3.3. Factors associated with drug uptake in bivariate analysis in Ulanga district

Modified Poisson Bivariate regression analysis revealed ten factors to be predictors of drug uptake during MDA programs. Those factors include; understanding Onchocerciasis symptoms, Onchocerciasis targeted health education, MDA advocacy and sensitization attendance, perceived benefit of MDA sensitization, pre-MDA Heath Education, fear of MDA side effects, understanding MDA distribution interval and area respectively and perceived reasons for drug uptake. (Table 6)

Table 6: Factors associated with MDA drug uptake in bivariate analysis, in Ulanga district

Variable	MDA Drug Uptake			
	Yes	NO	CPR (95%CI)	p-value
Understanding Oncho Symptoms				
Knows symptoms	357(86.6)	55(13.4)	5.0(3.7-6.8)	0.00*
Don't know the symptoms	23(76.7)	47(23.3)	1	1
Pre MDA advocacy and sensitization attended				
Yes	208(92.9)	16(7.1)	4.7(2.8-7.1)	0.00*
No	172 (66.3)	86(33.3)	1	1
Onchocerciasis Targeted health education				
Hygiene and Ocho	118(98/3)	2(1.7)	0.2(0.05-1.13)	0.07
Other but not Ocho	78(57.1)	6(42.9)	6(2.2-16.0)	0.01*
Don't remember	176(66.7)	88(33.3)	4.7((2.1-10.3)	0.00*
Onchocerciasis only	78(92.9)	6(7.1)	1	1
Perceived impact of advocacy attended in MDA drug uptake				
Influenced next MDA	195(97.5)	5(2.5)	1	1
Didn't Influenced next uptake	185(65.6)	97(34.4)	13.8(5.7-33.2)	0.00*
Source Pre uptake Health Education				
FLHW	184(94.4)	11(5.6)	1.4(0.3-6.2)	0.65
TV and Radio	52(80)	13(20)	5(1.2- 21.2)	0.03*
Never heard	96(55.8)	76(44.2)	11(2.8-43.5)	0.00*
CDD	48(96)	2(4)	1	1
Benefit of IVM in symptoms control				
Stop Itching	325(97.3)	9(2.7)	1	1
Don't Stop Itching	37(97.4)	1(2.6)	0.97(0.12-7.5)	0.98
Don't know	18 (16.4)	92(83.6)	31(16.2.2-59.5)	0.00*

Variable	MDA Drug Uptake			
	Yes	NO	CPR (95%CI)	p-value
Perceived fear of IVM side effects				
Influenced drug uptake	83(67.5)	40(32.5)	1.8(1.3-2.6)	0.00*
Not influenced drug uptake	297(82.7)	40(17.3)	1	1
Experience of previously treated patient				
Influenced drug uptake	244(75.8)	78(24.2)	1.6(1.1-2.5)	0.02*
Not influenced drug uptake	136(85)	24(15)	1	1
Understanding MDA distribution area				
Brought at Household	175 (95.1)	9(4.9)	1	1
CDDs compound	125(68.8)	2(31.2)	0.3(0.1-1.5)	0.14
Leaders compound	78(95.1)	4(4.9)	0.9(0.3-3.1)	0.9
Don't Know	2(2.3)	87(97.7)	19(10.6-37.8)	0.00*
Understanding MDA distribution Interval:				
Once a year	311(96.6)	11 (3.4)	1	1
After every 6 months	62(89.9)	7(10.1)	2.9(1.2-7.4)	0.02*
Don't Know	7(7.7)	82(92.3)	27 (15.1-48.5)	0.00*
MDA drug distribution modality				
House to house	346(96.1)	14(3.9)	1	1
Fixed Post	33(97.1)	1(2.9)	0.8(0.1-5.6)	0.78
Don't Know	1 (1.1)	87(98.9)	25.4(15.2-42.5)	0.00*
History of previous effects following drug uptake				
At least two	267(88.1)	36(18.9)	1	1
One Effect	113(63.1)	66(36.9)	3.1(2.1- 4.5)	0.00*
Perceived reason for drug uptake:				
Fear of alcohol restriction	81(92)	7(8)	4.8(1.5-14.6)	0.007*
Prevention Effects	5(5.3)	90(94.7)	56.7(23.7-135.4)	0.00*
Side effects	294(98.3)	5(1.7)	1	1

CPR = Crude Prevalence Ratio, **IVM** = Ivermectin, **FLHW** = Front Line Health Worker

4.3.4. Factors associated with MDA drug uptake in Multivariate analysis, in Ulanga district

A stepwise modified Poisson regression model that included all thirteen exposure variables from bivariate analysis was developed. Subsequently, three independent predictors of drug uptake were identified which are; perceived benefit of IVM in symptoms control, understanding MDA distribution interval and perceived reason for drug uptake.

Understanding Ivermectin effects on symptoms was first determinant for drug uptake in the district. Proportion of drug uptake among participants who didn't know if Ivermectin has effects on reducing itching due to Onchocerciasis was about five times less compared to

participants who believed Ivermectin relieve itching and other onchocerciasis symptoms [APR = 4.7(95% CI: 1.03-21.1)].

Furthermore, understanding MDA distribution cycle was another determinant of drug uptake. Drug uptake among participant who didn't know the MDA distribution cycle was about three times less compared to participants who knew the distribution cycle was once a year in a district [APR = 4.72.5(95% CI: 1.1-6.0)].

Finally, belief in the onchocerciasis prevention effects of the IVM drugs was another determinant of drug uptake among participants. Drug uptake among participants who believed Ivermectin prevents Onchocerciasis was 13 times higher compared to those who feared Ivermectin due to side effects [APR = 13.4(95% CI:2.9-60.9)], while drug uptake among participants refrained Ivermectin because of their alcohols drinking behavior was 12 less compared to those whose drug uptake was influenced by ivermectin side effects [APR = 12(95% CI: 2.4-60.9)]

Table 7: Factors associated with MDA drug uptake in multi variate analysis, in Ulanga district

Variable	MDA Drug Uptake					
	Yes	**NO**	**CPR (95%CI)**	**p-value**	**APR (95%CI)**	**p-value**
Understanding Onchocerciasis Symptoms						
Knows symptoms	357(86.6)	55(13.4)	5.0(3.7-6.8)	0.00*	0.9(0.8-1.1)	0.38
Don't know the symptoms	23(76.7)	47(23.3)	1	1	1	1
Pre MDA advocacy and sensitization attended						
No	208(92.9)	16(7.1)	4.7(2.8-7.1)	0.00*	1.02(0.8-1.3)	0.85
Yes	172 (66.3)	86(33.3)	1	1	1	1
Onchocerciasis Targeted health education						
Hygiene and Ocho	118(98/3)	2(1.7)	0.2(0.05-1.13)	0.07	0.4(0.2-1.2)	0.12
Other but not Ocho	78(57.1)	6(42.9)	6(2.2-16.0)	0.01*	0.6(0.2-1.7)	0.33
Don't remember	176(66.7)	88(33.3)	4.7((2.1-10.3)	0.00*	0.6(0.2-1.8	0.36
Onchocerciasis only	78(92.9)	6(7.1)	1	1	1	1
Perceived impact of advocacy attended in MDA drug uptake						
Didn't Influenced	195(97.5)	5(2.5)	1	1	1	1

Variable	MDA Drug Uptake					
	Yes	NO	CPR (95%CI)	p-value	APR (95%CI)	p-value
Influenced next MDA	185(65.6)	97(34.4)	13.8(5.7-33.2)	0.00*	2.1(0.7-6.4)	0.17
Source Pre uptake Health Education						
FLHW	184(94.4)	11(5.6)	1.4(0.3-6.2)	0.65	1.5(0.8-2.6)	0.18
TV and Radio	52(80)	13(20)	5(1.2- 21.2)	0.03*	1.6(0.9-2.5)	0.07
Never heard	96(55.8)	76(44.2)	11(2.8-43.5)	0.00*	1.6(0.9-2.6)	0.05
Reference CDD	48(96)	2(4)	1	1	1	1
Benefit of IVM in symptoms control						
Stop Itching	325(97.3)	9(2.7)	1	1	1	1
Don't Stop Itching	37(97.4)	1(2.6)	0.97(0.12-7.5)	0.98	2.6(0.3-20.4)	0.38
Don't know	18 (16.4)	92(83.6)	31(16.2.2-59.5)	0.00*	4.7(1.03-21.1)	0.05*
Perceived fear of IVM side effects						
Influenced drug uptake	83(67.5)	40(32.5)	1.8(1.4-2.6)	0.00*	1.2(0.9-1.3)	0.08
Not influenced drug uptake	297(82.7)	40(17.3)	1	1	1	1
Experience of previously treated patient						
Influenced drug uptake	244(75.8)	78(24.2)	1.6(1.1-2.5)	0.02*	1.1(0.9-1.3)	0.15
Not influenced drug uptake	136(85)	24(15)	1	1	1	1
Understanding MDA distribution Interval						
Once a year	311(96.6)	11 (3.4)	1	1	1	1
After every 6 months	62(89.9)	7(10.1)	2.9(1.2- 7.4)	0.02*	1.3(0.3-5.5)	0.73
Don't Know	7(7.7)	82(92.3)	27 (15.1-48.5)	0.00*	2.5(1.1-6.0)	0.03*
History of previous effects following drug uptake						
At least two	267(88.1)	36(18.9)	1	1	1	1
One Effect	113(63.1)	66(36.9)	3.1(2.1- 4.5)	0.00*	0.9(0.8-1.1)	0.56
Perceived reason for drug uptake:						
Fear of alcohol restriction	81(92)	7(8)	4.8(1.5-14.6)	0.007*	12(2.4-60.9)	0.003*
Prevention Effects	5(5.3)	90(94.7)	56.7(23.7-135.4)	0.00*	13.4 (2.9-60.9)	0.001*
Side effects	294(98.3)	5(1.7)	1	1	1	1

4.4.Program and Community Drug Distributor (CDD) Factors and their Influence on Drug Uptake in Selected Villages of Ulanga District

In-depth interview with 9 key informants were conducted to explore the possible factors related to program organization and CDDs that affects community participation in the MDA programs. The characteristics of the key informants are reflected in table 8 below

Table 8: Characteristics of the In-depth Interview Participants

Category	Respondents N=9
Sex	
Male	5
Female	4
Level of education	
None	0
Primary Education	6
Secondary Education	1
Post-Secondary Education	2
Experience in MDA program (duration)	
0-2 year	3
3-5 years	1
6-10 years	1
≥10 years	4

Table 9: Summary of categories and subcategories of information form key informants

Subcategories	Categories
• Improper MDA timing and Frequency • Drug stock out • In adequate lower level supervision • Community sensitization and mobilization • Pre MDA training	Program delivery factors
• Misconception about infertility and birth control • Belief that they cause inflammation/swelling • Interaction with alcohol drinking • Belief that they cause death to old people	Drug/ Medicine related factors
• In adequate incentives • Size of the hamlet and workload • Lack of working tools • Selection criteria	CDD Related Factors

4.4.1. The Program Delivery Factors

Findings from in-depth interviews revealed that subcategories responsible for program delivery factors that affect drug uptake by the community members in MDA program were; Improper MDA timing and frequency, Drug stock out, In adequate lower level supervision, Community sensitization and mobilization and Pre MDA training. These were attributed by the top down directives and instructions to lower level implementers and in weak two-way communication between the implementers and coordinators.

Improper MDA timing and frequency

From the participants experience it was noted that planning to conduct MDA during farming season was a barrier to many people to participate in drug uptake. Some reasons pointed out were that the Mectizan drugs weaken their energy so once they are in the farming season, they are afraid taking them. One of the participants said:

> *"…other thing, these drugs should be distributed before they start farming, for example if distributed now, many people will take them because it is good timing, but after that some people start farming, so they reject due to that. Yes, the way I have experienced, during this time you find there is a queue of people demanding drugs…"* **(30 years, Male from Isongo)**

Also, it was reported that the disease is caused by small insects found in faming fields, therefore many people cannot avoid it. For them to be safe it is important to have two rounds of MDA, the first one before they start faming and the second one after they have done with harvesting. One participant comment this:

> *"….in addition, I advise the ministry, they should bring these MDA exercises during summer, when the people are resting. Now when they bring the MDAs during this rain period, most of the citizens are in the countryside for farming to reach them becomes a problem so it leads to low coverage…"* **(45 years Female from Togo)**

Drug stock out

Insufficient drug during MDA was another factor that was pointed out by CDDs to affect drug uptake in the community. It was noted that sometimes there is stock out while distributing, therefore some may not be able to receive the drugs.

> *"…great challenge is also encountered during MDA exercise is drug shortage, Mectizan are brought few, it is supposed that when MDA exercise commences there*

should be enough drugs for all people, rather than a few then we start looking for them…" **(30 years, Male from Isongo)**

In adequate lower level supervision

This was another factor that was highlighted by participants during interview, it was noted by several interviewees that minimal support in terms of supervision is provided to CDDs, although at the district level they were supervised.

"…No, support this is a challenge my son, they do not give support of any kind, we distribute ourselves, until we finish, we return the document…" **(40 years, Female from Isongo)**

Community sensitization and mobilization

Conducting mass sensitization and house to house sensitization was found to be one of the greatest factors that influences community participation in drug uptake. Interviewees highlighted that when sensitization is done before MDA most people participate in the drug uptake. It was further noted that in absence of support from the district program coordinators for MDA, CDD do sensation to ensure that people become aware of the MDA so that they can adhere to drug uptake.

"…we call them to the meeting we sensitize them, so when they see drugs they come here to take and others we follow them house by house…" **(49 years, Male from Mawasiliano)**

Pre MDA-Training

Another key important factor that was found to influence community adherence to drug uptake was the way training of lower level implementers is conducted. It was pointed out by respondents that if good training will be provided it will help them to address small challenges they face within the communities about the drugs. But in most cases, there has been either no training or simple orientation that does not equip the CDDs to manage well execution of the MDA program hence resulting in poor coverage.

"…Because we get them for a moment in a day, when I look at some people who have been recently chosen for example by villagers, it becomes difficult to them especially because they are taught for a short time that they don't understand…" **(50 years, Male from Uponera)**

4.4.2. Drug/Medicine Related Factors

From the participant's experiences, the main subcategories associated with drugs/medicine factors that affects drug uptake in the community were; Misconception about infertility and birth control, Belief that they cause inflammation/swelling, Interaction with alcohol drinking, Belief that they cause death to old people. These were attributed to minimal awareness about the disease and decreased number of people with typical symptoms of Onchocerciasis in the community.

Misconception about infertility and birth control

This was the greatest factor perceived to influence individual drug uptake in the community that was pointed out by almost all participants. Belief that drugs that are distributed in the community are meant for something else other than control of Onchocerciasis. Majority of people refuse taking the drugs because they believe they are brought indirectly to affect their reproductive ability and fetility.

> *"…But secondly, there are others who feel, they have bad beliefs, that these drugs may reduce reproduction potentials in them in terms of birth control for both males and females too…"* **(43 years, Female from Isongo)**

> *"…they say if you swallow this pill you won't be able to reproduce, you see yeah, so due to education as years go on, we keep on educating them…"* **(50 years, Male from Uponera)**

Belief that they cause inflammation/swelling

Other factors that affected individual drug uptake in the community was the fear that the drugs distributed in the community cause inflammation and swelling. The participants said in some of the households' people reject the drugs because they have heard that they cause body swelling, and they are even linked to hydrocele and lymphoedema therefore they refuse to take the drugs

> *"…And the other say the moment I take these drugs I got inflammation throughout my body. And it is true because some people when they took these drugs their body swells. I tell them that whoever gets inflammation it is because they do not take the drugs every year; because if you drink once and then you stop, then you must swell…"* **(52 years, Male from Mawasialino)**

Interaction with alcohol drinking

Another factor noted by the CDDs in some villages was fear that when they take drugs, they will be restricted from taking alcohol therefore they refuse taking drugs simply because they don't want to stop drinking.

> *"…In this…. village, people value alcohol a lot, so they say if we take drugs, we won't be able to take alcohol…."* **(50 years, Male from Uponera)**

> *"…But other people still insist, saying I have taken Alcohol right now should I take drugs and alcohol…"* **(43 years Female from Isongo)**

Belief that they cause death to old people

This was another important factor that was highlighted by participants in the villages that hinders some people from taking drugs. Participants said there is a belief that an old man dies once they consume the drug. This has been a hinderance to them from taking drugs. They have been associating death of the old people with Mectizan drug uptake within the village.

> *"…Reasons that may make people refuse to take drugs, first is poor understanding. For example, it happened in my village those years I remember when I was still a student; someone had swallowed the MDA drugs but later lost life (died). So, they assumed that drugs had caused him to die, but he had already developed a fever that was not known at the time…"* **(30 years Male from Isongo)**

4.4.3. CDD Related Factors

Experience from participants highlighted the factors related to CDD that affected drug uptake in the community to include; In adequate incentives, Size of the hamlet and workload, Lack of, working tools and CDD Selection criteria. In all sets of interview participants quoted one or two of these subcategories that they affected drug uptake in the community.

Inadequate incentives

This was among the major factor pointed out by the participants during interview that affected CDD performance during MDA and hence drug uptake and coverage. Participants highlighted that CDD are required to visit all households within the hamlet, however at the end are motivated enough.

> *"…For example, personally as I distribute drugs in the hamlet, the incentives I receive is very little, in fact when you go to collect registers, I get 10,000. At the end when I return the registers after MDA, I get 20,000…"* **(45 years Female from Togo)**

Size of the hamlet and workload

Participants highlighted that most of the hamlets are large in terms of geographical area and population size therefore, putting heavy workload on the CDDs. Thus, during MDA, they in large hamlets with limited working tools, they become exhausted therefore their efficiency decreases and may not visit all households especially the isolated households.

> *"…my hamlet is too large with so many people and we are only two CDDs, it would work better if we could get additional CDDs…"* **(38 years, Male from Togo)**

CDD Selection criteria

According to participants experience, most CDD were selected by virtual of their leadership position in their hamlet. This was attributed to community perception that drug distribution is voluntary, there is no financial incentives, therefore they don't like to volunteer as CDDs. Therefore, hamlet chairpersons are obliged to distribute the drugs.

> *"… initially I was selected chairman of the hamlet, because this exercise, people, because the distribution of drugs is free (voluntary) citizens do not want, that's why we chairman of the hamlet, we decide to distribute because it is part of our service to thr government…"* **(50 years, Male from Uponera)**

Lack of working tools

Participants pointed out that, drug distribution during MDA requires a lot of mobility within the hamlet, sometimes MDA is conducted during rainy season therefore working tools such as gumboots and facilitation with transport is essential. But all of them are not provided making their work too difficult. It was further highlighted that CDDs are the ones who do mobilization, but they don't have tools to facilitate mobilization.

*"…But also, the tools for example I might want to mobilize the community using megaphone. Because of the payment I get, I'm obliged to use my money to make sure the work is done and I encure transport too. All these are not provided …" (***38 years, Male from Togo)**

CHAPTER FIVE

5. DISCUSSION

5.1.Overview

Ulanga District have been implementing MDA trough Community Directed Treatment with Ivermectin (CDTI) approach for the past 20 years. Despite an average treatment coverage of 78% in the year 2017, as reported by the district, there is limited evidence of interruption of transmission within the district. There is still some uncertainty over the reported treatment coverage and the relative contribution of various programmatic and social demographic factors in sustaining optimal coverage leading to transmission interruption. This study focused on assessing reported treatment coverage and determining the factors associated with drug uptake in the community as potential explanatory factors for sustaining optimal MDA coverage with subsequent Onchocerciasis transmission interruption.

5.2 Sociodemographic determinants of drug uptake

The findings of this study indicate that, age is an important determinant for drug uptake. While participants aged 15-24 years had increased chances of drug uptake there has been no significant changes in drug uptake among people aged 35- 44 and ≥ 55 in comparison to those aged 45-54 (Table 5). This could probably be explained by the fact that people who are aged 15-24 years are either at primary or secondary school level of education, therefore easily accessible through the school system. This increase their chances for drug uptake during MDA Program, this finding is unlike findings from earlier studies (41,64) in which drug uptake was not attributable to age particularly among young adults. Further the study highlighted increased proportion of people who do not participate in MDA therefore drug uptake as you move across different age group, suggesting potential increase in the non-compliance to drug uptake in the community unlike finding from other studies that reported no significant difference in drug uptake across age groups (64,65). Participants who had lived in the area for less than one year were less likely to comply to drug uptake. This could probably be due to inadequate knowledge about Onchocerciasis, which may be attributable to minimal risk perception about the diseases and low awareness about MDA campaign. This finding is similar to other studies (51) which reported low coverage to drug uptake to be associated with living in CDTI program area for less than five years.

Ulanga district has vast fertile land and precious minerals deposits, such as spinel, gold, ruby and graphite that act as a natural factor for emigration that define its unique context and explains the existence of many community members who are not born in that area. If these unique features are not well accommodated during MDA programs it hampers the effective implementation and attainment of optimal MDA coverage.

5.3 MDA Coverage as Reported in the Registers and the Community Members

The study found low treatment coverage below the WHO recommended coverage of 85% (table 2) for Isongo, Togo, Mawasiliano and Uponera villages as recorded in the community drug distribution register. The coverage level was lower compared to that reported by the community survey for the last MDA which was 78.8%. Both the reported survey treatment coverage are lower than the WHO recommended coverage of 85%, for successful transmission interruption (72). Poor treatment coverage in areas which have been in the MDA program for a long period have been reported earlier by other research studies (17,48,62) as a probable barrier to transmission interruption. Other studies have likewise found very low coverage levels of 31% in semi urban populations (45) that could be due to occupational nature of most urban and semi urban residents, implying that during distribution they are not found at home. Understanding these dynamics forms the basis for successful MDA programs and sustaining efforts to achieve high treatment coverage.

5.4 Perceived Diseases and drug factors that determine drug uptake;

In this study it has been established that being aware of the; potential of IVM to prevent Onchocerciasis transmission, adverse effects due to Ivermectin uptake and understanding the distribution interval have influence on drug uptake during MDA. Drug uptake was observed to be high among participants who were influenced by possible prevention effects of Ivermectin towards Onchocerciasis ($p<0.00$). This could have been attributed to decreased number of people with visible signs of Onchocerciasis in the community thus increasing the community's belief on the impact of the drugs. This finding is comparable to a previous study in Cameroon (8) which reported that about three quarters of the people who complied to CTDI; believed in the effectiveness of the Ivermectin drugs. Similarly a study conducted in Bukinafaso indicated high compliance to drug uptake among people who were attracted by Ivermectin benefits than the rest (66).

Furthermore, participants who feared Ivermectin side effects had increased likelihood of not complying to drug uptake, compared to those who did not consider side effects as a hinderance to drug uptake. This may be due to misconceptions and myths about IVM drugs that exist in most communities such as attributing Ivermectin effects to male impotence and body swelling, thus resulting in poor acceptance of preventive services; such misconceptions are likely to extend to other programs like drug distribution programs and vaccination. Along the same lines William and Fed *et al* (2016, 2005) conducted a study in Tanzania and Uganda respectively that pointed out several misconceptions about Ivermectin drugs such as associating Ivermectin with male impotency, death and body swelling that leads to noncompliance to drug uptake (65).

On the other hand, understanding MDA distribution interval were found to have influence on drug uptake. Participants who did not know the MDA distribution cycle that is after how long they should take next round of drugs during MDA had lower drug uptake in the community. This increases the possibility of missing drugs in several distribution cycles uptake compared to those who knew when they were supposed to take drug for at least once every year. This could have been due to lack of awareness campaigns leading to inadequate community sensitization before drug distribution during MDA. Unlike findings from earlier research that found limited association between drug uptake and knowledge of MDA rounds (41), this study established that there is a relationship between knowledge of the MDA rounds and compliance to drug uptake (table 7).

There is a possibility that these instrinsic characteristics for drug recipients within Ulanga district were overlooked, therefore explaining consistent low coverages reported by both program and various study surveys within the district. It is therefore important that these factors are well articulated in MDA campaign to attain recommended coverage and accelerate the pace towards controland elimination.

5.5 Program delivery and CDD related factors that determine drug uptake

Results from in-depth interviews suggests that the main factors which may affect drug uptake during MDA can be categorized into three key areas, programmatic delivery factors, drug/medicine related factors and CDDs factors.

Planning MDA campaign during farming season, according to CDDs, causes many people to miss drugs because of their migratory nature during this period. They spend daytime in farms and return in the evening, CDDs visits are conducted during the day and therefore they are not found at their homes. Similarly a study conducted in Kenya indicated that conducting MDA in areas whose residents engages in subsistent livelihood activities such as farming and fishing was attributed to low coverage during MDA(41). Drug stock out during MDA was an exclusive finding that affected drug uptake in the community. This could be due to underestimates of the eligible population and minimal involvement of health workers and village leaders during MDA planning. Even though there could be enough drugs supplied by the National program, the questions arise in relation to drug management and supply system within the district. On the other hand, the study found that there is minimal supervision during MDA, this has been implicated with low effectiveness in drug distribution by the CDD since there is minimal follow-up and monitoring of their work(40). Several factors may be implicated for inadequate supervision by the district which may include but not limited to insufficient resources and transport to cover all areas within the district. However, with proper pre-MDA planning it is possible to plan cascaded supervision using the extension field staff available in wards and villages. The current study found community sensitization and mobilization to be an important factor that influenced community participation in the MDA with subsequent drug uptake. Sufficient sensitization has been explained by earlier research to be an important component of the program for the success of the CDTI and increased compliance to drug uptake (61,64).

Pre MDA training for CDDs has been found to be an important determinant of drug uptake. according to CDDs if they are well trained, they feel more motivated to perform drug distribution. May be because they become knowledgeable enough, to respond to issues that could be raised during the drug distribution process in the community and feeling that they have acquired a different social status in the community. Along the same lines this finding is comparable to other studies that have documented good performance of the CDDs based on training they received whose reflection had been on good MDA coverage (60).

In this study we found that beliefs and misconceptions about the Ivermectin drugs have had negative influence on compliance to drug uptake. Community members believe that the drugs

being distributed can either affect their reproductive functions like causing impotence in men or cause other effects to the body such as swelling and death. This could be attributed to low awareness among the participants that need special attention. Negative beliefs, myths and misconceptions found in this study are analogous to the findings of earlier studies that documented swelling and impotence as barriers to drug adherence among the studied communities (46,60). However, belief that the Ivermectin drugs could kill older people is a unique finding for this study. Moreover, low compliance to drug uptake was found to be associated with fear of restriction from taking alcohol after taking the drugs; may be due to preconceived knowledge that medicine, and alcohol don't go together, but also fear that drugs could react with the alcohol. These findings are correspond to what was reported by Lakwo *et al* (61) in Rungwe community that people who drink alcohol had low compliance to Ivermectin due to their drinking behavior.

With respect to CDDs' motivation and performance and their influence on drug uptake; the study found factors such as inadequate incentives, size of the hamlet, workload and selection criteria to be potential determinants of drug uptake.

CDDs were selected by virtual of their leadership status in the community. Most of the CDDs were either hamlet leaders or had previously saved as hamlet leaders. Only two CDDs were found to have been selected based on the recommendation of the community meeting as directed by the CDTI program. This may be attributable to the voluntary nature of the work and minimal incentive package itself. A hamlet leader to save as a CDD implies commitment to visit every household for drug distribution unlike voluntary CDDs. A study that systematically reviewed factors that influenced CDDs motivation to drug uptake from 10 different counties showed that CDDs who were selected by their peer were more likely to perform better than those selected by default by their status (67). This finding may be providing an alternative explanation for the low treatment coverage in the area. Inadequate incentives and workload were another CDDs related factor that was found to affect drug uptake. Increased workload may be due to size of the hamlets and population while earning minimal incentives may demoralize CDDs and therefore affect their performance. This may extend to their ability to visit and revisit every household within their jurisdiction to ensure no

one who is eligible is left unattended. Other authors have indicated the influence of incentive and workload in determining performance of CDD during MDA programs (9,62,74).

Attainment of 2025 national and global target for Onchocerciasis elimination in Ulanga requires adoption of a system tactic to reduce challenges to the implementation process of MDA for Onchocerciasis. These findings point to important factors for the MDA programs to reinforce including but not limited to health education campaigns tailored at tackling negative community feelings and perceptions. Similarly, MDA implementation should thoroughly consider the drug uptake determinants that have been outlined in this study, underscore their significance to the context of Ulanga district and develop a plan to explicitly discourse these issues in advance to attain and sustain optimal coverage with subsequent transmission interruption and elimination of onchocerciasis

5.6 Limitations of the Study

The main limitation of our study was the fact that investigations were conducted four to five months after the last MDA distribution paving a way for the recall bias. Nevertheless, we believe that our results concerning the treatment coverage and compliance to drug uptake are reliable; because we first reviewed all the records available in the community register of the study area and cross checked with the records at the district level. Also, the uniqueness of ivermectin tablets themselves in terms of both physical appearance (small and white) and their distribution strategy makes the treatment cycle easily remembered

CHAPTER SIX

6. CONCLUSION AND RECOMMENDATIONS

6.1.CONCLUSION

i) Although MDA has been implemented in Ulanga district for the past 20 years there is still low compliance to drug uptake by individuals in the community. This study has demonstrated low coverage of drug uptake as recorded in the community drug distribution register which indicates that the effectiveness of the MDA activities was not up to the recommended level.

ii) Age and duration that the individual has lived in the community are important socio demographic determinants for drug uptake. The longer the person lives in the community the higher the chance of compliance to drug uptake. Young adults contributed positively to drug uptake and compliance.

iii) Belief in the prevention effects and understanding the pattern of MDA distribution interval contributed positively to drug uptake while fear of Ivermectin side effects affected individual participation and compliance to drug uptake.

iv) Misconceptions about ivermectin drugs specifically the belief that drugs causes impotence and sterility, swelling as well as death affected participation in the MDA program and compliance to drug uptake.

v) Timing of MDA campaign, Community sensitization and drug stockout contributed negatively to drug uptake and community compliance. Factors such as CDDs selection criteria, inadequate incentives to CDDs, hamlet size and workload, and lack of working tools were found to negatively affect compliance to drug uptake

6.2.RECOMMENDATIONS

Coverage review surveys should be undertaken immediately after MDA campaign so that there is alignment between the reported data and actual treatment coverage reported in the community register.

To improve future compliance to drugs uptake the innovative approaches to social mobilization through community led health education campaingns and integration with existing health promotion should be considered not only to address drug misconceptions but also to intensify awareness of the benefits of ivermectin in Onchocerciasis control and MDA distribution cycles.

CDDs' motivation should be improved including the training package they receive to enable them to effectively carry out MDA campaigns. CDDs should be encouraged to execute a mop up campaign once low treatment coverage has been observed in their respective areas.

MDA should be planned to take place during the dry season where the chances of finding a maximum number of people in their homes during MDA distribution can be guaranteed. Efforts should be made to identify and persuade new residents to comply to drug uptake.

Finally, consideration for semi-annual distribution should be made and implemented.

Potential for future studies

This study assessed MDA coverage and compliance to drug uptake as one of the important requirements for Onchocerciasis transmission interruption. Further studies should be undertaken to investigate the possibility of existence of an *Onchocerca volvulus* drug resistant strain in both the vector species and the human population. Taking into account that Ivermectin has no lethal effects on adults' filarial worms, Therefore, there is need to further studies to explore the possibility of introducing a new drug like Moxidectin which is more effective than Ivermectin or a second drug with lethal effects on adults' filarial worms that will be used in combination with Ivermectin to accelerate transmission interruption and subsequent Onchocerciasis elimination. The generated information would be valuable for developing an alternative strategy for Onchocerciasis transmission interruption and elimination.

7. REFERENCES

1. Katabarwa MN, Walsh F, Habomugisha P, Lakwo TL, Agunyo S, Oguttu DW, Unnasch TR, Unoba D, Byamukama E, Tukesiga E, Ndyomugyenyi R. Transmission of onchocerciasis in Wadelai focus of northwestern Uganda has been interrupted and the disease eliminated. Journal of parasitology research. 2012;2012.

2. Kirk R. Observations on onchocerciasis in the Bahr-el-Ghazal Province of the Sudan. Annals of Tropical Medicine & Parasitology. 1947 Dec 1;41(3-4):357-64.

3. Keenan JD, Hotez PJ, Amza A, Stoller NE, Gaynor BD, Porco TC, Lietman TM. Elimination and eradication of neglected tropical diseases with mass drug administrations: a survey of experts. PLoS neglected tropical diseases. 2013 Dec 5;7(12):e2562.

4. Lakwo T, Garms R, Wamani J, Tukahebwa EM, Byamukama E, Onapa AW, Tukesiga E, Katamanywa J, Begumisa S, Habomugisha P, Oguttu D. Interruption of the transmission of Onchocerca volvulus in the Kashoya-Kitomi focus, western Uganda by long-term ivermectin treatment and elimination of the vector Simulium neavei by larviciding. Acta tropica. 2017 Mar 1;167:128-36.

5. Okeibunor JC, Amuyunzu-Nyamongo M, Onyeneho NG, Tchounkeu YFL, Manianga C, Kabali AT, et al. Where would I be without ivermectin? Capturing the benefits of community-directed treatment with ivermectin in Africa. Trop Med Int Heal. 2011;16(5):608–21.

6. Turner HC, Walker M, Churcher TS, Basáñez MG. Modelling the impact of ivermectin on River Blindness and its burden of morbidity and mortality in African Savannah: EpiOncho projections. Parasites and Vectors. 2014;

7. Dyson L, Stolk WA, Farrell SH, Hollingsworth TD. Measuring and modelling the effects of systematic non-adherence to mass drug administration. Epidemics. 2017 Mar 1;18:56-66.

8. Dissak-Delon FN, Kamga GR, Humblet PC, Robert A, Souopgui J, Kamgno J, Essi MJ, Ghogomu SM, Godin I. Adherence to ivermectin is more associated with perceptions of community directed treatment with ivermectin organization than with onchocerciasis beliefs. PLoS neglected tropical diseases. 2017 Aug 14;11(8):e0005849..

9. Emukah EC, Enyinnaya U, Olaniran NS, Akpan EA, Hopkins DR, Miri ES, et al. Factors affecting the attrition of community-directed distributors of ivermectin , in an onchocerciasis-control programme in the Imo and Abia states of south – eastern. 2008;102(1):45–51.

10. Brieger WR, Okeibunor JC, Abiose AO, Wanji S, Elhassan E, Ndyomugyenyi R, et al. Compliance with eight years of annual ivermectin treatment of onchocerciasis in

Cameroon and Nigeria. Parasit Vectors. 2011;4(1):152.

11. Cantey P. Weekly Epidemiological Record. 2017;92(45):681–700. Available from: http://www.who.int/wer

12. Donadeu M, Lightowlers MW, Fahrion AS, Kessels J, Abela-Ridder B. Weekly epidemiological record: relevé épidémiologique hebdomadaire. Wkly Epidemiol Rec [Internet]. 2009;III(47):445–52. Available from: http://orton.catie.ac.cr/cgi-bin/wxis.exe

13. Hollows F, International HK. Tanzania Work Plan. 2019;(October 2015).

14. World Health Organization. Report of the twenty-eighth session of the Technical Consultative Committee (TCC): Ouagadougou, 09-14 March 2009. African Programme for Onchocerciasis Control; 2009.

15. Greter H, Mmbando B, Makunde W, Mnacho M, Matuja W, Kakorozya A, Suykerbuyk P, Colebunders R. Evolution of epilepsy prevalence and incidence in a Tanzanian area endemic for onchocerciasis and the potential impact of community-directed treatment with ivermectin: a cross-sectional study and comparison over 28 years. BMJ open. 2018 Mar 1;8(3):e017188.

16. Tekle AH, Zouré HG, Noma M, Boussinesq M, Coffeng LE, Stolk WA, Remme JH. Progress towards onchocerciasis elimination in the participating countries of the African Programme for Onchocerciasis Control: epidemiological evaluation results. Infectious diseases of poverty. 2016 Dec;5(1):66.

17. Mmbando BP, Suykerbuyk P, Mnacho M, Kakorozya A, Matuja W, Hendy A, Greter H, Makunde WH, Colebunders R. High prevalence of epilepsy in two rural onchocerciasis endemic villages in the Mahenge area, Tanzania, after 20 years of community directed treatment with ivermectin. Infectious diseases of poverty. 2018 Dec;7(1):64.

18. Hendy A, Krüger A, Pfarr K, De Witte J, Kibweja A, Mwingira U, Dujardin JC, Post R, Colebunders R, O'Neill S, Kalinga A. The blackfly vectors and transmission of Onchocerca volvulus in Mahenge, south eastern Tanzania. Acta tropica. 2018 May 1;181:50-9.

19. Crump A, Omura S. Ivermectin,'wonder drug'from Japan: the human use perspective. Proceedings of the Japan Academy, Series B. 2011 Feb 10;87(2):13-28.

20. Gonzalez P, A. Gonzalez F, Ueno K. Ivermectin in Human Medicine, An Overview of the Current Status of Its Clinical Applications. Curr Pharm Biotechnol. 2012;13(6):1103–9.

21. Gunawardena S, Ismail M, Bradley M, Karunaweera N. Factors influencing drug compliance in the mass drug administration programme against filariasis in the Western province of Sri Lanka. Trans R Soc Trop Med Hyg. 2007;101(5):445–53.

22. Symptoms S, America L. Onchocerciasis Key facts. 2018;(March):1–5.

23. Panic G, Duthaler U, Speich B, Keiser J. Repurposing drugs for the treatment and control of helminth infections. International Journal for Parasitology: Drugs and Drug Resistance. 2014 Dec 1;4(3):185-200.

24. Basáñez MG, Sébastien DS, Churcher TS, Breitling LP, Little MP, Boussinesq M. River blindness: a success story under threat? PLoS medicine. 2006 Sep 26;3(9):e371.

25. Agency US, Development I, Burnham G, Brieger W. USAID Neglected Tropical Disease Program 2016 Evaluation. 2018;(March).

26. Ibe O, Onwujekwe O, Uzochukwu B, Ajuba M, Okonkwo P. Exploring consumer perceptions and economic burden of onchocerciasis on households in Enugu state, south-East Nigeria. PLoS neglected tropical diseases. 2015 Nov 30;9(11):e0004231.

27. Treatment M, For C. United Republic of Tanzania and neglected tropical diseases. 2016;

28. World Health Organization. Conceptual and operational framework of onchocerciasis elimination with ivermectin treatment. African Programme for Onchocerciasis Control; 2010.

29. Taylor MJ, Awadzi K, Basáñez MG, Biritwum N, Boakye D, Boatin B, Bockarie M, Churcher TS, Debrah A, Edwards G, Hoerauf A. Onchocerciasis control: vision for the future from a Ghanian perspective.

30. Mweya CN, Kalinga AK, Kabula B, Malley KD, Ruhiso M, Maegga BT. Onchocerciasis situation in the Tukuyu focus of southwest Tanzania after ten years of ivermectin mass treatment. Tanzania Journal of Health Research. 2007;9(3):174-9.

31. Sauerbrey M, Rakers LJ, Richards FO. Progress toward elimination of onchocerciasis in the Americas. International health. 2018 Feb 19;10(suppl_1):i71-8.

32. Turner HC, Walker M, Churcher TS, Osei-Atweneboana MY, Biritwum NK, Hopkins A, Prichard RK, Basáñez MG. Reaching the London Declaration on Neglected Tropical Diseases goals for onchocerciasis: an economic evaluation of increasing the frequency of ivermectin treatment in Africa. Clinical Infectious Diseases. 2014 Jul 18;59(7):923-32.

33. Rebollo MP, Zoure H, Ogoussan K, Sodahlon Y, Ottesen EA, Cantey PT. Onchocerciasis: shifting the target from control to elimination requires a new first-step—elimination mapping. International health. 2018 Feb 19;10(suppl_1):i14-9.

34. Higazi TB, Zarroug IM, Mohamed HA, ElMubark WA, Deran TC, Aziz N, Katabarwa M, Hassan HK, Unnasch TR, Mackenzie CD, Richards F. Interruption of Onchocerca volvulus transmission in the Abu Hamed focus, Sudan. The American journal of tropical medicine and hygiene. 2013 Jul 10;89(1):51-7.

35. World Health Organization. Uniting to combat neglected tropical diseases. London Declaration on Neglected Tropical Diseases. 2012.

36. Kuesel AC. Research for new drugs for elimination of onchocerciasis in Africa. International Journal for Parasitology: Drugs and Drug Resistance. 2016 Dec 1;6(3):272-86.

37. Taylor HR. Recent developments in the treatment of onchocerciasis. Bulletin of the World Health Organization. 1984;62(4):509.

38. Boussinesq M. A new powerful drug to combat river blindness. The Lancet. 2018 Oct 6;392(10154):1170-2.

39. Yirga D, Deribe K, Woldemichael K, Wondafrash M, Kassahun W. Factors associated with compliance with community directed treatment with ivermectin for onchocerciasis control in Southwestern Ethiopia. Parasites & vectors. 2010 Dec;3(1):48.

40. Silumbwe A, Zulu JM, Halwindi H, Jacobs C, Zgambo J, Dambe R, Chola M, Chongwe G, Michelo C. A systematic review of factors that shape implementation of mass drug administration for lymphatic filariasis in sub-Saharan Africa. BMC Public Health. 2017 Dec;17(1):484.

41. Njomo DW, Amuyunzu-Nyamongo M, Mukoko DA, Magambo JK, Njenga SM. Socioeconomic factors associated with compliance with mass drug administration for lymphatic filariasis elimination in Kenya: descriptive study results. Annals of Tropical Medicine and Public Health. 2012 Mar 1;5(2):103.

42. Njomo DW. Factors Influencing Compliance with Mass Treatment in the National Programme for the Elimination of Lymphatic Filariasis in Kenya (Doctoral dissertation).

43. Amuyunzu-Nyamongo M, Tchounkeu YF, Oyugi RA, Kabali AT, Okeibunor JC, Manianga C, Amazigo UV. Drawing and interpreting data: Children's impressions of onchocerciasis and community-directed treatment with ivermectin (CDTI) in four onchocerciasis endemic countries in Africa. International journal of qualitative studies on health and well-being. 2011 Jan 1;6(2):5918.

44. World Health Organization. Report of the external mid-term evaluation of the African Programme for Onchocerciasis Control. African Programme for Onchocerciasis Control; 2010.

45. Griswold E, Eigege A, Ityonzughul C, Emukah E, Miri ES, Anagbogu I, Saka YA, Kadiri S, Adelamo S, Ugbadamu P, Ikogho C. Evaluation of treatment coverage and enhanced mass drug administration for onchocerciasis and lymphatic filariasis in five local government areas treating twice per year in Edo State, Nigeria. The American journal of tropical medicine and hygiene. 2018 Aug 2;99(2):396-403.

46. Kamga GR, Dissak-Delon FN, Nana-Djeunga HC, Biholong BD, Ghogomu SM, Souopgui J, Kamgno J, Robert A. Audit of the community-directed treatment with ivermectin (CDTI) for onchocerciasis and factors associated with adherence in three regions of Cameroon. Parasites & vectors. 2018 Dec;11(1):356.

47. Parlewar R, Bhatia KS, Rathore M, Dadwal D. Global Journal of Medicine and Public Health.

48. 1. Nayak S.K, Thorat S.B KN. Reaching the unreached. Indian J Lepr. 2004;76(2):175.

49. Duamor CT, Datchoua-Poutcheu FR, Ndongmo WP, Yoah AT, Njukang E, Kah E, Maingeh MS, Kengne-Ouaffo JA, Tayong DB, Enyong PA, Wanji S. Programmatic factors associated with the limited impact of Community-Directed Treatment with Ivermectin to control Onchocerciasis in three drainage basins of South West Cameroon. PLoS neglected tropical diseases. 2017 Nov 20;11(11):e0005966.

50. Kisoka WJ, Tersbøl BP, Meyrowitsch DW, Simonsen PE, Mushi DL. Community Members'perceptions of Mass Drug Administration for Control of Lymphatic Filariasis in Rural and Urban Tanzania. Journal of biosocial science. 2016 Jan;48(1):94-112.

51. Senyonjo L, Oye J, Bakajika D, Biholong B, Tekle A, Boakye D, Schmidt E, Elhassan E. Factors associated with ivermectin non-compliance and its potential role in sustaining Onchocerca volvulus transmission in the west region of Cameroon. PLoS neglected tropical diseases. 2016 Aug 16;10(8):e0004905.

52. Njomo DW, Amuyunzu-Nyamongo M, Magambo JK, Njenga SM. The Role of Personal Opinions and Experiences in Compliance with Mass Drug Administration for Lymphatic Filariasis Elimination in Kenya. PLoS One. 2012;7(11).

53. Fobi G, Yameogo L, Noma M, Aholou Y, Koroma JB, Zouré HM, Ukety T, Lusamba-Dikassa PS, Mwikisa C, Boakye DA, Roungou JB. Managing the fight against onchocerciasis in Africa: APOC experience. PLoS neglected tropical diseases. 2015 May 14;9(5):e0003542.

54. Lawrence J, Sodahlon YK, Ogoussan KT, Hopkins AD. Growth, Challenges, and Solutions over 25 Years of Mectizan and the Impact on Onchocerciasis Control. PLoS Negl Trop Dis. 2015;9(5):e0003507.

55. Guevara Á, Lovato R, Proaño R, Rodriguez-Perez MA, Unnasch T, Cooper PJ, Guderian RH. Elimination of onchocerciasis in Ecuador: findings of post-treatment surveillance. Parasites & vectors. 2018 Dec;11(1):265.

56. Shuford KV, Turner HC, Anderson RM. Compliance with anthelmintic treatment in the neglected tropical diseases control programmes: a systematic review. Parasites & vectors. 2016 Dec;9(1):29.

57. Katabarwa MN, Eyamba A, Nwane P, Enyong P, Yaya S, Baldiagaï J, Madi TK, Yougouda A, Andze GO, Richards FO. Seventeen years of annual distribution of ivermectin has not interrupted onchocerciasis transmission in North Region, Cameroon. The American journal of tropical medicine and hygiene. 2011 Dec 1;85(6):1041-9.

58. Cantey PT, Roy SL, Boakye D, Mwingira U, Ottesen EA, Hopkins AD, Sodahlon YK. Transitioning from river blindness control to elimination: steps toward stopping treatment. International health. 2018 Feb 19;10(suppl_1):i7-13.

59. Alonso LM, Ortiz ZH, Garcia B, Nguema R, Nguema J, Ncogo P, Gárate T, González-Escalada A, Benito A, Azcarraga PA. Knowledge, attitudes, and practices toward onchocerciasis among local population in Bioko Island, Equatorial Guinea. Annals of Tropical Medicine and Public Health. 2017 Sep 1;10(5):1228.

60. York KJ, Kabole I, Mrisho M, Berry DM, Schmidt E. Factors affecting community participation in the CDTI program in Morogoro, Tanzania. Journal of Nursing Scholarship. 2015 Jan;47(1):96-104.

61. Lakwo TL, Gasarasi DB. Non-adherence to community directed treatment with ivermectin for onchocerciasis control in Rungwe district, southwest Tanzania. East African medical journal. 2006;83(6):326-32.

62. Fleming FM, Matovu F, Hansen KS, Webster JP. A mixed methods approach to evaluating community drug distributor performance in the control of neglected tropical diseases. Parasites & vectors. 2016 Dec;9(1):345.

63. Boussinesq M, Fobi G, Kuesel AC. Alternative treatment strategies to accelerate the elimination of onchocerciasis. International health. 2018 Feb 19;10(suppl_1):i40-8.

64. Ndyomugyenyi R, Byamungu A, Korugyendo R. Perceptions on onchocerciasis and ivermectin treatment in rural communities in Uganda: implications for long-term compliance. International health. 2009 Dec 1;1(2):163-8.

65. Nuwaha F, Okware J, Ndyomugyenyi R. Predictors of compliance with community-directed ivermectin treatment in Uganda: quantitative results. Tropical medicine & international health. 2005 Jul;10(7):659-67.

66. Brieger WR, Okeibunor JC, Abiose AO, Ndyomugyenyi R, Wanji S, Elhassan E, Amazigo UV. Characteristics of persons who complied with and failed to comply with annual ivermectin treatment. Tropical Medicine & International Health. 2012 Jul;17(7):920-30.

67. Krentel A, Gyapong M, Mallya S, Boadu NY, Amuyunzu-Nyamongo M, Stephens M, McFarland DA. Review of the factors influencing the motivation of community drug distributors towards the control and elimination of neglected tropical diseases (NTDs). PLoS neglected tropical diseases. 2017 Dec 6;11(12):e0006065.

68. Gardon J, Gardon-Wendel N, Kamgno J, Chippaux JP, Boussinesq M. Serious reactions after mass treatment of onchocerciasis with ivermectin in an area endemic for Loa loa infection. The Lancet. 1997 Jul 5;350(9070):18-22.

69. Bennett S, Woods T, Liyanage WM, Smith DL. A simplified general method for cluster-sample surveys of health in developing countries.

70. Sandelowski M. Combining qualitative and quantitative sampling, data collection, and analysis techniques in mixed-method studies. Research in nursing & health. 2000 Jun;23(3):246-55.

71. Vukojević B. Creswell JW: Research design: Qualitative, quantitative, and mixed approaches, London: Sage publications, 2009. Politeia. 2016; 6 (12): 191-4.72. WHO Certification of Elimination of Onchocerciasis 2001.pdf.

73. World Health Organization. Certification of elimination of human onchocerciasis: criteria and procedures. Geneva: World Health Organization; 2001.

74. York KJ. The Community Health Workers' Role in the Community-Directed Treatment with Ivermectin Program in the Morogoro Rural District of Tanzania (Doctoral dissertation, University of Cincinnati)

APPENDICES

Appendix 1A: Informed Consent Form- English Version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

ID- NO | | | | | | | | | | |

Consent to Participate in a Research

Greetings! My name is.....From the Muhimbili University of Health and Allied Sciences carrying out a research aimed at determining the Mass Drug Administration Coverage and determinants of individual drug uptake in the MDA program in Ulanga district

Purpose of the Study

This study has the purpose of collecting information on determinants of drug uptake in mass drug administration programs for onchocerciasis elimination in Ulanga districts, Morogoro Tanzania. You are requested to participate in this study because you have relevant information and experiences that possibly will be significant to the study.

Confidentiality

I reassure you all information we collect on the tablets or forms will be entered into computer with only the unique identification number and that the information will be strictly confidential. Only people who are involved in this study will have access to the information of this study. We will be compiling a report which will contain responses from all research subject involved in this study. Your name will not appear in the report or other information that will identify you or the records you provided

What Participation Involved

If you consent to participate in this study, you will be required to answer a series of questions that have been prepared for the study through questionnaire in order to obtain the intended information regarding determinants of drug uptake on the mass drug administration campaigns in this area.

Rights to withdraw and alternatives

Taking part in this study is completely your choice. If you choose not to respond to any question asked you won't be penalized. You can stop participating in this study any time even if you have already given your consent. Refusal to participate or withdraw from the study will not involve penalty or restriction to receive drugs in the further MDA rounds

Benefits

We hope that the information will provide essential data to assess the potential determinants for an individual and community to accept ivermectin drugs during MDA. Study results will provide evidence-based decisions when planning for further MDA programs in order to achieve onchocerciasis elimination goal in Tanzania.

Who to contact?

If you ever have questions about this study, you should contact the study coordinator Ambakisye K. Mhiche of Muhimbili University of Health and Allied Sciences, P.O. Box 65001, Dar es Salaam. If you ever have questions about your rights as a participant, you may call

Chairperson of the Senate Research and Publications Committee,

Telephone No. 2150302- 6 or 2152489.

P.O. Box 65001

DAR ES SALAAM

Signature:

Do you agree?

Participant agrees.....Participants does NOT agree…….....

I .....have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant.....

Signature of research assistant.....

Date of Signed consent.....

Appendix 1B: Informed Consent Form- Kiswahili Version

CHUO KIUU CHA AFYA NA SAYANSI SHRIKISHI MUHIMBILI

Na. ya Fomu | | | | | | | | | | | |

Fomu ya ridhaa kushiriki kwenye Utafiti

Ridhaa kushiriki kwenye utafiti

Habari za sahizi/ habari za leo! ---------- Shikamoo

Ninaitwa_____ Ninafanya utafiti juu ya sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji wa dawa za Kinga Tiba ili kudhibiti na kutokomeza ugonjwa wa Usubi katika wilaya ya Ulanga.

Madhumuni ya utafiti

Lengo la utafiti huu ni kuchunguza sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji wa dawa za Kinga Tiba ili kudhibiti na kutokomeza Usubi katika wilaya ya Ulanga. Ili kutambua ni sababu gazi zinaweza msukuma mwananchi kumeza au kutokumeza dawa wakati wa zoezi la ugawaji dawa za Kinga Tiba katika jamii. Unaombwa kushiriki katika utafiti huu kwasababu taarifa utakazotoa zitakua na umuhimu mkubwa katika utafiti huu

Usiri

Napenda kukuhakikishia kwamba taarifa tutakazojaza kwenye simu au fomu hii zitaingizwa kwenye kompyuta yenye namba maalumu za siri na kwamba taarifa hizi zitatunzwa kwa usiri mkubwa.

Baada ya ukusanyaji wa taarifa zote, itaandaliwa ripoti ya utafiti huu, katika ripoti hiyo, jina la mtu aliyeshiriki kutoa taarifa halitatajwa wala utambulisho wowote mwingine hautaoneshwa kwenye ripoti hiyo. Namba iliyowekwa kwenye fomu ya dodoso ndio itatumika kama utambulisho wa taarifa utakayotoa.

Nini kinahitajika ili kushiriki

Ukiridhia kushiriki katika utafiti huu, utatakiwa kujibu maswahi kadhaa yaliyopo kwenye dodoso ili kuweza kupata taarifa muhimu kuhusu sababu zinazomfanya mtu kukubali au kukataa kumeza dawa za kingatiba.

Faida

Taarifa unazotoa kwenye utafiti huu zitasaidia sana katika kujua sababu zinazochangia mtu kukubali au kukataa kumeza dawa wakati wa kampeni ya kumezesha dawa za KingaTiba. Taarifa hizo zitatumika na Wizara ya Afya na wadau wa maendeleo kupitia Mpango wa Taifa wa Kudhibiti Magonjwa Yaliyokuwa Hayapewi Kipaumbele kujipanga na kuboresha kampeni ya umezeshaji wa dawa za Kinga Tiba katika jamii.

Haki ya kujitoa au vinginevyo

Kushiriki katika utafiti huu ni hiari na sio lazima. Hivyo unaweza kuamua kutoendelea kwenye utafiti huu wakati wowote na hakutakua na adhabu wala hutapoteza haki yako yoyote na wala hautanyimwa dawa wakati wa kampeni ya umezeshaji dawa ukifika.

Nani wa kuwasiliana naye

Kama una swali lolote kuhusiana na utafiti huu tafadhali wasiliana na Mtafiti Mkuu anayeratibu utafiti huu Ndugu **Ambakisye Kuyokwa Mhiche** (Simu; 0757487278).

Kwa maswali zaidi unaweza kuwasiliana Mwenyekiti wa Kamati ya Utafiti na Machapisho wa Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili.

Simu Na. 2150302- 6 au 2152489.

S.L.P 65001

DAR ES SALAAM

Je, Umekubali?

Mshiriki amekubali ( ), Mshiriki hajakubali ( )

Mimi_____nimesoma/nimeelezewa na kuridhia maelezo yote yaliyotolewa katika fomu hii, hivyo kwa ridhaa yangu mwenyewe nakubali kushiriki katika utafiti huu.

Saini ya Mshiriki_____

Sahihi ya mtafiti msaidizi_____

Tarehe _____

Appendix 2A: Questionnaire

Muhimbili University of Health and Allied Sciences

Tanzania Field Epidemiology and Laboratory Training Program (TFELTP)

Project Title: Assessment of Mass Drug Administration Coverage and Determinant of Drug uptake for Elimination of Onchocerciasis in Ulanga District

Community Questionnaire

Identiification :

Questionnaire No…… District……..……

Village……..…… Interviewer…….

Introduction:

Thank you for agreeing to answer these questions about predictors of drug uptake against Onchocerciasis. This questionnaire will take 15-20 minutes and will focus on Onchocerciasis preventive chemotherapy in your hamlet and the factors that influence individual uptake of the drugs during MDA. Please feel free to ask for clarification if there is anything you haven't understood.

Your responses in this interview are confidential and your name will not be linked to this interview only numbers are used

A) Social Demographic Characteristics

1. **Gender……**
2. **Age…….**
3. **Education level**
   a) None ()
   b) Primary education ()
   c) Secondary education ()
   d) College/University education ()
4. **Occupation**
   a) Student
   b) Peasant
   c) HCW
   d) Teacher
   e) Extension worker
   f) Other
5. **Employment Status**
   a) Self employed
   b) Public servant
   c) Private sector employee
   d) Business
   e) Subsistence farming
6. **Marital Status**
   a) Single
   b) Married/Cohabiting
   c) Divorced
   d) Widow

7. **Length of stay in the village**
    a) Less than a year
    b) One year
    c) Two years and above

B) Community perceived disease and drug effects that influence drug uptake uptake

8. Have you ever heard of the diseases called Onchocerciasis……? (Yes / No)

    If the answer is No go to question 18

9. Which of the following are the signs/symptoms of Onchocerciasis?
    a. Severe itching
    b. Headache
    c. Nodule under the skin
    d. Diarrhea and vomiting
    e. Difficulty in breathing

10. **Which of the following are the effects of Onchocerciasis to the affected person?**
    a. Blindness or visual impairment
    b. Lizard like skin
    c. Leopard like skin

11. **Do you know that Onchocerciasis can be prevented and controlled through community drug distribution ……? (Yes No)**

    If the answer is No, go to question 19

12. **Would you please tell me how often the drugs to treat/block transmission of Onchocerciasis are given?**
    a. After every six months
    b. Once a year
    c. Every two years
    d. I don't know

13. **Please tell me if you have ever been taken drugs to treat/block transmission Onchocerciasis for the past 5 years? if you haven't please skip to question number 15**
    a. I have taken once
    b. I have taken several times

c. I have never taken the drugs
d. I don't remember if I have taken the drugs for Onchocerciasis

14. **Which of the following reasons have influenced your decision to accept drug uptake?**
    a. Information that they boost body activeness made me regularly take them as they are distributed
    b. Since they help to prevent the disease, I decided to take them regularly
    c. Once I received them, I was cured from other diseases, so I decided to never miss the drugs

    Other specify …….

15. **Please could you tell me how the drugs are distributed to community members (chose what apply)**
    a. House to house
    b. A place in the village
    c. Health Facility
    d. I don't know
16. **Where in this community are the drugs normally distributed?**
    a. Compound of the village leader
    b. Community center/ community meeting place
    c. Compound of the community drug distributor
    d. Church/ mosque and school
    e. The drugs were brought at my house
    f. I don't know
17. **Do you consider taking the drugs control the symptoms of Onchocerciasis like itching…?**
    a. Yes, the drugs stop itching
    b. Yes, but does not control all itching
    c. No, they don't control itching
    d. I don't know

18. **Which of the following reasons have influenced your decision to refrain from drug uptake?**
    a. Rumor that they drug causes infertility has made me refrain from the drugs
    b. Rumor that they want to depopulate us has made me refrain from the drugs
    c. The fact that once I take them, I'm not allowed to take alcohol is the main hindrance factor Information that they boost body activeness made me regularly take them as they are distributed

    Other specify …….
19. **Have you ever heard of any adverse effects of the ivermectin drugs, and has this information influenced your decision about participation in the next MDA and swallowing the drugs?**
    a. Yes, but had not changed my decision to take the medication
    b. Yes, and since that day I stopped taking those drugs
    c. Yes, but I have experienced none, so I continue participating in the MDA program
    d. Yes, but I want to learn more before I continue participating in the MDA program
    e. No. I have not heard of Side effects that's why I continue swallowing the medication
20. **Do you know anybody who was suffering from the diseases and has recovered after taking the drugs being distributed, how has the person influenced your decision about the drug uptake?**
    a. Yes, but had nothing to do with my decision
    b. Yes, and since that day I have never missed distribution
    c. No, I do not know anybody but even those without the disease also take the medication, so I just take it

C) Program expert support, awareness creation and drug supply system for ivermectin distribution during

21. **Have you ever received information about the Onchocerciasis disease and from which source?**
    a. Yes, from FLHW
    b. Yes, from CDD
    c. Yes, from radio/TV
    d. No haven't received it before
22. **Have you ever attended health education session(s) given in your community?**

    If yes, could you please tell me the topics that were covered?
    a. It was only on Ochocerciasis
    b. It was on personal hygiene and Onchcerciasis
    c. It covered general environmental cleanliness but not Onchocerciasis
    d. I am not aware of any health education session in my village
23. **Did the health education session attended enlighten you on the importance of swallowing the drugs in the next MDA cycle?**
    a. Yes, I will participate in next round of distribution
    b. Yes, but after asking other people in my family
    c. Yes, but after asking the health worker in my village
    d. I did not get any added information to what I knew

Appendix 2B: Questionnaire, Swahili version

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili

Mpango wa Mafunzo ya Epidemilojia na Maabara Tanzania (FELTP)

Sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji dawa za Kinga Tiba kwa ajli ya kudhibiti nakutokomeza ugonjwa wa Usubi katika wilayani Ulanga.

Dodoso la jamii

Utambulisho

Na. Ya Dodoso…… Wilaya……..……

Kijiji……..…… Mtafiti Msaidizi…….

Utangulizi

Nashukuru kwa kukubali kushiriki katika kujibu maswali ya dodoso hili kuhusu sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji wa dawa za Kinga Tiba kwa ili kudhibiti na kutokomeza Usubi katika wilaya ya Ulanga**.** Dodoso hili litachukua kati ya dakika 15-20 na litajikita kingatiba ya ugonjwa Usubi katika kitongoji chako na sababu zinazopelekea mtu akakubali kumeza dawa za Kingatiba wakati wa kampeni ya umezeshaji dawa katika jamii. Tafadhali jisikie huru kuuliza swali kwa ajili ya ufafanuzi kama kuna kitu chochote hujaelewa. Majibu yote utakayo toa katika dodoso hili ni siri na jina lako halitahusishwa na dodoso hili, namba ya dodoso tu undo itaonekana.

A) Taarifa za kijamii

1. **Jinsia……**
2. **Umri…….**
3. **Kiwango cha elimu**
   e) Sijasoma ()
   f) Elimu ya msingi ()
   g) Elimu ya Sekondari ()
   h) Elimu ya Chuo ()
4. **Kazi yako**
   g) Mwanafunzi
   h) Mkulima
   i) Mfanya kazi wa afya
   j) Mwalimu
   k) Mtaalamu wa mifugo nankilimo
   l) Kazi nyingine

5. **Hali ya ajira**
    f) Nimejiajiri
    g) Nimeajiliwa na umma/serikali
    h) Nimeajiliwa na sekta binafsi

6. **Hali ya ndoa**
    e) Sijaoa/ Olewa
    f) Nimeolewa/ Naishi na Mtu
    g) Tumeachana
    h) Majane

7. **Muda uliokaa kijijini**
    d) Chini ya mwaka mmoja
    e) Mwaka mmoja
    f) Zaidi ya mwaka mmoja

B) Mtazamo wa jamii kuhusiana na madhara ya Ugonjwa wa usubi na dawa zinazotumika kwa ajili ya KingaTiba na namna mtazamoa huo unavyoathili umezaji wa dawa

8. **Je umewahikusikia kuhusu ugonjwa wa Usubi …… (Ndio Hapana)**

    Kama jibu ni Hapana, Nenda swali la 18

9. **Zipi ni daliliza ugonjwa wa Usubi**
    a. Mwili kuwasha sana
    b. Maumivu ya kichwa
    c. Vinundu kwenye ngozi
    d. Kuharisha na kutapika
    e. Kupumua kwa shida

10. **Je yepoi ni madhara ya ugonjwa wa Usubu kwa amtu aliyeathirika na ugonjwa huo**
    a. Upofu au uoni hafifu
    b. Ngozi kubadilika na kuwa kama ya kenge
    c. Ngozi kubadilika na kuwa kama chui

11. **Je unafahamu kwamba ugonjwa wa Usubi kuzuilika na na kudhibitiwa kupita kampeni ya ugawaji wa dawa kwenye jamii. …… (Ndio Hapana)**

    Kama jibu ni Hapana, Nenda swali la 18

12. Je unaweza kuniambaia ni mara ngapi dawa za Kingatiba ya Usubi zinatolewa?

a. Kila baada ya miezi sita

b. Mara moja kwa mwaka

c. Kila baada ya miaka miwili

d. Sijui

13. Tafadhali unaweza kuniambia kama umesha wahi kushiriki kumeza dawa za kingatiba ya Usubi?

a. Nimesha wahi meza mara moja maishani mwangu
b. Nimesha wahi meza mara kadhaa
c. Sijawahi kumeza dawa hizo
d. Sikumbuki kama nimeshawahi kumeza hizo dawa za usubi

14. Zipi kati ya sababu zifuatazo zinakushawishi wewe kumeza dawa za KingaTiba kila zinapotolewa

a. Kitendo cha kwamba baada ya kumeza siruhusiwi kunywa pombe, kunafanya nisinywe dawa hizo
b. Uvumi kwamba dawa hizo zinatibu zaidi ya ugonjwa wa Usubi na zinafanya mwili kuwa na nguvu ulinifanya nianze kumeza dawa hzi kila zinapoletwa
c. Kwasababu zinasaidia kukinga, niliona ni muhimu kumeza kila zianpogawiwa
d. Sababu nyingine, tafadhali taja ……

15. Tafadhali unaweza kuniambia namna ambayo dawa hizo zinagawiwa kwenye jamii (chagua jibu linalokufaa)

a. Numba kwa nyumba
b. Kwenye eneo moja ndani ya kijiji
c. Kwenye zahanati
d. Sijui

16. Je ni wapi dawa hizo huwa mara nyingi zinatolewa?

a. Nyumbani kwa mwenyekiti wa kijiji
b. Kwenye uwanja wa kijiji
c. Nyumbani kwa Mgawa dawa ngazi ya jamii
d. Kanisani, msikitini na shuleni
e. Dawa huwa zinaletwa nyumbani
f. Sijui

17. Je unafikiri dawa hizi zinasaidian kudhibiti dalili za ugonjwa wa Usubi hususani kuwasha

a. Ndio, zinaondoa kuwasha
b. Ndio lakini haziondoi kuwasha
c. Hapana haziondoi kuwasha
d. Sijui

18. Sabu ipi kati ya hizi zifuatazo zilikusababisha usishiriki kumeza dawa wakati wa umezeshajindawa katika jamii.

a. Uvumi kwamba zinasababisha ugumba ulifanya nikaacha kumeza dawa
b. Uvumi kwamza ni dawa za uazi wa mpango ulifanya niache kumeza dawa hizo
c. Kitendo cha kwamba baada ya kumeza siruhusiwi kunywa pombe, kunafanya nisinywe dawa hizo
d. Sababu Nyingine, tafadhali taja …….

19. Umeshawahi sikia madhara yoyote ya dawa za Kinga Tiba ya Usubi, na je habari hizo zilichangia kwa namna yoyote maamuzi yako kuhusu kumeza dwa hizo wakatoi wa zoezi la ugawaji dawa kwenye jamii.

a. Ndiyo, lakini haikuathili maamuzi yangu kuhuzu umezaji dawa
b. Ndiyo, na baada ya hapo sikuwahi meza dawa hizo tena
c. Ndiyo, lakini sijawahi pata hata mara moja hivyo niliendelea kunywa dawa hizo kila zigawiwa
d. Ndiyo, lakini nahitaji kujuz azidi kabla sijaendela kushirikia katika kumeza dawa hzio.
e. Hapana, sijawahi sikia na ndo maana nimekuwa nameza dawa hizo kila zikiletwa

20. Je unafahamu mtu yeyote ambaye amewahi ugua ugonjwa wa Usubi na sasa hici amepona kwasababu ya kumeza dawa za Kinga Tiba? Na ufahamu huo umeathiri namna gani maamuzi yako kuhusu umezaji dawa za Kinga Tiba dhidi ya Usubi

a. Ndiyo, lakini haikubadili chochote kuhusu maamuzi yangu
b. Ndiyo, na tangu wakati huo sijawahi kosa dawa kila zinapotolewa
c. Sifahamu mtu yeyote, hata hivyo kwa kuwa hata watu wasio nadalili huwa wanameza na mimi nimekuwa nameza.

C) Usimamizi wa wataalamu wa Mpango, kuongeza ulewa na mifumo ya usambazaji wa dawa wakati wa zoezi la umezeshaji dawa matika jamii.

21. Je uesha wahi pata habari yoyote kuhusu chanzo cha ugonjwa wa Usubi?

a. Ndio, kutokwa Muhudumu wa Afya
b. Ndio, kutoka kwa Mgawa dawa ngazi ya jamii

c. Ndio, kutoka kwenye TV/Radio
d. Hapana sijawahi pata habari yoyote

22. Je umesha wahi hudhuria tukio lolote la uhamasishaji na uelimishaji jamii kuhusu afya

Kama ndio je unaweza kuniambia ni mada zipi zilizungumziwa?

a. Ilihusu usubi peke yake
b. Kulikuwa na mada nyingi pamoja naugonjwa wa usubi
c. Kulikua na mada nyingi lakini usubi haukuzungumziwa kabisa
d. Sikumbuki kama kumekuwa na tukio lolote la uelimishaji jamii kuhusu afya hapa kijijini.

23. Je elimu ya afya uliyohudhuria ilisaidia kukuongezea uelewa kuhusu umuhimu wa kumeza dawa katika kamapeni ya umezeshaji dawa za usubi katika jamii?

a. Ndiyo, katika zoezi lilifuata la umezeshaji dawa
b. Ndiyo, lakini baada ya kuhakikisha kwa kuuliza zaidi kwa watu wengine numbani.
c. Ndiyo, lakini baada ya kupata uhakikka kwa kuuliza kwa mganga wa zahanati/hospitali ya kijiji
d. Hapana, haikusaidia kupata elimu mpya yoyote zaid ya nilichokuwa nafahamu

Appendix 3A: Interview Guide, English version

Muhimbili University of Health and Allied Sciences

Tanzania Field Epidemiology and Laboratory Training Program (TFELTP)

Project Title: Assessment of Mass Drug Administration Coverage and Determinant of Drug uptake for Elimination of Onchocerciasis in Ulanga District

Interview guide for CDD and FLHW

Identification :

Name…… Interviewée No. …….

Village…….…… Interviewer…….

Introduction:

Welcome and thank you for coming to this interview about predictors of drug uptake in the MDA programs for Onchocerciasis elimination and your role in distribution of the drugs. The session will last about forty-five minutes and will focus on your tasks related to MDA program. We encourage you to state your opinions as well as ask any questions for clarification throughout the discussion. There are no wrong answers, so we encourage you to share any information about the program with us that you think will answer the questions and will help improve your work and health of the community at large. Everything you say is confidential and your name will not be linked to these responses only numbers will be used

1. Do you understand the Onchocerciasis disease and the MDA programs…….?
2. Was your selection based on your understanding about the disease? In your village how were you selected to be the drug distributor……?
3. How long have you been saving as CDD/FLHW…….……?
4. Have you ever received any training implementation of drug distribution in the MDA programs…….……?
5. Do you think the training you received is enough to enable you perform your duties without any problem…….……...?
6. Do you get enough support from the district, regional and national program staff…...?

7. Do you think the drugs you distributed in the community are helpful in blocking transmission of Onchocerciasis and do the community easily accept the drugs when you bring the…….?
8. What do you think should be done to Improve the drug distribution activities……...…?
9. What do you think could be the reasons preventing some community members from participating in the program…….……...…….?

Thank you for your Participation.

Appendix 3B: Interview Guide, Swahili version

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili

Mpango wa Mafunzo ya Epidemilojia na Maabara Tanzania (FELTP)

Sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji dawa za Kinga Tiba kwa ajli ya kudhibiti nakutokomeza ugonjwa wa Usubi katika wilayani Ulanga.

Muongozo wa mahojiano kwa CDD na FLHW

Utambulisho

Na ya Dodoso…… Namba ya Msahiliwa……
Kijiji……..…… Mtafiti Msaidizi…….

Utangulizi

Karibu na ahsante kwa kuja kuhudhuria katika mahojiano haya kuhusu sababu zinazoathili umezaji wa dawa katika jamii wakati wa zoezi la ugawaji wa dawa za Kinga Tiba kwa ili kudhibiti na kutokomeza Usubi katika wilaya ya Ulanga. Mahojiano haya yatadumu kwa takribani dakika 45 na yatajikiata katika ushiriki wako na majukumu yako katika zoezi la umezeshaji dawa za a Usubi katika jamii. Tunakuomba uwe huru kutoa mawazo yako na kuuliza maswali kama kuna jambo lolote unahitaji ufafanuzi wakati wa mjadala. Napenda kukusitiza kwamba hakuna jibu la uongo, hivyo nakusihi uwe huru kuzungumza taarifa zozote kuhuzi zoezi la umezeshaji dawa na sisi ambazo unadhsni ziatasaidia kuboresha mpango wa umezeshaji dawa na kuboresha afya ya jamii. Neno lolote utakaloongea katika usahili huu litabaki kuwa siri na jina lako halitahusishwa na usahili huu, badala yake namba ya msailiwa ndiyo itaokeana.

1. Unaweza kueleza kidogo kuhusu ugonjwa wa Usubi na mpamgo wa ugawaji dawa kwenye jamii…….?
2. Je kuchanguliwa kwako kuwa mgawa dawa ngazi ya jamii kunatoikana na uelewa wako wa ugonjwa wa usbi!? Na katika kijiji chenu utaratibu wa kuwapata wagawa dawa ngazi ya jamiiukoje……?
3. Ni kwamuda gani umekuwa ukifanya kazi hii ya ugawaji dawa katika jamii?
4. Je umesha wahi pata mafunzo wakati kuhusu utekelezajiwa kazi ugawaji dawa ngazi ya jamii……..…….?
5. Je unadhani mafunzo uliyopata yanatosha kukusaidia kufanya kazi zako bila mashaka…...?
6. Je huwa unapata msaada wa kutosha kutoka kwa waratibu wa mradi wa wilaya, mkoa au taifa wakati wa utekelezaji wa zoezi la umezeshaji dawa…….. …..?

7. Unadhani dawa ambazo huwa mnazigawa katika jamii zinasaidia kuzuia maambukizi ya ugonjwa wa usubi katika jamii na je mwitikio wa jamii mnavyowapelekea dawa ukoje…...?
8. Unapendekeza nini kifanyike kili kuborsha zoezi la ugawaji dawa katika jamii……..?
9. Unafikiri ni sababu gani zinawazuia baadhi ya watu kutomeza dawa za kingatiba ya usubi……...……?

Ahsante kwa kushiriki

Appendix 4A: checklist for abstraction of the MDA Coverage of the past 5 consecutive MDA program in selected villages of Ulanga district

Village/Community	MDA Coverage per year (%)									
	2014		2015		2016		2017		2018	
	HFSDF	CDD Register	HFSDF	CDD Register	HFSDF	CDD Register	HFSDF	CDD Register	HFSDF	CDD Register
Village 1										
Village 2										
Village 3										
Village 4										
Mean Coverage										

Appendix 4B: checklist for abstraction of the MDA Coverage of the past 5 consecutive MDA program in selected villages of Ulanga district, Swahili version

Kijiji/Mtaa	Kiwango cha umezeshai dawa (%)									
	2014		2015		2016		2017		2018	
	Fomu ya majumuisho ya kituo	Rejista ya CDD	Fomu ya majumuisho ya kituo	Rejista ya CDD	Fomu ya majumuisho ya kituo	Rejista ya CDD	Fomu ya majumuisho ya kituo	Rejista ya CDD	Fomu ya majumuisho ya kituo	Rejista ya CDD
Kijiji cha 1										
Kijiji cha 2										
Kijiji cha 3										
Kijiji cha 4										
Wastani										

Appendix 5: Ethical Clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

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Ref. No. DA.287/298/01A/

15th February, 2019

Ambakisye, Kuyokwa Mhiche,
MSc. Applied Epidemiology,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: "ASSESSMENT OF MASS DRUG ADMINISTRATION COVERAGE AND DETERMINANT OF DRUG UPTAKE FOE ELIMINATION OF ONCHOCERCIASIS IN ULANGA DISTRICT"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from **18th December, 2018 to 17th December, 2019.** In case you do not complete data analysis and dissertation report writing by **1st January, 2020,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Emmanuel Balandya
ACTING: DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Public Health and Social Sciences, MUHAS

Appendix 6: Introduction Letter from University to the Morogoro Region

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
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Ref. No. HD/MUH/T.325//2017

18th February, 2019

Regional Commissioner
Morogoro Region
P.O. Box 650
MOROGORO.

Re: INTRODUCTION LETTER

The bearer of this letter Mr. Ambakisye, Kuyokwa Mhiche is a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc. Applied Epidemiology,.

As part of his studies he intends to do a study titled: ***"Assessment of mass drug administration coverae and detrminant of drug uptake for elimination of onchocerciasis in Ulanga District".***

The research has been approved by the Chairman of University Senate.

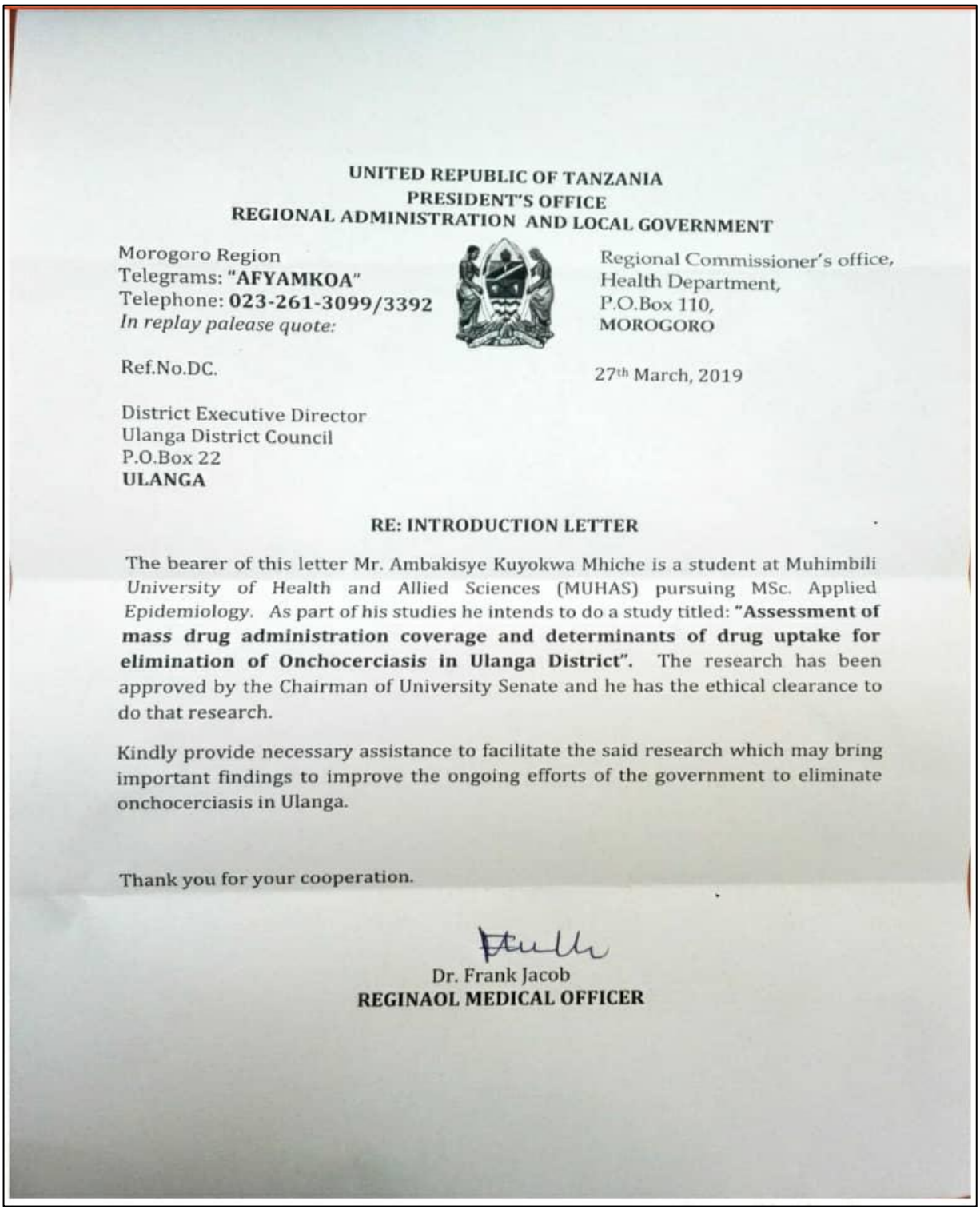
Kindly provide him the necessary assistance to facilitate the conduct of him research.

We thank you for your cooperation.

Ms. Sharifa Kamby
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Public Health and Social Sciences
cc: Mr. Ambakisye, Kuyokwa Mhiche

Appendix 7: Introduction Letter from Morogoro Region to Ulanga District



UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

Morogoro Region
Telegrams: "AFYAMKOA"
Telephone: 023-261-3099/3392
In replay palease quote:

Regional Commissioner's office,
Health Department,
P.O.Box 110,
MOROGORO

Ref.No.DC.

27th March, 2019

District Executive Director
Ulanga District Council
P.O.Box 22
ULANGA

RE: INTRODUCTION LETTER

The bearer of this letter Mr. Ambakisye Kuyokwa Mhiche is a student at Muhimbili *University of Health and Allied Sciences (MUHAS) pursuing MSc. Applied Epidemiology.* As part of his studies he intends to do a study titled: **"Assessment of mass drug administration coverage and determinants of drug uptake for elimination of Onchocerciasis in Ulanga District".** The research has been approved by the Chairman of University Senate and he has the ethical clearance to do that research.

Kindly provide necessary assistance to facilitate the said research which may bring important findings to improve the ongoing efforts of the government to eliminate onchocerciasis in Ulanga.

Thank you for your cooperation.

Dr. Frank Jacob
REGINAOL MEDICAL OFFICER

Appendix 8: Request for Research Assistant from Maweni Clinical Officers College Training College

AMBAKISYE K. MHICHE.
MUHAS - TFELTP
P.O. BOX 65001.
DAR ES SALAAM

20th, March, 2019.

THE PRINCIPAL
MAWENI CLINICAL OFFICERS TRAINING COLLEGE
P. O. BOX 458,
KIGOMA

Dear Sir,

RE: REQUEST FOR MS. AGNESS NGUVUMALI TO PARTICIPATE IN THE RESEARCH ON *MDA ASSESSMENT AND DETERMINANTS OF DRUG UPTKES FOR ELIMINATION OF ONCHOCERCIASIS* AS RESEARCH ASSISTANT TO BE DONE AT ULANGA DISTRICT, MOROGORO REGION

Kindly refer to the heading captioned above.

I am a Masters resident at Muhimbili University of Health and Allied Sciences studying MSc. Applied Epidemiology. I am currently conducting a research study on Mass Drug Administration (MDA) Assessment and Determinants of Drug uptakes for Elimination of Onchocerciasis in Ulanga District in Morogoro as part of the University requirements for completion of Masters.

Ms. Agnes Nguvumali has vast experience on digital data collection using mobile devises and has participated in various Health surveys conducted through Regional Health Management Team (RHMT) and Ministry of Health. Since data collection methods for my research uses methodology which is very familiar to Her, I find her of great help towards my master's research process. Therefore I would like to engage her as Research assistant and data collection supervisor during data collection which will be done in Ulanga district.

Based on those factors, I humbly request your good office to permit Ms. Agnes Nguvumali to participate in the said study as data collection supervisor and research assistant. The study will be conducted for 20 days from 25th, March, 2019 to 20th, April 2019.

I have attached the Ethical clearance from University Ethical Review Board and Introduction letter to Regional Commissioner for Morogoro for your further reference

Thank you for your continued cooperation

Ambakisye Kuyokwa Mhiche
Resident and Principal Investigator
Mobile: +255 757 487 278
Email: ambakisyekuyokwa@ymail.com