

**Factors associated with persistence of onchocerciasis transmission after two decades
of community-directed treatment with ivermectin in Ulanga District, Tanzania**

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**MSc (Tropical Diseases Control) Dissertation
Muhimbili University of Health and Allied Sciences
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**FACTORS ASSOCIATED WITH PERSISTENCE OF
ONCHOCERCIASIS TRANSMISSION AFTER TWO DECADES
OF COMMUNITY-DIRECTED TREATMENT WITH IVERMECTIN
IN ULANGA DISTRICT, TANZANIA**

By

Vivian Mushi

**A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree
of Master of Science (Tropical Diseases Control) of**

**Muhimbili University of Health and Allied Sciences
October, 2018**

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: *“Factors associated with persistence of onchocerciasis transmission after two decades of community-directed treatment with Ivermectin in Ulanga District, Tanzania”* in (partial) fulfillment of the requirements for the degree of Master of Science (Tropical Diseases Control) of Muhimbili University of Health and Allied Sciences.

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I, **Vivian Mushi**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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DEDICATION

This dissertation is dedicated to all members of my family, especially my father Prof. Philemon A.K Mushi, my mother Mrs. Patricia Mushi and my sisters Lilian, Paula and Vertas for their love, support and encouragement throughout the entire period of my studies.

ABSTRACT

Background: Community Directed Treatment with Ivermectin (CDTI) was initiated in Tanzania since 1997 in Mahenge focus endemic for onchocerciasis with an operational prediction for interruption of transmission after 14-17 years. Ulanga as one of the hyperendemic districts, have received 20 rounds of annual CDTI. However a transmission assessment survey done on 2017 showed there was persistent transmission. Knowledge, attitudes and perceptions of the community drug distributors (CDDs) and individuals in the community towards onchocerciasis and preventive chemotherapy potentially affects CDTI coverage, consequently leading to persistent transmission. This study sought to investigate the current burden and its associated factors.

Objective: The study examined the current *O.volvulus* prevalence and the associated factors in Ulanga district, two decades after initiation of mass drug administration for control.

Methodology: A cross sectional study involving both quantitative and qualitative methods was carried out using primary and secondary data. The primary data entailed structured community interviews among 422 community members on their knowledge regarding onchocerciasis, attitude and perception on the preventive use of Ivermectin. This was complimented with qualitative data using key informants, in-depth interviews and focused group discussions. Secondary data from NTDCP was used for establishing, the current prevalence of *O.volvulus*. The quantitative data were organized to obtain proportions and their 95% CI. Associations between variables were assessed by the Chi-square test at significance level of 0.05. The qualitative data were organized in themes and content analysis.

Results: Out of 587 children < 10 years of age tested for the presence of IgG4 antibodies to antigen Ov16; 17 (2.9% [95% CI: 1.7- 4.4]) were positive showing active transmission of onchocerciasis. There was association between duration of residence and age of the children with being infected; children aged 5 to 9 years were more infected than children less than 5 years of age (p=0.032) which was contributed with duration the children have stayed in

Ulanga. The older children were at higher risk of exposure to *O. volvulus* infection compared to children aged less than 5 years (OR = 6.626; 95% CI: 0.864-50.824).

Out of 422 household members interviewed; majority (94.1%) were found to have heard about onchocerciasis. However, they had inadequate knowledge on causative agent, transmission, treatment and prevention. Of the participants interviewed; 49.2% had low level of the knowledge, 35.5% had moderate level of knowledge and few 15.4% had high level of knowledge. Furthermore the community held negative attitudes (46.2%) and perceptions (44%) towards ivermectin treatment. All community drug distributors interviewed could not tell the causative agent of onchocerciasis and how transmission occurs despite distributing ivermectin for several years. However, they had positive attitude and perception that ivermectin is the best drug for treatment and elimination of the disease in Ulanga.

Conclusion: Two decades of CDTI have not interrupted transmission of onchocerciasis in Ulanga district as shown by the 2.9% prevalence in children < 10 years. However, there was a borderline level of knowledge on the causative agent, transmission, treatment and prevention as only about a half (50.8%) had moderate to high level of knowledge. The low level of knowledge coupled with negative perceptions and attitudes in a section of the community have the potential of affecting uptake and therefore total coverage of CDTI hence the persistence of transmission.

Recommendations: Public health education should be reinforced in the community and community should be given an opportunity to participate in selection of the drug distributors that they think are capable so as to improve the participation in CDTI program.

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ACRONYMS/ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
APOC	African Programme for Onchocerciasis Control
BCC	Behavior Change Communication
CDC	Centers for Diseases Control and Prevention
CDD	Community-Directed Distributors/Community Drug Distributors
CDTI	Community Directed Treatment with Ivermectin
CDTIP	Community Directed Treatment with Ivermectin Programme
CI	Confidence Interval
CMs	Community Members
DAS	District Administrative Secretary
ELISA	Enzyme-Linked Immune Sorbent Assay
FGDs	Focused Group Discussions
HIV	Human Immunodeficiency Virus
IDI	In-Depth Interviews
IVM	Ivermectin
MDA	Mass Drug Administration
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics
NIMR	National Institute of Medical Research
NTDs	Neglected Tropical Diseases

NTDCP	Neglected Tropical Disease Control Programme
PCR	Polymerase Chain Reaction
RAS	Regional Administrative Secretary
SPSS	Statistical Package for the Social Sciences
Tsh	Tanzania Shillings
WHO	World Health Organization

DEFINITIONS OF TERMS IN RELATION TO ONCHOCERCIASIS

Attitude: Attitude refers to an individual point of view (about onchocerciasis) which can either be positive or negative.

Control: Control refers to reduction of prevalence, incidence and morbidity (of the onchocerciasis) as the results of interventions. Interventions must be carried on in order to maintain the reduction.

Community directed distributors: CDDs are volunteers both men and women who are selected by community members to distribute ivermectin.

Community directed treatment with ivermectin: CDTI is the strategy that is used to control and eliminate onchocerciasis where community itself has the power and responsibility for the organization and implementation of treatment with ivermectin annually for its members.

Elimination: Elimination refers to reduction of the incidence of onchocerciasis to zero cases in a certain geographical location, with low risk of reintroduction as a consequence of deliberate control interventions.

Ivermectin: IVM is an oral drug that contain compound of the avermectin group used as antihelmintic in variety of parasitic infections such as onchocerciasis.

Knowledge: Knowledge means awareness and familiarity on cause, symptoms, mode of transmission and prevention strategies of onchocerciasis.

Mass drug administration: MDA refers to treatment of the whole population or section of the population at higher risk whether symptoms are present or absence. The aim of MDA is to reduce or interrupt transmission of the disease.

Onchocerciasis: Onchocerciasis is a parasitic disease caused by *Onchocerca volvulus* and transmitted by repeated bites of *Simulium* spp (black flies) that breed in fast flowing rivers and streams.

Practice: Practice refers to control efforts and measures taken by community members to avoid contracting onchocerciasis and interrupting transmission.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Onchocerciasis is an eye and skin parasitic disease caused by the filarial worm known as *Onchocerca volvulus*, transmitted to humans by repeated bites of infected black fly that belongs to *Simulium spp.* Onchocerciasis is commonly known as river blindness because it causes blindness and the black fly that transmits it breeds near fast flowing rivers (Crump *et al.*, 2012).

Transmission of onchocerciasis occurs when an infected black fly takes a blood meal in human host and introduces microfilariae in the skin, where they penetrate into the bite wound. In subcutaneous tissues the microfilariae develop into adults that reside in nodules in subcutaneous tissues. Adults produce unsheathed microfilariae that are found in the skin, lymphatics of connective tissue and peripheral blood. When a black fly bites an infected person during a blood meal, it also ingests microfilariae which develop from first stage larvae to third-stage infective larvae; the third-stage infective larvae migrate to the black fly's proboscis and can infect another human when the black fly takes a blood meal (CDC, 2017).

People who live near rapid flowing rivers and streams where there are black flies are at higher risk of acquiring onchocerciasis. Black flies are mostly found in rural agriculture areas in sub Saharan Africa. Infected people may have a skin disease in the form of nodules under the skin and debilitating itching; they may also have eye disease in form of visual impairment and blindness. Some people do not get any symptoms while they are infected as the microfilariae can migrate through the human body without aggravating immune response. Most of the observed symptoms are caused by the host immune responses to dead or dying larvae (WHO, 2017).

In diagnosis and treatment; Skin snips, Rapid-Format Antibody card tests (Ov16 card test), ELISA test and PCR test are used in detection and confirmation of suspected onchocerciasis cases (WHO, 2016). Ivermectin is a drug of choice for treatment that is given once yearly for

between 10 to 15 years to interrupt transmission and prevent the long-term skin damage and blindness (Tekle *et al.*, 2016).

Currently there have been several interventions that are in progress in different parts of the world for the purpose of preventing and reducing onchocerciasis transmission. The interventions are; Vector control through the use of insecticides and community-directed treatment with ivermectin (CDTI). Application of these interventions in endemic areas has led into decrease of onchocerciasis in those areas (WHO, 2017).

1.2 Global burden of onchocerciasis

The World Health Organization's (WHO) fact sheet released in 2017 states that 198 million people in 36 countries live in endemic areas near fast flowing rivers that put them at risk of onchocerciasis and over 40 million people were infected. Among the infected people over 6.5 million suffer from severe itching or dermatitis, 800,000 had visual impairment and 300,000 people were blind due to infection (CDC, 2017; WHO, 2017).

Onchocerciasis is endemic in Africa, Americas and Arabian Peninsula. African region is highly affected compared to other regions where by 99% of infected people live in 31 countries in sub Saharan Africa. Onchocerciasis is more prevalent in Africa because of poor socio economic development. The countries affected are Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda and United Republic of Tanzania (WHO, 2017).

Burden of onchocerciasis has led into introduction of control interventions such as vector control (simulium control) and community-directed treatment with ivermectin and this has relieved 40 million people from infection, prevented 600,000 people from going blind and ensured more than 18 million children were born free from the risk of acquiring the disease and become blind (WHO, 2017). The burden of onchocerciasis in several parts of sub

Saharan Africa has gone down due to control interventions which have led into morbidity reduction. However, onchocerciasis remains a second most common cause of blindness after trachoma in Africa(CDC, 2015).

In America, some countries such as Columbia, Ecuador, Mexico and Guatemala's were successfully able to eliminate onchocerciasis due to effective biannual large scale treatment with ivermectin (WHO, 2017).

1.3 Onchocerciasis burden in Tanzania

Onchocerciasis is one among the neglected tropical diseases in Tanzania where there are 27 endemic districts in which a total of 6 million people are at risk of infection. The disease is endemic in the following regions: Tanga, Morogoro, Iringa, Lindi, Mbeya and Ruvuma. The main vector for transmission of *Onchocerca volvulus* in Tanzania is *Simulium damnosum sensu lato* (Mweya *et al.*, 2007; Maegga *et al.*, 2011).

Baseline mapping was done early in 1990's, methods used were palpation to determine nodule prevalence and skin snips whereby map showing endemic areas was produced and mass treatment was introduced and emphasized in endemic areas (NTDCP, 2016; NTDCP, 2017). Surveillance and monitoring were done in 2006, 2015, 2016 and 2017. In 2006, during phase I of surveillance and monitoring both nodule prevalence and skin snips were used but as the transmission started to decline, some areas become hypoendemic, thus, new highly sensitive diagnostic test, the Ov16 was introduced and used in the surveillance and monitoring of the disease in 2015, 2016 and 2017 (NTDCP, 2017).

Given the high burden of onchocerciasis in the country, Tanzania in collaboration with African Programme for Onchocerciasis Control (APOC) introduced the control of onchocerciasis through community directed treatment with ivermectin (CDTI)(York *et al.*, 2015; NTDCP, 2016). This control measure needs to last between 12 and 15 years with a minimum 80% coverage to ensure transmission is interrupted. Treatment started in 1997/1998 in highly endemic district and by 2016 the overall coverage of CDTI was 67% with 4.12million out of the 6.15 million eligible people having received treatment. The population

left out in CDTI conceivably served as reservoir of infection and therefore continuity of *O.volvulus* transmission (URT-NTDs, 2017). In order to ensure elimination of onchocerciasis, it is crucial to treat all people who are at risk of getting infection and ensuring that coverage of MDA is maintained above 80% (Cantey *et al.*, 2018). Vector control is also one among the interventions that was introduced in Tanzania, aimed at large scale larvaciding. It was first done in Tukuyu between 2003 and 2005 and has resulted into reduction of biting rate according to WHO (2008).

Onchocerciasis is a neglected disease that government do not see it as a serious disease compared to other diseases that cost a lot of lives in Tanzania but since it can be eliminated much effort must be stepped up to eliminate it. There is persistent transmission of onchocerciasis in the districts of; Busokelo, Ifakara, Ileje, Muheza, Kilosa, Kilombero, Kyela, Rungwe and Ulanga (NTDCP, 2016). Further studies are needed to understand the factors that are associated with persistent transmission of onchocerciasis even after decades of interventions in endemic areas so as to find out new strategies that will help to eliminate the disease. The current study therefore aimed to investigate the factors associated with persistence of onchocerciasis transmission after two decades of community directed treatment with ivermectin in Ulanga district.

1.4 Problem statement

Under the African Programme for Onchocerciasis Control (APOC) preventive chemotherapy through annual Community Directed Treatment with Ivermectin (CDTI) was initiated in Tanzania since 1997 in Mahenge focus endemic for onchocerciasis (NTDCP, 2016). Ulanga was one of the hyperendemic district since 1990s with microfilariae prevalence of around 60% and nodule prevalence of 95% (Mwaiko *et al.*, 1990; NTDCP, 2016).

The operational prediction for interruption of transmission can be reached by annual CDTI (total coverage 80%) within 14–17 years (Colebunders *et al.*, 2018). Following two decades of annual CDTI, a transmission assessment survey carried out in 2017 in the Mahenge focus of Ulanga district the prevalence of onchocerciasis of 2.1% was found indicating that transmission was persistent (NTDCP 2016; NTDCP 2017). This was supported by the presence of a 0.57% infected black fly vectors from the same area indicating that the two decades of annual CDTI have not interrupted transmission (Hendy *et al.*, 2018). This could plausibly be explained by among other factors, by the low CDTI coverage in Ulanga district which was below 65% from 1997 to 2002 and above 65% (mean 76%) for the years 2003 to 2017 (NTDCP, 2017), being below 80% the optimal coverage (Colebunders *et al.*, 2018). A number of factors may be associated with the low coverage including timelines of drug delivery and distribution methods that might serve as barriers to access to treatment and poor treatment compliance conceivably leading to insufficient treatment coverage (Kyelem *et al.*, 2008).

Knowledge, attitudes and perceptions of the community drug distributors (CDDs) and individuals in the community towards onchocerciasis and preventive chemotherapy through CDTI also affect coverage (York *et al.*, 2015). Low knowledge, negative perceptions and attitudes to the CDTI are likely to affect the compliance profiles of the community during MDA. Of particular importance are the systematic non-compliant community members who would serve as reservoirs of persistent infection to black flies and therefore transmission to other community members (Colebunders *et al.*, 2018). The factors that contribute to persistent transmission of onchocerciasis in the Mahenge focus despite two decades annual CDTI have not been fully investigated. This study was set to examine the factors that contribute to

persistent transmission of onchocerciasis from the perspectives of the community and the drug distributors in Mahenge, Ulanga district.

1.5 Conceptual framework

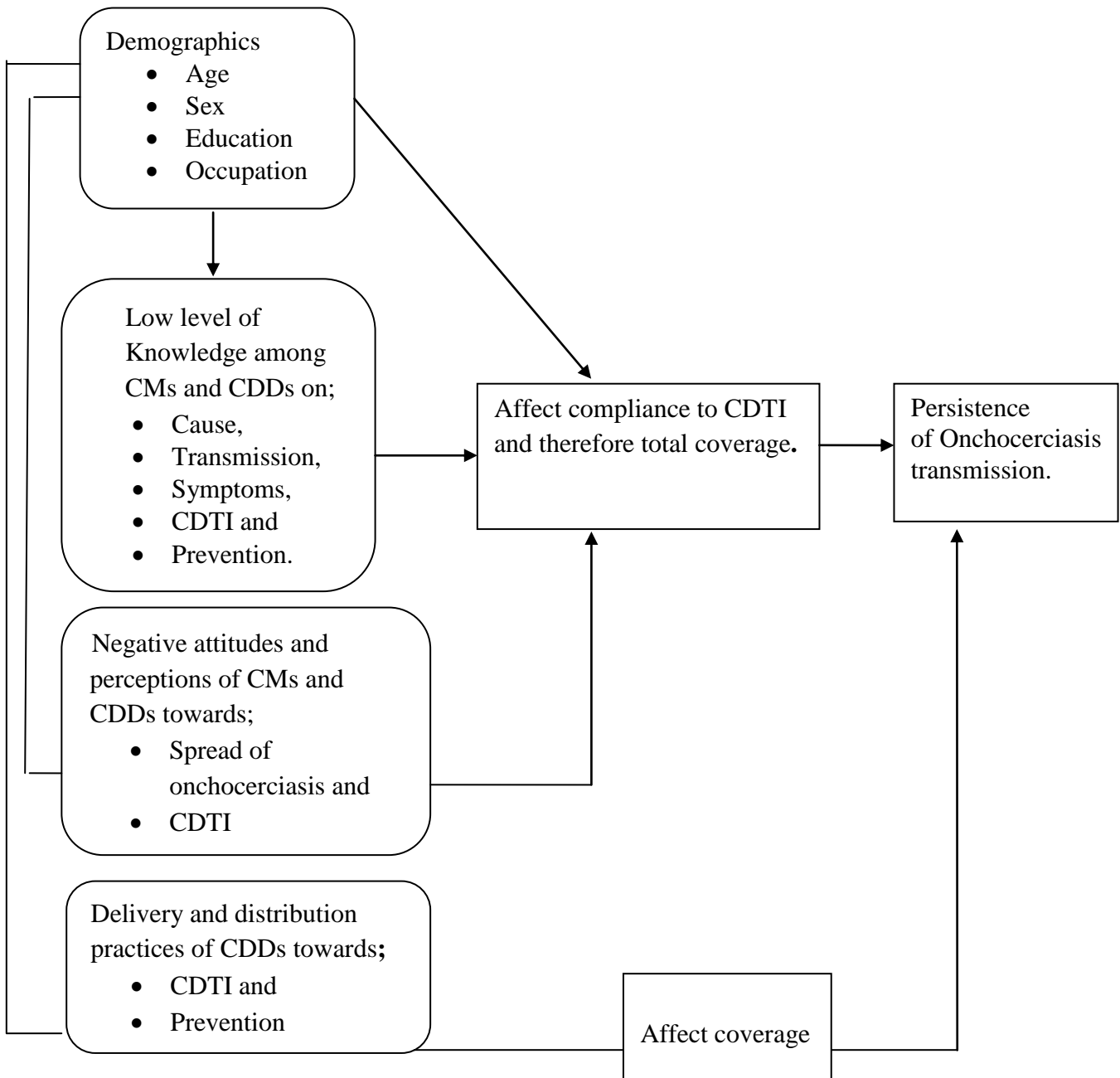


Figure 1: A conceptual framework for investigating factors that lead to persistence of onchocerciasis transmission.

1.5.1 Description of conceptual framework

Onchocerciasis is the disease that can be treated and eliminated in the endemic areas by annual community directed treatment with Ivermectin. Ivermectin has the ability to reduce morbidity and transmission of the disease in the community when it's appropriately carried and maintained above 80% coverage. Community knowledge, attitudes and practices toward onchocerciasis and ivermectin treatment play an important role in either elimination or persistence of the disease.

Low level of knowledge on causes, transmission, symptoms, treatment and prevention of onchocerciasis hinders adherence and acceptability of community directed treatment with ivermectin hence persistence of the disease. Negative attitudes, wrong beliefs, wrong perception and poor practices of community members on the onchocerciasis lead to non adherence in control and prevention program hence persistence of onchocerciasis.

Community drug distributors are very important when it come to successful use and distribution of ivermectin in a district. Low level of knowledge and misconception among community drug distributors affects community participation in the intervention hence low chance of success of the control intervention.

Level of knowledge, attitudes, perceptions and practices are influenced by demographics such as age, sex, and education. The knowledge of the disease, attitudes, perceptions and practice towards CDTI depends on age, sex and education level of community members. Educated people are expected to be more aware of the disease and adhere to ivermectin treatment.

1.6. Research questions

The study aimed to answer the following research questions;

- What is the prevalence of onchocerciasis among children under ten years of age in Ulanga district?
- Is there any association between demographics factors with onchocerciasis prevalence in Ulanga district?
- What is the knowledge, attitudes and perceptions of Ulanga community towards onchocerciasis and acceptability of ivermectin treatment?

- What is the knowledge, attitudes and perceptions of the community drug distributors towards onchocerciasis control program?

1.7. Research objectives

1.7.1. Broad objective

The broad objective of the study was to determine the current prevalence and factors associated with persistence of *O.volvulus* transmission in Ulanga district despite two decades of treatment with Ivermectin.

1.7.2. Specific objectives

The specific objectives of the study were;

- To determine the prevalence of onchocerciasis among children under ten years of age in Ulanga district.
- To determine the association of demographic factors with prevalence of onchocerciasis in Ulanga district.
- To assess community knowledge, attitudes and perceptions towards onchocerciasis and acceptability of ivermectin treatment in Ulanga district.
- To assess knowledge, attitudes and perceptions of the community drug distributors towards the use of ivermectin for onchocerciasis control in Ulanga district.

1.8. Rationale of the study

The findings of this study will help to establish the current disease burden due to onchocerciasis and the factors associated with persistence of *O.volvulus* transmission in Ulanga district. This will inform program managers on the relevant programmatic changes needed so as to improve CDTI in areas with persistent onchocerciasis transmission despite two decades of MDA. Findings will also provide practical information to policy makers (Government and donor agencies) that will aid in planning and implementing effective strategy to improve and ensure the coverage of CDTI is maintained above 80% so as to block the cycle of transmission.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviews literature related to the study. The review covers prevalence of onchocerciasis and transmission, association between onchocerciasis and socio-demographic/economic factors, Knowledge, attitude and practice of community members and drug distributors towards onchocerciasis and community directed treatment with ivermectin.

2.1 Prevalence of onchocerciasis and transmission

Onchocerciasis is caused by the filarial nematode known as *Onchocerca volvulus*. The disease is also known as river blindness because it causes blindness and the vector “black fly” that transmits it breeds near fast flowing rivers and streams (Takaoka, 2015). Onchocerciasis affects rural communities more than urban communities because location of many rivers and streams are in rural areas (USAID, 2015). Onchocerciasis is a chronic disease its manifestation of which takes times (months to years) after infection (Lustigman *et al.*, 2009). Clinical manifestation is the result of microfilariae death which is very toxic to eyes resulting to eye lesions that can progress to irreversible blindness, and skin resulting in skin itching and disfigurement (Murdoch, 2018). Chronic infection causes either pruritic lesions that are heavily lichenified or asymptomatic hypopigmented lesions in a leopard skin pattern. Some patients can develop dermatitis of one limb or one region of the body commonly known as “sowda” (Enk, 2009; Prieto-Granada, Lobo and Mihm, 2010). Patients with chronic infection also develop nodules known as “onchocercomata” which are located on bony torso and hips for Africans while for South Americans chronic infection occurs in head and shoulders (Prieto-Granada, Lobo and Mihm, 2010). Mahenge is also the first place in Tanzania where cases of nodding syndrome with seizures disorder was identified in children with symptoms of involuntary head nodding, followed by other types of epileptic seizures (Dowell *et al.*, 2013).

Onchocerciasis is transmitted by repeated bites of female *simulium* flies (black flies) as blood meals are necessary to female black flies for ovulation. During blood meal the flies either transmits *O.volvulus* to humans or acquire them from humans (Kaplain, Anthony and Tyring,

2017). There are several different species of *Simulium* that transmit onchocerciasis depending on geographical areas. In Africa savanna, the main species are *S.damnosum* and *S.sirbanum*. In African forest and rainforest regions, the dominant species are *S.neavei*, *S.yahense*, and *S.squamosum*. In large coastal rivers of West Africa the dominant specie is *S.auctipauli* (Basáñez *et al.*, 2009).

The main vector for transmission of *Onchocerca volvulus* in Tanzania is *Simulium damnosum sensu lato* (Hendy *et al.*, 2018). This vector is responsible for transmission of the disease in Kilosa, Kilombero, Mahenge and Uluguru Mountains, Ruvuma and Tukuyu foci. *Simulium neavei* are also present in some areas of Tanzania such as Usambara and Uluguru Mountains and are associated with transmission of the disease in these areas (Kalinga and Post, 2011).

Hendy *et al* (2018) conducted a study on the black flies vectors and transmission of *Onchocerca volvulus* in Mahenge, South eastern, Tanzania, and results showed that *O.volvulus* was detected in 97/104 pools of bodies and 51/104 pools of heads in *S.damnosum* s.L. The estimated percentage of *S.damnosum* s.L carrying infective L3 was 0.57% which was almost similar to 0.61% recorded in 1967. This infection rate of 0.05% is above WHO recommended threshold for interruption of transmission (WHO, 2016). The researchers concluded that transmission of *O.volvulus* in Mahenge was still going on after 19 annual rounds of community directed treatment with ivermectin. Annual treatment could be inadequate to eliminate onchocerciasis in hyperendemic areas.

A study was conducted by Adeleke *et al* (2010) on biting behavior of *Simulium damnosum* complex and *O.volvulus* infection along the Osun River, Southwest Nigeria. The infectivity rate was determined among the collected black flies using dissection and PCR 0-150 techniques. Results showed there was variation in biting activity of *S.damnosum* with biting peak between 10:00 to 16:00 as it was corresponded with working time of individuals. Dissected flies were 1,472 and screened flies with 0-150 were 1,235 and none of them had *O.volvulus*. The researchers concluded that the high biting rate of *Simulium* caused nuisance rather than transmission in that area.

The prevalence of onchocerciasis varies between hyper endemic and meso endemic areas in Tanzania (Zouré *et al.*, 2014). In Tanzania there are seven foci of onchocerciasis namely; Kilosa, Mahenge, Morogoro, Ruvuma, Tanga, Tukuyu and Tunduru (NTDCP, 2016). The history showed that in 1990's the prevalences were high in Bwakira, Mahenge, and Ruvuma which were 63.6%, 58.6% and 31.9% respectively. Mahenge focus which Ulanga district is located was one of highest infected area with prevalence above 87% in some communities. The burden of onchocerciasis led to introduction of community directed treatment with ivermectin (Mwaiko *et al.*, 1990 ; NTDCP, 2016).

CDTI is the strategy that was introduced in the country by African Program for Onchocerciasis Control in 1997 in order to interrupt transmission and the first project was carried out in Mahenge focus (NTDCP, 2017). Currently CDTI is carried on in Tanga (16th rounds), Kilosa (15th rounds), Ruvuma (19th rounds), Mahenge(20th rounds), Tukuyu (17th rounds), Morogoro (15th rounds) and Tunduru (13th rounds) (NTDCP, 2017). Epidemiological evaluations were done in these areas with Ov16 rapid test from 2009 to 2013 to determine the proportion of people who still harbors *O.volvulus* after several rounds of CDTI, the results showed that no microfilaria were seen in Tanga, Tukuyu and Tunduru among the tested individuals which is good indicator towards elimination while some communities in Mahenge, Ruvuma, Kilosa and Morogoro still have microfilaria load hence hinder elimination of the disease (NTDCP, 2017).

Higazi *et al* (2013) conducted a study on interruption of *O.volvulus* transmission in the Abu hamed focus, Sudan in 2013. The aim was assessment of transmission as CDTI was carried out since 1998. Parasitological, entomological and serological tests were done and results showed absence of skin microfilaria and nodules among 536 people tested, no *O.volvulus* DNA among 17,537 black flies collected and no Ov16 antibodies among 6,756 school aged children. The researchers concluded that transmission was interrupted in Abu hamed focus and it is the evidence in East Africa that CDTI alone if it is carried out and maintained can interrupt transmission of Onchocerciasis. A similar study was conducted in Kashoya-Kitomi focus, Uganda on interruption of transmission of onchocerciasis by ivermectin treatment and

larvaciding for vector control, findings showed that 13 rounds of ivermectin treatment with combination of 6 rounds of biannual treatment and 36 cycle of ground larvaciding within 3 years had interrupted transmission as the epidemiological survey of 2013 that was done serologically showed 5 positive school aged children out of 3,246 who were again checked using PCR O-150 and only one was found positive (Lakwo *et al.*, 2017).

Studies on West Africa and central Africa, Ghana and Cameroon respectively have shown that even though repeated treatment with ivermectin have been in progress for more than one and half decades, still transmission of onchocerciasis was going on and it was above WHO threshold and researchers suggested improvement of CDTI coverage in all communities and that further studies focusing on entomological part could give reasons for persistence (Kamga *et al.*, 2016; Lamberton *et al.*, 2015).

2.2 Association between Onchocerciasis (prevalence, adherence to treatment) and socio-demographic/economic variables

Socio-economic factors have been associated with adherence to community directed treatment with ivermetin (O'Hanlon *et al.*, 2017). Adherence to CDTI is very important when it comes to onchocerciasis elimination, people in the community who are not taking ivermectin during mass treatment contribute to the continuation of onchocerciasis transmission (Endale *et al.*, 2015).

Age, ethnicity and years of residency in a certain village are highly associated with adherence to CDTI; young adults have been associated with poor compliance of CDTI perhaps due to works and mobility from one place to another, while community members who had moved into certain village in the period of less than five years also have poor compliance toward CDTI probably due to lack of awareness of the disease and control intervention going on (Senyonjo *et al.*, 2016). Education level has shown positive association with compliance (Brieger *et al.*, 2012).

A study done on Predictors of compliance with CDTI for onchocerciasis control in Kobo area, south western, Ethiopia; revealed that among 308 females, 81.6% had higher compliance to ivermectin than males 80.3%. In marital status, 81% of married respondents had higher compliance than single respondents about 80.5%. Respondents aged more than 35 years old had higher compliance of 93.7% compared to 75.1% for those aged less than 35 years old. Compliance was also higher for those who lived in the area of intervention for ten years and more (87.2%) compared to those who lived in the area for less than ten years (60.8%). Literate people had higher compliance of 86% compared to illiterate 75%. Family size also mattered when it comes to compliance to treatment; households with members 1 to 4 had higher compliance of 82.1% compared to households with more than 9 members which was 68.2%. Type of occupations had no significant association with compliance to CDTI, farmers had compliance of 79.6% while other occupations had 83.9% (Endale *et al.*, 2015).

Akinboye *et al* (2010) conducted a study on onchocerciasis among inhabitants of Ibarapa local government community Oyo state Nigeria. The aim of the study was to identify high risks age groups and occupation as well as magnitude of onchocerciasis in Ibarapa. In the study, 72 inhabitants were randomly selected; their socio-demographic and economic data were collected prior to parasitological testing. Results showed that prevalence of onchocerciasis was 54% with males being more affected (30.5%) compared to women (23.6%). The age group that was more affected was between 21 to 30 years with prevalence of 11.1% while age group between 11 to 20 years were less affected with prevalence of 9.8%. There was association between occupation and onchocerciasis prevalence, where by prevalence among farmers was 31.9%, among students was 12.5% and among traders was 8.3% (Sigma *et al.*, 2013).

2.3 Knowledge, attitudes and perceptions of community members towards onchocerciasis and CDTI

Community directed treatment with ivermectin (CDTI) is the strategy introduced by APOC that involve the use of some community members known as CDDs for ivermectin delivery for the purpose of elimination of onchocerciasis (WHO, 2010). The CDTI project has been proven to be successful in reducing onchocerciasis transmission and morbidity (Kim *et al.*, 2015). Coverage and effective participation of the community is affected by low level of knowledge about the disease, low level of community awareness on ivermectin treatment, negative attitudes on CDTI and drug distribution system (Weldegebreal *et al.*, 2014).

Understanding community knowledge, attitude and practice is crucial for improvement of community participation as well as designing and modification of available intervention for onchocerciasis which will have influence on compliance (Okwara *et al.*, 2017).

Alonso *et al* (2017) conducted a study on Knowledge, attitudes, and practices toward onchocerciasis among local population in Bioko Island, Equatorial Guinea. One hundred and forty (140) heads of household were interviewed and results showed 54% of the heads of household had heard about onchocerciasis, 19.3% knew the right mode of transmission, 65.6% perceived ivermectin as the treatment. Furthermore the researchers observed that community members had better practices towards the disease than the knowledge of the disease and recommended the need to raise awareness on the disease and control programmes.

According to Dissak-Delon *et al.*, (2017), there is association between beliefs and perceptions of community members with compliance to CDTI. High compliance of CDTI in some areas of Cameroon, Nigeria and Uganda has been influenced by perception of benefits and effectiveness of annual ivermectin treatment (Brieger *et al.*, 2012). A study was done in Morogoro, Tanzania on factors affecting community participation in the CDTI program disclosed high awareness of onchocerciasis (90%) and techniques for control and treatment (95%). 75% of interviewed members knew how ivermectin was distributed in the community and had taken the drug (74%) as the part of control intervention. Factors affecting participation to CDTI were lack of proper knowledge on the disease, doubts on medication in

relation to side effects, mistrust of the method for dose calculation, lack of sufficient health education materials, insufficient community drug distributors, and inflexible drug distribution mechanisms (York *et al.*, 2015).

2.4 Knowledge, attitudes and perceptions of community drug distributors towards CDTI

Mass treatment with ivermectin has been the main control strategy for onchocerciasis in Africa (Fobi *et al.*, 2015). CDTI aims at reducing public health and socio-economic problems associated with onchocerciasis by administering ivermectin for the period between 12 to 15 years (Kim *et al.*, 2015). Effective use of ivermectin in community has kept microfilariae population down with transmission and disease effects were reduced (Cupp *et al.*, 2011).

Community directed distributors (CDDs) consists of volunteers both women and men selected by community members for the purpose of distributing ivermectin (WHO, 2010). CDDs are trained and retrained every 1 to 2 years to deliver drugs in the community and educate community members on health issues (Weldegebreal *et al.*, 2016).

The motivation of the volunteers is mainly to gain self esteem, recognition and knowledge rather than cash incentives, the main tasks of CDDs are: to carry out village census for the purpose of determining total ivermectin tablets required; administering ivermectin tablets in the community according to people's height; keeping records on the number of ivermectin tablets used, unused and lost; treating minor drug reactions and referring community members with adverse drug reactions to health facilities (WHO, 2010).

Weldegebreal *et al* (2016) conducted a study to assess knowledge, attitude and practice of community drug distributors about onchocerciasis and CDTI in Quara district, Ethiopia. 79 CDD were interviewed and results showed that 9 (11.4%) knew the causative agent of the disease, 28 (35.4%) had good level of knowledge on the onchocerciasis, 19 (24.1 %) had good level of positive attitude and 18 (22.8 %) had good level of positive practice about onchocerciasis. Female CDDs older than 35 years old were associated with high level of knowledge on onchocerciasis. The researcher observed that majority of CDDs 88.6% (70) had at least one misconception about etiology, mode of transmission and prevention of

onchocerciasis. Among interviewed CDDs 74 (93.7%) knew that the disease was treatable and 78.5% believed that itching was the symptom of onchocerciasis. Furthermore the research concluded CDDs need continuous training on CDTI as well as health education regarding onchocerciasis.

In Tanzania there has been increasing in participation of women in community distribution of ivermectin(Mutalemwa *et al.*, 2009). Participation of females has increased distribution of ivermectin in the infected communities, in Tanzania, female CDDs have shown to be tolerant and patient than men(Vouking *et al.*, 2015). In Uganda, about 70% of community members were of the opinion that women were more persuasive, committed and patient compared to men when it came to ivermectin distribution hence improving the compliance of community members towards treatment(Katabarwa *et al.*, 2009).

Community drug distributors have played a critical role in ensuring the success of CDTI for onchocerciasis, however currently there is decline in motivation of some volunteers due to change in socio-cultural environment and long period of many MDA which can affect the control program(Krentel *et al.*, 2017).

There are factors associated with negative motivation of CDDs in the community such as insufficient training, drug supplies and sensitization of community members (Hoerauf *et al.*, 2011; Fleming *et al.*, 2016). Poor morale support and inadequate incentives have been associated with decline of motivation towards ivermectin distribution (Hoerauf *et al.*, 2011). Recognition, respect and other factors that improve their capacities to perform their duties in the community have been associated with increase of motivation of CDDs (Hoerauf *et al.*, 2011; Fleming *et al.*, 2016; Krentel *et al.*, 2017).

In order to improve coverage and acceptability of CDTI, better compensation and increase of incentives to CDDs should be done as they are important when it comes into coverage and acceptability of onchocerciasis control program(NTDSC, 2016).

CHAPTER THREE

3.0 MATERIALS AND METHODS

This chapter covers the details of research methodology used in this study and includes study area, study design, study population, sample size estimation, sampling techniques, eligibility criteria, study variables, data collection techniques, data quality management, data processing and analysis, ethical consideration and study limitations.

3.1. Study Area

This study was conducted in Ulanga district, one of the six districts in Morogoro region. Ulanga district lies at latitude of $-8^{\circ}59'19.90''$ S and longitude of $36^{\circ}36'47.92''$ E. Ulanga district has an area of 24,460 km² with approximate population of 169,853 where by females are 85,098 and males are 84,755 (NBS, 2016-2017). The majority ethnic group is Pogoro. The district is bordered to the north and west by Kilombero district, to the east by Lindi region and to the south by Ruvuma region.

Ulanga district has **29** wards namely; Biro, Chirombola, Euga, Ilonga, Iragua, Isongo, Itete, Ketaketa, Kichangani, Kilosa Mpepo, Lukande, Lupiro, Mahenge, Malinyi, Mawasiliano, Mbuga, Milola Minepa, Msogezi, Mtimbira, Mwaya, Nawenge, Ngoheranga, Ruaha, Sali, Sofi, Usangule and Vigoi.

The district experiences tropical climatic conditions, characterized by annual rainfall approximately between 800mm and 1600mm every year and normally there are two rainy seasons; "the long rains" in March to May and "the short rains" between November to January.

In health services, the following are diseases present in Ulanga; Onchocerciasis with nodding syndrome in children, malaria, worms(soil transmitted helminths), Anemia, Diarrhea, Pneumonia, Protein Calorie Malnutrition, Tuberculosis, Acute Respiratory Infection, Diabetes, HIV/AIDS, Epilepsy, Hypertension and Asthma.

Ulanga district has **40** rivers where by **34** rivers flow throughout the year and **17** rivers flow in the valleys. Luli, Lukande, Mbalu, Mzelezi, Mzingizi and Ruaha are some of perennial rivers, known as breeding sites for *S.damnosum* s.I. that transmit Onchocerciasis. The main economic activities in Ulanga district are subsistence farming and fishing.

3.2. Study Design

A community based cross sectional study involving both quantitative and qualitative methods of data collection was carried out in Ulanga district in June and July 2018 using primary and secondary data.

3.3. Study Population

The study population for the quantitative primary data involved community members aged 15 years and above while the population for the qualitative data involved community drug distributors.

The study population for the burden of disease involved children less than 10 years of age screened for onchocerciasis according to the secondary data collected under the Neglected Tropical Disease Control Program.

3.4. Sample size estimation for primary data

The sample size for this study was estimated using the formula for cross-sectional surveys:

$$n = \frac{z^2 P (100-P)}{\varepsilon^2}$$

Whereby;

n = Minimum required sample size

Z= Standard normal deviate of 1.96 on using 95% confidence interval.

P = Expected proportion of population with knowledge on onchocerciasis, which is **50%**. This proportional is used since no previous studies were found.

ϵ = Margin of error (5%)

$$\text{Hence, } n = \frac{1.96^2 \times 50\% (100-50)}{5^2}$$

$$n = 384$$

Sample size was adjusted for 10% non response rate as follows;

$$n = 1/R * 384$$

$$n = (10/100 * 384) + 384$$

$$n = 422$$

The estimated sample size for this study was **422** community members.

3.5. Sampling Technique

3.5.1 Primary data

The study used multistage sampling technique to obtain representative sample of this study. Sampling was done in three stage cluster sampling technique where by 1st stage involved simple random selection of one endemic ward from the list of all **29** onchocerciasis endemic wards obtained from the District onchocerciasis control program officer whereby Isongo ward was selected. The 2nd stage was selection of representative villages from Isongo ward, Isongo ward has two villages (Uponera and Isongo), Uponera had few members who agreed to participate on this study so sample size was not enough which necessitated the second village also to be included in the sample so that members from this village could fill the remaining gap therefore both villages were taken. The 3rd stage was selection of one representative village unit from each village, simple random sampling was used to select one village units from the list of all village units in each village which made a total of two village units from the two villages in which all reachable households were visited and **422** community members who met the inclusion criteria were interviewed to generate the required data.

Subjects for in-depth interviews and FGDs were sampled purposively, thus; five community drug distributors were recruited for in-depth interviews (three CDDs were from Uponera village and two CDDs were from Isongo village) and eight people were recruited for each focus group discussion.

3.5.2 Secondary data

The secondary data were obtained from the Neglected Diseases Control Program at National Institute of Medical Research. The sampling was done by NTDCP in transmission assessment survey of 2017 where systematic random sampling was used to recruit **587** children less than 10 years of age in the community for blood samples collection. Children less than 10 years of age were used for the purpose of checking if there was interruption of transmission of *O.volvulus* in Ulanga community after receiving ivermectin treatment for 20 years.

3.6. Eligibility criteria

3.6.1 Inclusion criteria

The inclusion criteria for this study was; all community members above 15 years and community drug distributors who were residents of respective village for more than 12 years and voluntary agreed to participate by either signing the informed consent form or provide informed verbal consent on the day of the study.

3.6.2 Exclusion criteria

The exclusion criteria for this study was; community members and community drug distributors who refused to participate and neither signed informed consent nor provide informed verbal consent on the day of the study.

3.7. Study Variables

3.7.1 Independent variables

The independent variables for this study were:

Socio demographic characters such as; gender (male or female), age group, employment status (employed, unemployed), marital status (single, married, divorced), and education level (none, primary, secondary, tertiary).

Knowledge about onchocerciasis and CDTI as well as attitudes and perceptions towards onchocerciasis and CDTI.

3.7.2 Dependent variable

The dependent variables for this study were coverage of CDTI and prevalence of onchocerciasis.

3.8. Data collection techniques

3.8.1. Primary data

3.8.1a. Structured interviews

Interviews were conducted to collect information from community members. The structured interview consisted of close ended questions that focused on information regarding socio-demographic data, knowledge on cause, transmission, symptoms, treatment and prevention as well as attitudes and perceptions towards treatment and prevention. The interviews were done in 30-45 minutes.

3.8.1b. In-depth interviews

In depth interviews were held with community drug distributors to explore information on their knowledge, attitudes, perceptions, practices and experiences towards onchocerciasis and CDTI. Community drug distributors were also interviewed on how they distributed drugs, side effects of the drugs and how they managed the side effects. A total of five community drug

distributors were interviewed in Isongo and Uponera villages. Tape recorder was used to record information and short notes were also taken.

3.8.1c. Focus Group Discussions

Focus Group Discussions were held with community members to explore their knowledge, attitude and perception toward onchocerciasis and CDTI. Two FGDs were held in village offices. The first FGDs involved men and the second FGDs involved women. Each focused group discussion involved 8 members. With the consent of participants, the FGDs were audio taped.

3.8.2. Secondary data for Onchocerciasis burden

The secondary data were obtained from Neglected Diseases Control Program at National Institute of Medical Research. NTDCP conducted transmission assessment survey of onchocerciasis in endemic districts in 2017. Ulanga District was also one among the area where assessment was done. The survey of 2017 in Ulanga District was done after 20 years of annual community-directed treatment with ivermectin which is beyond the average coverage of CDTI.

In diagnosis, Ov16 rapid card tests were used to detect IgG4 antibodies to recombinant *O.volvulus* antigen Ov16 with capillary blood samples from children less than 10 years of age who represented the rate of infection in community and results were obtained. The obtained results were used to calculate the prevalence of onchocerciasis after 20 rounds of CDTI as well as to determine association between prevalence of onchocerciasis with socio-demographic attributes.

3.9 Data quality management

3.9.1 Recruitment and training of research assistants

The study recruited two research assistants for the purpose of data collection. The two research assistants were trained for one day briefly on research concept but more emphasis was on procedures to follow during conducting interviews and how to fill the questionnaires

after requesting consent from interviewees. Training was done by investigator to guarantee quality field operation.

3.9.2 Pre-testing of data collection tools

A pilot study was conducted at Mahenge village located in Mahenge ward with the aim of pre-testing the research tools (questionnaires) so as to measure the validity and reliability as data collection tools. Pre-testing involved **38** of community members (**10%** of calculated sample size). Mahenge ward that was used in pilot study was excluded during actual data collection. Researcher and research assistants participated in pretesting of questionnaires in order to be familiar with the instrument and some of the questions in knowledge section were modified on the basis of the results obtained from pre-testing.

3.10. Data processing and analysis

3.10.1. Quantitative data

The primary data collected was cleared prior to coding, entered and then analyzed using statistical package for the social sciences (SPSS) version **22**. The collected data were double entered to minimize errors during data entry and to ensure that no information was left out.

In measuring knowledge, knowledge scale was used. Eight multiple choice questions that carried total of 12 correct responses were asked and scores were given for the both correct and incorrect responses where by the score for correct response was 1 and incorrect response was 0 then the scores were added. The scores were varied from 0-12 points and cut off points was based on mean knowledge score and categorized as follows; 80 – 100% (10-12 points) of correct responses meant a high level of knowledge, 50% – 79% (6-9 points) meant moderate level of knowledge and less than 50% (0-5) meant low level of knowledge.

In measuring attitude and perception, five point-likert scale was used. There were 7 statements for attitude and 15 statements for perception. The rating scale was measured as follows;

Table 1: Likert scale system

Statement	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

In attitude measurement, the individual attitude scores varied from 8 to 35 points which were added to obtain total attitude score. Mean attitude score was calculated from the total scores that aided in classification of attitude as positive attitude or negative attitude. Negative attitude ranged from 8 to 23 points and positive attitude from 24 to 35 points.

In perception measurement, the individual perception scores varied from 20 to 112 points which were added to obtain total perception score. Mean perception score was calculated from the total scores that aided in classification of perception as positive perception or negative perception. Negative perception ranged from 20 to 51 points and positive perception from 51 to 112 points.

Statistical package for the social sciences (SPSS) version **22** was used to tabulate frequency tables of socio-demographic characteristics, knowledge, attitudes and perceptions. The quantitative data were organized to obtain proportions and their 95% CI; associations between onchocerciasis knowledge, attitudes and perceptions with socio-demographic characteristics were assessed by the Chi-square test at significance level of 0.05.

The secondary data collected from NTDCP were entered and analyzed using statistical package for the social sciences (SPSS) version **22**. From secondary data, frequency distribution and proportions were done to summarize the variable of interest and multivariable analysis was done to determine independent variables associated with the outcome of interest. P value of <0.05 at 95% CI was used to test the statistical significances between the dependent and independent variables and results were presented into tables and graphs.

3.10.2. Qualitative data

The collected data from in-depth interviews and FGD's were analyzed qualitatively using thematic analysis. The collected audio data from FGD'S and interviews were transcribed to obtain textual format and then organized into segments of text and themes, finally analysis and interpretations were done by clustering similar and related topics together to form major themes.

3.11. Ethical consideration

Ethical clearance was obtained from Muhimbili University of Health and Allied Sciences Ethical Review Board. Permission to conduct the study in Ulanga district was requested from the Regional Administrative Secretary (RAS) of Morogoro, then District Administrative Secretary (DAS) and District Medical officer (DMO) of Ulanga district after submitting introduction letter attached with ethical clearance from MUHAS. Community members and drug distributors were informed about the study, the selected community members who fitted the criteria of inclusion were given informed consent forms and requested to sign if they were willing to participate in the study. Community members and drug distributors who did not sign informed consent forms or provide informed verbal consent did not participate in the study.

Respondents were assured that no one will be harmed in the participation of the study and high level of confidentiality were maintained in the study where by numbers were used instead of names of participants. All audio recorded data from focused group discussion and in-depth interviews were transferred into personal computer of the investigator and locked with password so that nobody else can access the data.

3.12. Study limitations

The major limitation was on secondary data that prevalence was obtained by using only Ov16 antibody test but according to WHO guidelines it was supposed for those who tested positive skin snips to be taken for PCR in order to confirm. Recall bias from participants was also a limitation. However, this limitation was mitigated by using high quality/comprehensive questionnaires and interviewees were given enough time for recalling important information. Interviewer bias by using several research assistants was mitigated by training the research assistants.

CHAPTER FOUR

4.0 RESULTS

This chapter presents the results of the study done in Ulanga district. These are presented in relation to study objectives and are reported in the following order; demographic characteristics of study participants, prevalence of onchocerciasis among community members, association of demographic factors with prevalence of onchocerciasis, community knowledge, attitudes and perceptions towards onchocerciasis and acceptability of ivermectin treatment and finally knowledge, attitude and perceptions of community drug distributors towards the use of ivermectin for onchocerciasis control.

4.1 Demographic characteristics of study participants

4.1a. Study participants in primary data

A total of 422 respondents were interviewed, with a sex ratio of 1:1 with more than two thirds (69.4%) being 20-49 years old (Table 2). More than a half (56.6%) were peasants, while about two thirds (64.5%) were residents for 20-49 years.

Table 2: Demographic characteristics of study participants in primary data (N=422)

Variables	Sex		Total (%)
	Male (%)	Female (%)	
Sex	211(50)	211(50)	422(100)
Age groups (years)			
Less than 20	9(47.4)	10(52.6)	19(4.5)
20-29	45(55.6)	36(44.4)	81(19.2)
30-39	66(50.8)	64(49.2)	130(30.8)
40-49	45(54.9)	37(45.1)	82(19.4)
50-59	13(31)	29(69)	42(10)
60-69	18(43.9)	23(56.1)	41(9.7)
Above 70	15(55.6)	12(44.4)	27(6.4)
Marital status			
Married	136(54.8)	112(45.2)	248(58.8)
Single	63(46.3)	73(53.7)	136(32.2)
Divorced	3(25)	9(75)	12(2.8)
Widow(er)	9(34.6)	17(65.4)	26(6.2)
Education			
Never attended school	21(38.9)	33(61.1)	54(12.8)
Pre-primary	24(57.1)	18(42.9)	42(10)
Primary not completed	16(38.1)	26(61.9)	42(10)
Primary completed	108(54.8)	89(45.2)	197(46.7)
Secondary	38(54.3)	32(45.7)	70(16.6)
Post-secondary training	8(61.5)	5(38.5)	13(3.1)
University	4(100)		4(0.9)
Occupation			
Peasants	111(46.4)	128(53.6)	239(56.6)
Animal keepers	29(48.3)	31(51.7)	60(14.2)
Trader	35(47.3)	39(52.7)	74(17.5)
Employed	4(80)	1(20)	5(1.2)
Boda boda drivers	25(89.3)	3(10.7)	28(6.6)
Unemployed	7(56.2)	9(43.8)	16(3.8)
Duration of residence			
Less than 20	26(55.3)	21(44.7)	47(11.1)
20-29	46(53.5)	40(46.5)	86(20.4)
30-39	58(49.2)	60(50.8)	118(28)
40-49	37(54.4)	31(45.6)	68(16.1)
50-59	12(32.4)	25(67.6)	37(8.8)
60-69	20(47.6)	22(52.4)	42(10)
Above 70	12(50)	12(50)	24(5.7)

4.2b. Study participants in secondary data

A total of 587 children aged < 10 years were tested to check if there was interruption of transmission of *O.volvulus* following 20 years of CDTI. Their mean age was 7.4 years, with 52.3% being females (Table 3). More than two thirds (70.9%) were children of school age and had stayed in Ulanga for 5-9 years; about two third (68.8%) of them lived in households with 5-10 members.

Table 3: Demographic characteristics of study participants in secondary data (N=587)

Variables	Sex		Total (%)
	Male (%)	Female (%)	
Sex	280(47.7)	307(52.3)	587(100)
Age groups (years)			
Less than 5	79(46.2)	92(53.8)	171(29.1)
5-9	201(48.3)	215(51.7)	416(70.9)
Duration of residence (years)			
Less than 5	79(46.2)	92(53.8)	171(29.1)
5-9	201(48.3)	215(51.7)	416(70.9)
Size of the family (members)			
Less than 5	39(44.8)	48(55.2)	87(14.8)
5-10	190(47)	214(53)	404(68.8)
More than 10	51(53.1)	45(46.9)	96(16.4)

4.2 Prevalence of onchocerciasis among children under ten years of age in Ulanga district

Of 587 children aged < 10 years tested for *O.volvulus*, 17 were positive mostly in children aged 5-9 years. Thus, the prevalence of *O.volvulus* was 2.9% [95% CI (1.7, 4.4)].

Table 4: Prevalence of onchocerciasis among children under ten years of age in Ulanga district by sex, age, duration of residence and family size (N=587)

Variables	Onchocerciasis status		Total (%)
	Positive (%)	Negative (%)	
Sex			
Males	7(2.5)	273(97.5)	280(100)
Females	10(3.3)	297(96.7)	307(100)
Age groups (years)			
Less than 5	1(0.6)	170(99.4)	171(100)
5-9	16(3.8)	400(96.2)	416(100)
Duration of residence (years)			
Less than 5	1(0.6)	170(99.4)	171(100)
5-9	16(3.8)	400(96.2)	416(100)
Size of the family (members)			
Less than 5	1(1.1)	86(98.9)	87(100)
5-10	13(3.2)	391(96.8)	404(100)
More than 10	3(3.1)	93(96.9)	96(100)

4.3: Association of demographic factors with prevalence of onchocerciasis

4.3. (a): Association between sex and prevalence of onchocerciasis

The results of Ov-16 showed that among 17 children who tested positive males were 7(2.5%) and females were 10(3.3%). However, the observed difference in prevalence was not statistically significant ($\chi^2 = 0.299$ df =1; $p = 0.585$), which means there was no association between onchocerciasis and sex of the child. For a child to be infected with onchocerciasis is not determined by sex (Table 5).

4.3. (b): Association between age and prevalence of onchocerciasis

There was statistically significant association between age of the child and being infected with onchocerciasis ($\chi^2 = 4.584$ df =1; $p = 0.032$). Results showed the statistically significant difference between children < 5 years of age whose prevalence was found to be low (0.6%) compared to children from 5-9 whose prevalence was high (3.8%). Children aged 5-9 were at higher risk of exposure to *O. volvulus* infection of about sixth times than those aged less than 5 years (OR = 6.626; 95% CI: 0.864-50.824) (Table 5).

4.3. (c): Association between duration of residence and prevalence of onchocerciasis

There was statistically significant association between duration of residence and being infected with onchocerciasis ($\chi^2 = 4.584$ df =1; $p = 0.032$), this means higher prevalence (3.8%) was found among children who have resided for 5-9 years in Ulanga than those children who resided for < 5 years whose prevalence was 0.6%. Children who have resided for 5-9 years were at higher risk of exposure to *O. volvulus* infection of about sixth times that of those who have resided for less than 5 years (OR = 6.626; 95% CI: 0.864-50.824)(Table 5).

4.3. (d): Association between size of the family and prevalence of onchocerciasis

There was no statistically significant association between onchocerciasis prevalence and family size ($\chi^2 = 1.110$ df =1; $p = 0.574$), which means to be infected with onchocerciasis is not determined by size of the family (Table 5).

Table 5: Association between demographic factors and prevalence of onchocerciasis (N=587)

Variables	Onchocerciasis status		Total (%)	p-value	OR(95%CI)
	Positive (%)	Negative (%)			
Sex					
Males	7(2.5)	273(97.5)	280(100)	0.585	1(Reference)
Females	10(3.3)	297(96.7)	307(100)		1.335(0.498-3.578)
Age groups (years)					
Less than 5	1(0.6)	170(99.4)	171(100)	0.032	1(Reference)
5-9	16(3.8)	400(96.2)	416(100)		6.626(0.864-50.824)
Duration of residence (years)					
Less than 5	1(0.6)	170(99.4)	171(100)	0.032	1(Reference)
5-9	16(3.8)	400(96.2)	416(100)		6.626(0.864-50.824)
Size of the family (members)					
Less than 5	1(1.1)	86(98.9)	87(100)	0.574	1(Reference)
5-10	13(3.2)	391(96.8)	404(100)		1.975(0.199-19.607)
More than 10	3(3.1)	93(96.9)	96(100)		0.797(0.221-2.876)

4.4 Community knowledge, attitudes and perceptions towards onchocerciasis and acceptability of CDTI

4.4.1: Knowledge on the disease

Out of a total of 422 respondents interviewed, the vast majority (94.1%) had heard about onchocerciasis. On causative agent of onchocerciasis, only 19.6% correctly knew filarial worm as causative agent. However, more than half (62.2%) thought the black fly to be the causative agent (Table 6). There was statistically significant association between level of education and knowing the correct causative agent of the disease ($p = 0.015$) with respondents who completed primary education knew the correct causative agent of onchocerciasis than other levels of education. Other socio-demographic factors (age, sex, occupation and duration stayed in the village) didn't show any significant association.

Table 6: Knowledge of the disease among community members in Ulanga district (N=422)

Indicative questions on knowledge	n (%)
Have you ever heard about the disease known as onchocerciasis?	
Yes	397(94.1)
No	25(5.9)
What is the causative agent of onchocerciasis?	
Filarial worm	78(19.6)
Black fly	247(62.2)
Mosquito	37(9.3)
Witchcraft	2(0.5)
Don't know	33(8.3)

Knowledge of the disease was further supported with information from focused group discussions whereby majority of respondents had heard about onchocerciasis and they knew the local terms of the disease but they did not clearly define the disease and cause of it.

One of the participants said “*Onchocerciasis in our village is common known as wankoseka, it is a disease caused by vifuna when vifuna bite results into swelling and severe itching*” (FGD male, Uponera).

Another participant said “*The local term for onchocerciasis is mkita, when you say mkita even children can understand, the only thing I know about mkita is a disease of itching caused by vifuna, the moment vifuna bite you will suffer severe itching*” (FGD female, Uponera).

4.4.2: Knowledge on transmission

Table 7 shows the results of interviewee responses on knowledge of onchocerciasis transmission. Out of 422 respondents; 119 (28.2%) knew onchocerciasis is transmitted from one person to another via black fly bite, 217(51.4%) reported onchocerciasis is not transmitted from one person to another. More than two thirds (71.3%) correctly knew black fly bite as

mode of transmission while the rest did not know. Level of education was found to be associated with the knowledge on transmission ($p=0.001$), respondents who have completed primary education knew better the correct mode of transmission than other levels of education. Other socio-demographic factors (age, sex, occupation and duration stayed in the village) did not show any significant association.

Table 7: Knowledge on transmission among community members in Ulanga district (N=422)

Indicative questions on knowledge	n (%)
Is onchocerciasis transmitted from person to person?	
Yes	119(28.2)
No	217(51.4)
Don't know	86(20.4)
What is the mode of transmission of the disease?	
Black fly bite	301(71.3)
Contact with infected person	10(2.4)
Mosquito bite	42(10)
Through breath	6(1.4)
Don't know	63(14.9)

Knowledge on mode of transmission was complimented with information from focus group discussions; majority of participants knew the correct mode of transmission but did not clearly tell how transmission can occur from one person to another.

One of the participants said “*Transmission of wankoseka occurs when vifuna bite infected person and then goes to bite uninfected person*” (FGD male, Uponera).

Another participant said “*Transmission occurs when vifuna bite uninfected person*” (FGD female, Uponera).

4.4.3: Knowledge of symptoms

Table 8 shows the results on the knowledge of symptoms whereby community members were asked about symptoms of onchocerciasis, five symptoms were mentioned and respondents had an option to choose in each symptom if they know or not; 364(86.3%) respondents reported

itching, 305(72.3%) skin rashes, 303(71.8%) blindness, 245(58.1%) skin depigmentation and 185(43.8%) skin lesions as symptoms. The statistically significant difference was found between some socio demographic factors and symptoms such as respondents aged 30-39 years were more aware of itching ($p=0.027$), skin depigmentation ($p=0.005$), blindness ($p=0.000$) and skin rashes ($p=0.035$), as symptoms of onchocerciasis than other age groups. Respondents who have resided in Ulanga for 30-39 years were more aware of itching ($p=0.031$), skin depigmentation ($p=0.035$) and blindness ($p=0.003$) as symptoms. Other socio-demographic factors (sex, occupation and level of education) did not show any statistically significant difference.

Table 8: Knowledge of symptoms among community members in Ulanga district (N=422)

Indicative questions on knowledge	n (%)
What are the signs and symptoms of onchocerciasis?	
Itching	
Yes	364(86.3)
No	14(3.3)
Don't know	44(10.4)
Lesion	
Yes	185(43.8)
No	114(27)
Don't know	123(29.1)
Skin depigmentation	
Yes	245(58.1)
No	63(14.9)
Don't know	114(27)
Blindness	
Yes	303(71.8)
No	47(11.1)
Don't know	72(17.1)
Skin rashes	
Yes	305(72.3)
No	42(10)
Don't know	75(17.8)

Knowledge of symptoms was also supported with qualitative data from focused group discussions where by participants were asked how does a person infected with onchocerciasis look like; respondents gave some of the symptoms such as itching, blindness and skin rashes

as among the symptoms of the disease. The following are some of the statement given by participants;

“.....Infected person has hard skin with black spots and swelling body as the result of severe itching” (FGD male, Uponera).

“.....mmmhhhh do not remind me when I was once infected, I suffered severe itching especially around the buttocks area, I had ukurutu on my skin. Wankoseka is a bad disease it made me unable to participate in community activities” (FGD female, Uponera).

4.4.4: Knowledge on treatment and prevention

The large majority (96.4%) of the respondents reported that modern treatment, using medicines is the right treatment for onchocerciasis. Only a very small percentage (3.6%) reported traditional treatment. There was statistically significant association between duration of stay in Ulanga and knowing the correct type of treatment ($p=0.039$). Respondents who have stayed in Ulanga for 30-39 years reported the correct type of treatment compared to those who have stayed for less than 20 years. More than two thirds (70.9%) of respondents did not know Ivermectin as the correct drug for treatment, only a few reported Ivermectin (11.8%) and Albendazole (17.3%). Males 27 (6.4%) were more aware on the correct drug that is used to treat onchocerciasis than females 23(5.5%) and the difference was statistically significant ($\chi^2 = 7.034, p = 0.03$).

More than a half (60%) respondents agreed onchocerciasis can be prevented, the rest did not agree (19.7%) or did not know (20.4%) onchocerciasis can be prevented (Table 9). Males 141(33.4%) knew better that onchocerciasis can be prevented than females 112 (26.5%) and the difference was statistically significant ($\chi^2 = 8.337, p = 0.015$).

Table 9: Knowledge on treatment and prevention among community members in Ulanga district (N=422)

Indicative questions on knowledge	n (%)
What type of treatment is used to treat onchocerciasis?	
Modern	407(96.4)
Traditional	15(3.6)
If Modern, which drug is needed to treat the disease?	
Ivermectin	50(11.8)
Albendazole	73(17.3)
Don't know	299(70.9)
Is onchocerciasis a preventable disease?	
Yes	253(60)
No	83(19.7)
Don't know	86(20.4)

4.4.5: Classification of onchocerciasis knowledge among community members

Table 10 shows classification of onchocerciasis knowledge where by almost half of the population 207(49.2%) had low level of knowledge, 150(35.5%) had moderate knowledge and few 65(15.4%) had high level of knowledge. The mean (SD) of knowledge score was found to be 7.12(2.52) with minimum score of 0 and maximum score of 12 which corresponded to the average 7 correct answers out of 12 questions.

Table 10: Classification of onchocerciasis knowledge among community members in Ulanga district (N=422)

Knowledge level	n (%)
Low	207(49.2)
Moderate	150(35.5)
High	65(15.4)
Total	422(100)

4.4.6: Acceptability of community directed treatment with ivermectin

Table 11 shows acceptability of CDTI program among community members in Ulanga district. Community members were interviewed on acceptability of CDTI program; 352(83.4%) respondents agreed that they will take ivermectin as prescribed by CDDs when given to them while 70(16.6%) did not agree. Of the respondents who agreed, 50.3 %(177) were females. Residents who had stayed in Ulanga for 30-39 years vastly 102(29%) agreed that they will take ivermectin as prescribed compared to other residents 320(71%) and the difference was statistically significant ($p=0.032$). Among those 70(16.6%) respondents who did not agree to take ivermectin their reasons were fear of side effects 37(52.9%), mistrust of method of dose calculation 12(17.1%) and 21(30%) said it's because they were not sick.

Majority of community members 314(74.4%) were willing to comply with the duration of ivermectin treatment for 12 to 15 years in order to eliminate onchocerciasis while others were not willing 30(7.1%) and not sure 78(18.5%). Side effects were observed as main reason why community members did not agree to comply with ivermectin treatment. A total 269(63.7%) of the population interviewed had experienced side effects after taking ivermectin while 96(22.7%) respondents had never experience any side effects and 57(13.5%) did not remember if they had any side effect after taking ivermectin. The side effects that were experienced by community members included itching 132(49.1%), swelling 45(16.7%), body pain 25(9.3%), headache 22(8.2%), dizziness 18 (6.7%), vomiting 15(5.6%) and diarrhea 12(4.5%).

Table 11: Acceptability of CDTI program among community members in Ulanga district (N=422)

Indicative questions on acceptability of CDTI	n(%)
Will you take ivermectin as prescribed by CDDs when given to you?	
Yes	352(83.4)
No	70(16.6)
If no what will be the reason?	
Fear of side effects	37(52.9)
Fear of the method of dose calculation	12(17.1)
Not sick	21(30)
Are you willing to comply with the duration of ivermectin treatment for 12 to 15 years in order to eliminate onchocerciasis?	
Yes	314(74.4)
No	30(7.1)
Not sure	78(18.5)
Have you experienced any side effects as result of using ivermectin medication?	
Yes	269(63.7)
No	96(22.7)
Don't remember	57(13.5)
What were side effects of the drug?	
Itching	132(49.1)
Dizziness	18(6.7)
Headache	22(8.2)
Vomiting	15(5.6)
Diarrhea	12(4.5)
Swelling	45(16.7)
Body pain	25(9.3)

This section of acceptability of CDTI program among community members in Ulanga district was further complimented with qualitative data from focused group discussions; Participant were asked how often they take medication and majority said once per year with exception of very few who said twice per year.

One of the participant said *“The drugs are given only once per year but I have once take the drugs twice a year because of the symptoms I was experiencing”* (FGD female, Uponera). Participants were asked on the method of dose calculation; majority were able to say the dose is given after height measurement with a specific ruler that stays with CDDs however there were misconceptions on the use of height measurement as method of dose calculation.

One of the participant said *“Height measurement is used as method of dose calculation but I do not trust this method and I think it is the reason of the side effects people get because how can a person with 60kg given the dose similar to that of a person with 80 kg with excuse that they have same height. I think other measurements should also be taken such as weight before giving the drugs”* (FGD female, Uponera).

4.4.7: Attitude towards the disease

Table 12 shows results of respondents in each attitude statement asked according to Likert scale. More than three quarters (79.1%) of the respondents held positive attitudes by agreeing (47.6%) or strongly agreeing (31.5%) that onchocerciasis is a bad disease; as well as being sad to a person with onchocerciasis as they agreed (51.7%) or strongly (28.4%) agreed that it's very sad when you see a person with onchocerciasis; and they held the opinion that affected individual worries about consequences of onchocerciasis with 41.2% agreeing and 19.7% strongly agreeing.

Slightly more than half (53.3%) of the respondents held positive attitudes that onchocerciasis should not stigmatize the affected individual by disagreeing (20.4%) or strongly disagreeing (32.9%) that affected individual should be isolated. More than two thirds (71.1%) had negative attitudes towards Ivermectin as they agreed (46.9%) or strongly agreed (24.2%) that itching was a problem after taking ivermectin. More than half (56.2%) of the respondents held

positive attitudes to female drug distributors by agreeing (29.9%) or strongly agreeing (26.3%) that it feels comfortable when a female drug distributor gives ivermectin.

More than half of the respondents (55.1%) had negative attitude toward community drug distributors as they disagreed (17.5%) or strongly disagreed (37.6%) that they are happy to help onchocerciasis patients without payment.

Table 12: Attitude towards onchocerciasis among community members in Ulanga district (N=422)

Attitude statements	Strongly agree	Agree	Not sure	Disagreed	Strongly disagreed
	N (%)				
Onchocerciasis is a bad disease	133(31.5)	201(47.6)	41(9.7)	26(6.2)	21(5)
It's very sad when you see a person with onchocerciasis	120(28.4)	218(51.7)	52(12.3)	17(4)	15(3.6)
Affected individual worries about consequences of onchocerciasis	83(19.7)	174(41.2)	83(19.7)	30(7.1)	52(12.3)
Affected individual avoids contact with other community members	22(5.2)	66(15.6)	109(25.8)	86(20.4)	139(32.9)
Sometimes I feel itching after taking IVM	102(24.2)	198(46.9)	35(8.3)	48(11.4)	39(9.2)
I feel comfortable when a female drug distributor gives me IVM	111(26.3)	126(29.9)	91(21.6)	50(11.8)	44(10.4)

4.4.8: Classification of community attitude towards onchocerciasis and CDTI in Ulanga

Table 13 shows classification of community attitude towards onchocerciasis in Ulanga district. Majority of respondents 227(53.8%) interviewed had positive attitude compared to 195(46.2%) respondents who had negative attitude towards onchocerciasis and CDTI.

Table 13: Classification of community attitude towards onchocerciasis and CDTI in Ulanga district (N=422)

Attitude level	n(%)
Positive attitude	227(53.8)
Negative attitude	195(46.2)
Total	422(100)

Attitude towards onchocerciasis was further supported with information from focused group discussions; participants were asked about discrimination of infected people and majority disagreed and said they are treating each other equal. The following are some of the responses;

“..... How can my fellows discriminate me because of wankoseka, I was infected with wankoseka but no one treated me badly, I continued to share alcohol with others” (FGD male, Uponera).

“.....There is no discrimination in our village; I cannot treat my neighbors or relatives bad because of wankoseka” (FGD Female, Uponera). This indicates that onchocerciasis was not stigmatizing hence all family and community members would positively assist an affected individual.

4.4.9: Perception towards the disease

Table 14 shows results of respondents in each perception statement asked according in a Likert scale. More than three quarters (76.1%) of the respondents held positive perceptions by agreeing (46.7%) or strongly agreeing (16.8%) that onchocerciasis is common health problem in their community. In terms of seriousness and curability, 73% and 74.1% respectively, held positive perceptions that onchocerciasis is a serious health problem as they agreed (41.2%) or strongly agreed (31.8) that it is a dangerous disease; while 40.5% agreed and 34.1% strongly agreed that onchocerciasis is a curable disease.

Only less than a half (44.1%) of respondents held positive perceptions that they can get onchocerciasis by agreeing (21.1%) or strongly agreeing (23%) that they are at risk; while more than two third (69.4%) held positive perceptions by disagreeing (18%) or strongly disagreeing (51.4%) that onchocerciasis is caused by witch craft.

More than half (55.9%) of the respondents held positive perceptions towards IVM treatment by agreeing (39.1%) or strongly agreeing (16.8%) that IVM will eliminate onchocerciasis; while less than a half (46.1%) held the opinion that ivermectin has other health benefits with (25.1%) agreeing and (21%) strongly agreeing.

Two thirds (66.4%) of the respondents held positive perception by agreeing (34.6%) or strongly agreeing (31.8%) that home visit of CDDs increase the uptake of ivermectin. However, when it comes to the function of CDDs in handling of side effects; more than half (52%) of respondents disagreed (14.9%), strongly disagreed (12.1%) or were not sure (25.4%) if CDDs are prepared to handle side effects of the drug.

Regarding the operations of the CDTI program, less than half (46.5%) of the respondents held positive perceptions that women are more persuasive and patient during ivermectin distribution by agreeing (28%) or strongly agreeing (18.5%).

More than half (57.1%) of respondents held positive perceptions to the CDTI program by agreeing (37.9%) or strongly agreeing (19.2%) that it was an efficient way in fighting and preventing onchocerciasis; likewise more than a half (58.3%) approve their payment by agreeing (32.9%) or strongly agreeing that community drug distributors should be paid.

More than half (58%) of respondents held positive perceptions that that people with onchocerciasis should not be isolated by disagreeing (18.2%) or strongly disagreeing (39.8%) that people with onchocerciasis should live alone because they can transmit the disease to other people. Close to two thirds (63.3%) of the respondents held positive perceptions on socio-economic impact of the disease as they agreed (35.1%) or strongly agreed (28.2) that onchocerciasis is a threat to the socio-economic wellbeing of the community. However, more than two thirds held negative perceptions regarding community ownership of the program as 33.9% agreed and 37.9% strongly agreed that onchocerciasis control should be left to be run by the government (Table 15).

Table 14: Perception towards onchocerciasis among community members in Ulanga district (N=422)

Perceptions statements	Strongly agree	Agree	Not sure	Disagreed	Strongly disagreed
			N (%)		
Onchocerciasis is common in this village	124(29.4)	197(46.7)	54(12.8)	26(6.2)	21(5)
Onchocerciasis is a dangerous disease	134(31.8)	174(41.2)	77(12.8)	29(6.9)	8(1.9)
Onchocerciasis is a curable disease	144(34.1)	171(40.5)	58(13.7)	27(6.4)	22(5.2)
You are considering yourself to be at the risk of contracting onchocerciasis	97(23)	89(21.1)	97(23)	37(8.8)	102(24.2)
There is association between onchocerciasis with witchcraft	23(5.5)	41(9.7)	65(15.4)	76(18)	217(51.4)
Ivermectin treatment will eliminate parasite causing onchocerciasis	71(16.8)	165(39.1)	101(23.9)	55(13)	30(7.1)
Ivermectin has other health benefit	89(21)	106(25.1)	144(34.1)	63(14.9)	20(4.7)
Home visit of CDDs increase the uptake of ivermectin	134(31.8)	146(34.6)	79(18.7)	40(9.5)	23(5.5)
CDDs are prepared to handle side effects of the drug.	79(18.7)	122(28.9)	107(25.4)	63(14.9)	51(12.1)

Table 15: Perception towards onchocerciasis among community members in Ulanga district (N=422)

Perceptions statements	Strongly agree	Agree	Not sure	Disagreed	Strongly disagreed
	N (%)				
CDDs should be paid	107(25.4)	139(32.9)	83(19.7)	47(11.1)	46(10.9)
Women are more persuasive and patient compared to men when it came to IVM distribution	78(18.5)	118(28)	120(28.4)	51(12.1)	55(13)
CDTI is efficient way in fighting and preventing onchocerciasis	81(19.2)	160(37.9)	112(26.5)	24(5.7)	45(10.7)
People with onchocerciasis should live alone because they can transmit the disease to other people	35(8.3)	41(9.7)	101(23.9)	77(18.2)	168(39.8)
Onchocerciasis is a threat to the socio-economic wellbeing of this community	119(28.2)	148(35.1)	90(21.3)	36(8.5)	29(6.9)
Onchocerciasis control should be best run by the government	160(37.9)	143(33.9)	47(11.1)	23(5.5)	49(11.6)

4.4.10: Classification of community perception towards onchocerciasis and CDTI in Ulanga

Table 16 shows classification of community perception towards onchocerciasis and CDTI in Ulanga district. Overall, more than half (56%) of the respondents had positive perception indicating that there is a need for strengthening the BCC component of the CDTI program so as to change the perceptions of the 44% respondents who had negative perceptions towards onchocerciasis and CDTI.

Table 16: Classification of community perception towards onchocerciasis and CDTI (N=422)

Perception level	n (%)
Positive perception	236(56)
Negative perception	186(44)
Total	422(100)

Perceptions towards onchocerciasis were also supported with qualitative information from focused group discussions; Majority of participants (80%) perceived to be at the risk of acquiring onchocerciasis. The following are some of the statements from the participants;

“.....Yes I am considering myself at risk of acquiring wankoseka because a lot of vifuna are present where I live and they breed very fast” (FGD male, Uponera).

“.....I am considering myself at risk of acquiring mkita because I am a farmer and a lot of vifuna are presents in the farm and it's where they bite me so much” (FGD female, Uponera).

Participants were also probed to see if there is any relationship of local beliefs (superstition) being the cause of onchocerciasis. However all of them denied such a relationship. The following is one among the response of the participants;

“.....There is no relationship between superstition and onchocerciasis; it's a disease like other diseases that requires hospital treatment” (FGD male, Uponera).

4.5: Knowledge, attitudes and perceptions of the community drug distributors towards the use of ivermectin for onchocerciasis control in Ulanga district

The fourth objective aimed to assess knowledge, attitude and perceptions of the community drug distributors towards use of ivermectin for onchocerciasis control. The information in this objective was generated through in-depth interviews of CDDs. A total of five community drug distributors (three females and two males) were interviewed from Uponera and Isongo village. The findings are presented in five main themes.

Theme one: Experience, selection and training

Four of these CDDs were appointed by village executive officer and members of village committee because of experience and hard work with exception of one who volunteered, community members in Ulanga do not have a chance to select CDDs. Among five CDDs two of them have worked in this position for 15 to 20 years and the remaining ones for less than 10 years. The following are some of their statements;

“.....I have been working as a volunteer CDD for 15 years; I volunteered to work in this position because at that time no one wanted to work in this position” (CDD1 Female, Uponera).

“.....I was a nurse assistant at the time CDTI program started in 1997 people used to come and take ivermectin at the district hospital, so when distribution of drug started direct in the community I was appointed by village executive officer to help my community because of my experience” (CDD1 Female, Isongo).

CDDs were asked on type of trainings that were given for their position and their responses were as follows;

“.....Every year when I go to collect drugs for distribution, I must be trained first on how to do the distribution of drugs, measurements to take and how to manage side effects” (CDD3 Female, Uponera).

“.....The training is given once every year so as to remind each other on how to distribute drugs, the measurement to be taken so as to know the exact dose taken by a person, and how to manage side effects as a result of treatment” (CDD5 Female, Isongo).

Theme two: Knowledge of CDDs towards disease and use of ivermectin

CDDs were interviewed on causative agent, transmission mode, symptoms, treatment and control of the onchocerciasis. All CDDs did not know the correct causative agent of onchocerciasis, four of them responded “*Vifuna (black flies)*” as causative agent and one of them said “*mosquitoes*”. Majorities (80%) of CDDs were only aware of *black flies bite* as mode of transmission and did not clearly know how transmission occurs.

One of the CDDs said “*Transmission of onchocerciasis occurs when black flies bite a person.*” (CDD2 Male, Uponera).

Another CDD said “*Transmission occurs when the mosquito that carries parasites bites uninfected person*” (CDD4 Male, Isongo).

All CDDs were able to mention the symptoms of onchocerciasis, the most common symptoms mentioned were severe itching, skin depigmentation, skin lesions and blindness. Few (40%) of CDDs were able to mention the correct drug for treatment for onchocerciasis. The following are some of quotations which demonstrate understanding of the CDDs on treatment used;

“.....*Mectizan is the only drug that can prevent onchocerciasis and treat at the same time*” (CDD3 Female, Uponera).

“.....*Ivermectin that I distribute is used to treat and prevent onchocerciasis*” (CDD2 Male, Uponera).

“.....*Heee, how can I memorize the name of the drug, I only know how they look like and how to distribute them*” (CDD4 Male, Isongo).

Theme three: Participation, distribution and coverage on CDTI program

CDDs were asked on how they distribute ivermectin and how do they ensure community participate in CDTI program; all CDDs said “*house to house distribution*” is the main way used to distribute ivermectin and when it comes to participation of community in program the CDDs said they have the following roles;

“.....*After taking the medication from the district hospital, I must announce to community members, emphasize them to take medication and then I distribute the drugs from one house to another in the entire hamlet*” (CDD1 Female, Uponera).

“.....In the past community members used to collect medication at my house, but now I must pass house to house so as to ensure people take medication and if people are not there I must come back or leave the message for them to come to collect the medication”(CDD2 Male, Uponera).

It was observed that according to gender; the coverage and taking of ivermectin is higher in women than men. The following are some of the statement to support;

“.....Women are highly participating in the control program compared to men except those who are sick, pregnant or have delivered within five days at time of drug distribution” (CDD3 Female, Uponera).

“.....Women participate in CDTI program than men, high percentage of women take medication compared to men” (CDD4 Male, Isongo).

Theme four: Side effects and management

Side effects were mentioned as a greater barrier of community participation in CDTIP. CDDs were interviewed on side effects and management, all CDDs said ivermectin has several side effects when taken but side effects differ from a person to person. The following were side effects mentioned;

“.....The main side effects are swelling of the body, skin hardening, vomiting, dizziness and diarrhea especially when it's the first time to take ivermectin but when ivermectin is taken for several years these side effects tends to subside”(CDD5 Female, Isongo).

“.....Those who are infected must experience side effects especially swelling of the body and itching” (CDD2 Male, Uponera).

All community drug distributors interviewed agreed that they were given education on how to manage side effects.

“.....I was given health education on the possible side effects that can occur after taking ivermectin and these side effects are managed with panadol, if the side effects persist I advise a patient to see a doctor”(CDD5 Female, Isongo).

“.....If a person complains of itching or swelling of body after taking medication, I know these are side effects of medication hence I administer aspirin/panadol to subside the side effects” (CDD2 Male, Uponera).

Theme five: Attitude and perception of CDDs toward the use of ivermectin

CDDs were interviewed on community attitude and perception towards the use of ivermectin. CDDs responded attitude and perception in terms of benefits, side effects and method of dose calculation. CDDs believes and perceive that; some of community members have positive attitude and perception towards ivermectin to be very useful in treating those infected and at the same time preventing those uninfected from getting onchocerciasis while others have negative attitude and perception toward ivermectin due to side effects experienced, mistrust of method of dose calculation, fear of becoming impotent or being uninfected. The following are some of the benefit quotations from CDDs;

“.....Some of community members understand the benefit of using ivermectin as it treats infected people especially severe itching and restore their skin in good condition like before” (CDD3 Female, Uponera)

“.....Community members know the importance of using ivermectin, it has helped to treat a lot of infected people in the community and transmission has decreased compared to before. Now when distribution of ivermectin is late people are coming to ask me what is happening. Or why are they not getting the medication?” (CDD5 Female, Isongo)

Community drug distributors had a perception that side effects of ivermectin hinder community participation towards CDTIP though they believe it can be changed through education. The following are some of the statement to support;

“.....In the hamlet that I distribute the drugs many men do not take ivermectin because I once distributed to one man and he experienced swelling of genital areas, that man spread the rumors to others that it can cause impotency” (CDD4 Male, Isongo).

“.....At the beginning some people refused to take medication after experiencing side effects or observing side effects to others but after education people are now understanding and some are participating in CDTI program”(CDD2 Male, Uponera).

It was also observed that majority of community members do not believe the method of dose calculation and it is a barrier when it comes to community participation in CDTI program. The following are some of responses from CDDs;

“.....Some of community members do not believe if height is a correct measurement for dose calculation some wants their weight to be measured” (CDD2 Male, Uponera).

“.....Some of community members do not believe if height is enough measurement for dose calculation, so I need to educate them first and when it comes to educating them is difficult due to lack of materials to support my statements” (CDD5 Female, Isongo).

CDDs were interviewed on the challenges they are facing during ivermectin distribution because these challenges affect the use of ivermectin in the community and the following were their responses;

“..... There are several challenges that I face as a CDD such as; some community members are refusing to take medication because of side effects so its wastage of time going to a certain house and talking to them and at the end they are refusing to take medication, Geographic location of our village is the problem because houses are far from each other so it's difficult to reach every house (CDD5 Female, Isongo).

“.....Transportation is the problem in our village which makes the distribution difficult in some of the houses hence are skipped, in some of the houses people are not present when you go for distribution which is a wastage of time and we are also given few days for distribution that we are supposing to return the medicine to the district hospital after a month” (CDD4 Male Isongo)

The following were some of recommendations in order to increase and ensure maximum participation of community members in CDTI program.

“.....I recommend the distribution of drug should be done after farming season where people are at home and are free to participate” (CDD1 Female, Uponera).

“.....I recommend the transportation fees should be given so that drugs can be distributed in all places and containers for storage of medication should be given”(CDD2 Male, Uponera).

“.....I recommend the training that we are given before distribution of drugs should be done for at least three days because we are different in understanding and these drugs are poison”(CDD3 Female, Uponera)

“.....I recommend health education about onchocerciasis should be given to community members at least once a year in order to avoid all misconceptions about the treatment” (CDD4 Male, Isongo).

Finally all CDDs recommended allowance to be given to them so as to increase motivation of their work. All of them said *“They are not benefit anything from being CDDs and the work is very difficult”*.

CHAPTER FIVE

5.0 DISCUSSION

The study aimed to investigate the factors that have contributed to the persistent transmission of onchocerciasis in Ulanga district. This discussion is divided into four sections according to the specific objectives in the following order; prevalence of onchocerciasis among community members, association of demographic factors with prevalence of onchocerciasis, community knowledge, attitudes and perceptions towards onchocerciasis and acceptability of ivermectin treatment and finally knowledge, attitude and perceptions of the community drug distributors towards the use of ivermectin for onchocerciasis control.

5.1: Prevalence of onchocerciasis among community members in Ulanga district

Findings of this study demonstrate recent transmission of onchocerciasis in children who were born ten years after commencement of the CDTI program. The overall 2.9% prevalence in children < 10 years of age indicates that there is active transmission of onchocerciasis in the community despite the ongoing CDTI program for 20 years. The estimated number of annual MDA rounds for the interruption of transmission is 12 – 15 (Tekle *et al.*, 2016), however the community had received 20 rounds of MDA; if there was interruption of transmission the prevalence would have been < 0.1%, clearly demonstrating there is active transmission (WHO, 2016).

A higher prevalence (3.8%) was found among children aged 5 to 9 years compared to children less than 5 years (0.6%) this was because of long duration of residency which made them more exposed to continuous bites of black flies compared to those who have resided in less than 5 years. This finding was similar to that of Katarawa *et al* (2013) in Nyagak-Bondo focus of northwestern Uganda who found the ongoing transmission of *O.volvulus* with prevalence of 14.1% in children less than 10 years after eighteen years of annual CDTI . Wilson *et al* (2016) also found uninterrupted transmission among children aged 5 to 9 years old with seroprevalence of 2.5% after more than 10 years of ivermectin distribution in Senegal. In other areas such as in the abu hamed focus Sudan, interruption of transmission

occurred after only 14 rounds of annual MDA (Higazi *et al.*, 2013), indicating the CDTI programme is not operating optimally. The continuity of *O.volvulus* in human populations mirrors the earlier observation in the black fly vectors; thus, transmission assessment done after the 19th MDA round showed that transmission was continuing in the Mahenge Mountains after 19 years of annual CDTI to rates similar to those reported in the 1960s (Hendy *et al.*, 2018). The findings of our study provide further evidence that annual CDTI may be insufficient to eliminate the parasite in formerly hyperendemic foci, but a more detailed study is required to fully understand the epidemiological significance of the ongoing transmission.

Among the factors that might have contributed to the slow interruption of *O.volvulus* transmission is inadequate coverage of CDTI which was below 65% from 1997 to 2002 and above 65% (mean average of 76%) for the years 2003 to 2017 which is below the minimum 80% coverage (NTDCP, 2017). The study area was characterized by very high prevalence of onchocerciasis (Mwaiko *et al.*, 1990) and in such areas, control becomes difficult especially if ivermectin is only distributed once a year. This is mainly due to the fact that higher endemicity levels require higher coverage and longer treatment durations (Colebunders *et al.*, 2018).

5.2: Association of demographic factors with prevalence of onchocerciasis in Ulanga district

Though not to a statistically significant level, slightly more females than males were infected with *O.volvulus*, perhaps because female children accompany mothers in activities likely to expose them to infection. Gender has not been shown before to be associated with *O.volvulus* infection as demonstrated by Surakat *et al* (2018) who found no association ($p=0.129$) between gender of the child and prevalence of onchocerciasis among children, aged 5-9.

Older children (5 – 9 years) were more likely than younger children (< 5 years) at a borderline significance ($p = 0.032$). This is so because, as the age of children increases the chances of getting onchocerciasis increases and this is contributed with duration the children have stayed in Ulanga; most of these children were born and grown there which made them exposed to

continuous bite from black flies for a long time. Similar observations were made by Surakat *et al* (2018) who found an *O.volvulus* infection prevalence of 2.9% among children less than 10 years with a highly significant relationship between age and seroprevalence ($p=0.000$). This indicates that CDTI has not been effective in interruption of transmission. In an endemic setting of Makouopsap focus in western Cameroon it was shown that children born after initiation of CDTI and had resided in the area for less than ten years were significantly infected ($p=0.002$) with *O.volvulus* with a microfilariaemia prevalence of 4.7% and nodules 1.7% compared (Kamga *et al.*, 2017).

Family size was not associated with onchocerciasis prevalence in Ulanga ($p=0.574$); other studies demonstrated that a large family size is significantly associated with higher odds of infection with *O.volvulus*; thus the odds ratio of being infected with *O.volvulus* was 2.62, 95%CI: 1.07-6.45 in households with large family members. However the causal link remain unclear (Mahdy *et al* 2018). It was also observed that high prevalence of onchocerciasis in large families with more than 10 members was due to poor compliance to CDTI program compared families with fewer members less than 5 who had higher compliance towards CDTI program (Endale *et al.*, 2015).

5.3: Community knowledge, attitudes and perceptions towards onchocerciasis and acceptability of ivermectin treatment in Ulanga district

Majority (94.1%) of respondents interviewed had heard about onchocerciasis largely because the disease has been endemic in the study area for more than 4 decades coupled with the CDTI for over 20 years (Mwaiko *et al.*,1990; Zouré *et al.*, 2014). However; they had a borderline level of knowledge (low to moderate) on the causative agent, transmission, treatment and prevention. Inadequate level of knowledge on onchocerciasis affects coverage and community participation in CDTI program, conceivably leading to a high prevalence in those areas (Okwara *et al.*, 2017).

Despite onchocerciasis being a major health problem in Ulanga for more than 4 decades, only less than a quarter (19.6%) of the population correctly knew the disease is caused by a filarial worm; remaining population held the misconceptions that the disease is caused by black flies and mosquitoes as well as witchcraft. Lack of knowledge about the cause of the disease show a deficiency in the health education given in community meetings or during house-to-house distribution (York *et al.*, 2015). Though more than two thirds (71.3%) correctly knew that onchocerciasis is transmitted by black flies, only less than a third (28.2%) knew onchocerciasis can be transmitted from one person to another. Misconceptions were also common as over a quarter (28.7%) who reported transmission to be by mosquitoes bites, contact with infected person, and aerosols. The observed misconceptions on causative agent and transmission in Ulanga were also observed in other endemic areas such as in Nigeria and North western Ethiopia where respondents knew black flies bites, living in poor sanitation, poor personal hygiene, and witchcraft as causative of onchocerciasis while transmission was associated with sexual intercourse, sharing clothes, through breath, drinks, food and air, and mosquitoes bite (Adeoye, Ashaye and Onakpoya, 2010; Weldegebreal *et al.*, 2014; Afolabi *et al.*, 2016).

Respondents were knowledgeable on the manifestations of onchocerciasis; skin itching being the most common (86.3%), followed by skin rashes (72.3%), blindness (71.8%), skin depigmentation (58.1%) and skin lesions (43.8%), conceivably being reflective of their long experiences with these symptoms for over four decades (Mwaiko *et al.*, 1990; Zouré *et al.*, 2014). This is consistent with the study done in Equatorial Guinea which found that more than half of the community interviewed knew the symptoms of onchocerciasis with itching as the main symptom (Alonso *et al.*, 2017).

Though a vast majority (96.4%) knew modern treatment as the type of treatment, a small percentage (11.8%) knew ivermectin as the drug of treatment and prevention. It was also found that as duration of residency increases the level of understanding about the disease prevention also increases. Similar findings were demonstrated by Weldegebreal *et al* (2014) who found that the large majority (98.1%) community members who have resided in north

western Ethiopia for a long time knew onchocerciasis is treated with modern medicine and two thirds of those with family member who was once infected knew ivermectin as the first line drug of treatment.

Acceptability and compliance to ivermectin treatment is crucial in controlling onchocerciasis in endemic areas, it has proven to be successful in reducing transmission, morbidity and elimination of the disease (Kim *et al.*, 2015). Findings from the present study show a vast majority (83.4%) were willing to take ivermectin and about three quarters (74.4%) willing to comply with treatment for 12 to 15 years in order to eliminate the disease, findings that have positive implications for the success of the CDTI program. In instances that community members were not willing to take ivermectin and complying with duration of treatment the reasons were fear of side effects, mistrust of method of dose calculation and being uninfected. These reasons were observed to affect the participation of people in CDTI program and hence slow interruption of onchocerciasis transmission in this area. Similar observations were made in the study of York *et al* (2015) that showed that lack of symptoms, fear of medication, lack of knowledge about onchocerciasis and ivermectin treatment and misconceptions on medication tend to affect the participation of community members in control program.

Attitudes towards a disease and the available intervention have major implications on the uptake and therefore coverage of an intervention which also affects the success of the control of the specific disease. The present findings show that almost 50:50 percent of the population have either positive (53.8%) or negative (46.2%) attitudes; this has implications on the coverage of the CDTI program in that coverage may not be optimal because those with negative attitudes may be non-compliant to the intervention. Barriers to access to treatment and poor treatment compliance contribute to insufficient treatment coverage (Colebunders *et al.*, 2018). It was observed that affected people worry about the consequences of being affected though they don't avoid contact with other community members because they aren't discriminated, this is in agreement with a study in Guinea which found that affected people worry about performance in the daily activities though they are not stigmatized (Alonso *et al.*, 2017). Respondents held positive attitudes that its comfortable being given ivermectin by

female CDDs, however CDDs aren't happy to work without payment; motivation is very important to them as they are crucial for the success of the CDTI program. In Tanzania and Uganda participation of women in the CDTI program has increased in affected communities where females have been observed to be committed, tolerant, patient and highly convincing hence increasing participation and compliance to the program (Mutalemwa *et al.*, 2009; Katabarwa *et al.*, 2010; Vouking *et al.*, 2015).

The fact that only 56% had positive perceptions while 44% held negative perceptions about the CDTI program, have implications that coverage may not be optimal because those with negative perceptions may be non-compliant to the intervention. Barriers to access to treatment and poor treatment compliance contribute to insufficient treatment coverage (Colebunders *et al.*, 2018).

The success of a disease intervention depends on whether the affected community perceives the disease to be a public health problem that would motivate them to take the intervention. The present findings show that majority of community members perceived onchocerciasis as dangerous but curable. It is also perceived as a threat to socio-economic wellbeing of the community as they have seen their fellows being affected, suffered morbidity and cured. They also perceived to be at the risk of contracting the disease since majority of them are farmers hence highly exposed to black flies bites while farming in highlands. Community had positive perception that ivermectin treatment can eliminate the disease as well as treating other parasitic diseases and home visit of CDDs increase compliance to ivermectin treatment. However they can not handle side effects of the drugs. The findings from studies done in DRC, Nigeria and Cameroon revealed that onchocerciasis is perceived to be a public health problem and community members in endemic areas to be at the risk of getting infection (Makenga Bof *et al.*, 2017). Positive perception towards benefits and effectiveness of ivermetin treatment has increased compliance of CDTI in some endemic areas (Brieger *et al.*, 2012). In areas where onchocerciasis has declined as the result of using ivermectin, it has increased participation of community in the treatment (Okeibunor *et al.*, 2011). Door to door distribution of ivermectin has increased the participation of community in the control program

though its necessary to ensure that ivermectin is swallowed on the delivery (Makenga *et al.*, 2017).

5.4: Knowledge, attitudes and perceptions of the community drug distributors towards the use of ivermectin for onchocerciasis control in Ulanga district

CDDs play important role in engaging the community to participate in control program. They can either influence positively or negatively the successful of control program (Krentel *et al.*, 2017). It is important for community to be careful when selecting CDDs. However, in Ulanga community members are not involved in selection of these CDDs, majority of them are appointed by village executive officer with exception of few who volunteered which is inconsistent with WHO regulations (WHO, 2010). It was observed that some of the appointed CDDs are highly experienced, this is because they have been working in this position for a long time since the beginning of CDTI program hence have received several trainings. CDDs in Ulanga are trained every year on how to distribute drugs properly in the community so that can educate community members on importance of ivermectin treatment. The findings are similar with the finding of the study conducted in North Western Ethiopia (Weldegebreal *et al.*, 2016).

CDDs should be knowledgeable about onchocerciasis so that they can influence, motivate and educate people on participation of control program (Fleming *et al.*, 2016). In Ulanga all of the CDDs interviewed were familiar with disease though majority of them had inadequate knowledge. None of the CDDs knew the correct causative agent and other had misconceptions on the mode of transmission. This is possibly due to inadequate training in the aspect of the biology of the disease as the training mostly covered drug distribution and management of side effects (York *et al.*, 2015). CDDs were more aware on symptoms of the disease because they have been residents in endemic area for a long period of time and seen people infected and how they look like. However, some of them didn't know the name of the drug. This was in agreement with the study done in Ethiopia which showed; very few CDDs new the correct causative agent, but they knew well the symptoms of the disease and drug of treatment. Poor

knowledge of CDDs affect participation of community in control program as community members do not trust them (York *et al.*, 2015).

Distribution of ivermectin in Ulanga is through house to house distribution which is according to WHO guidelines (WHO, 2010). CDDs in Ulanga have a role to emphasize, motivate and ensure the community participates in control of onchocerciasis which is done through visiting households prior to ivermectin distribution to sensitize the community. However, the coverage of CDTI in Ulanga is fluctuating with mean coverage of 76% which is below 80% minimum coverage of CDTI, clearly indicating that onchocerciasis control remains difficult in certain areas (Colebunders *et al.*, 2018). Issues affecting coverage and access to treatment includes; inadequate knowledge/awareness about the disease among both community and CDDs, wrong timing of drug distribution as most of the time distribution is done during farming seasons where people are away from their houses, short time of drug distribution as CDDs are required to return the ivermectin to the health centers after a month, geographic location of hamlets which cause failure of CDDs to cover all houses, doubt on the method of dose calculation and fear of side effects that occurs as a result of ivermectin uptake. Some of these factors were also found in other study done in Tanzania by York *et al* (2015). According to gender; women are high participating in control program than men especially when they see their fellow women as CDDs (Vouking *et al.*, 2015). However, in Cameroon majority of women were non compliers because of fear to become infertile (Senyonjo *et al.*, 2016).

Fear of possible side effects of ivermectin was among the major barriers of community participation in CDTIP in Ulanga because when a community member experiences side effects or see their fellows experience side effects the previous may negatively affect uptake in the coming year due to worries, consequently causing fluctuations in coverage. Though the CDDs in Ulanga are trained, they lack confidence to handle side effects because the community does not trust them as previously documented by other studies conducted in Tanzania and Cameroon (York *et al.*, 2015; Senyonjo *et al.*, 2016).

Positive attitude and perception of CDDs towards the use of ivermectin has been associated with increase of compliance of ivermectin uptake in the community (Endale *et al.*, 2015). In Ulanga CDDs held positive attitudes and perceptions towards use of ivermectin for onchocerciasis control; likewise they were aware of the community attitudes and perceptions towards the treatment because of familiarity with community members. It was observed that CDDs and community believes ivermectin is best drug for treatment and preventing onchocerciasis, because of the obvious benefits. However, there are some negative attitudes and perceptions due to side effects and doubt of the method of dose calculation and fear of impotency or being uninfected. York *et al* (2015) and Weldegebreal *et al* (2014) reported similar findings that were: suspicions on method of dose calculation and misconceptions that use of ivermectin causes impotence and sterility as obstacles to CDTI coverage in Tanzania and Ethiopia.

CDDs in Ulanga observed that the challenges they face in distribution of ivermectin such as lack of transportation during distribution, people who refuse to take medication, shortage time of distribution, lack of storage facilities and lack of incentives affect the coverage of the CDTI program. This is echoed by findings from other studies that show that insufficient training, inadequate sensitization of community, inadequate supply of ivermectin, poor moral support and inadequate incentives are associated with demotivation of CDDs towards ivermectin distribution (Hoerauf *et al.*, 2011; Fleming *et al.*, 2016).

CDDs in Ulanga recommended distribution of ivermectin to be done after farming season because most people will be at their homes hence high chance of participating; as well as providing transportation money and increasing the time for distribution of drugs so as to increase participation in the CDTI.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

This chapter concludes the findings of this study and provides recommendations.

6.1: Conclusion

Findings of this study demonstrate that;

- Two decades of CDTI have not interrupted transmission of onchocerciasis in Ulanga district as shown by the 2.9% prevalence in children < 10 years.
- Community awareness on onchocerciasis was very high conceivably because the disease has been endemic for over four decades.
- However, there was a borderline level of knowledge on the causative agent, transmission, treatment and prevention as only about a half (50.8%) had moderate to high level of knowledge.
- There were mixed perceptions and attitudes towards CDTI with nearly half of population (44% and 46% respectively).

The low level of knowledge coupled with negative perceptions and attitudes in a section of the community have the potential of affecting uptake and therefore total coverage of CDTI hence the persistence of transmission.

6.2: Recommendations

Basing on research findings; two types of recommendations are provided which are recommendations for action and for further research.

6.2a: Recommendations for action

- Public health education should be reinforced so as to improve the level of knowledge regarding onchocerciasis and Ivermectin treatment as well as changing the negative perceptions and attitudes towards CDTI.

- Community members should be given an opportunity to participate in selection of the drug distributors that they think are capable so as to improve uptake of CDTI.
- There is a need to give incentives to CDDs and consider engaging them in other health interventions as Community Health Workers.

6.2b: Recommendations for further research

There is a need to develop “compliance profiles” of communities to identify those groups of individuals who remain “persistently non-compliant” during CDTIs (e.g., children, upper socioeconomic classes, young men, older ages), and then to determine the causes of this non-compliance and effective approaches to overcoming it”.

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APPENDICES**Appendix I: Consent Form (English Version)****MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****DIRECTORATE OF RESEARCH AND PUBLICATIONS****INFORMED CONSENT FORM****ID-NO:/...../.....****Consent for participation in the research study**

Greetings, my name is **Vivian Mushi** (MSc. TDC Candidate) from **MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**. At the moment, I am carrying out a study to investigate *“Factors associated with persistence of onchocerciasis transmission after two decades of community-directed treatment with Ivermectin in Ulanga District Tanzania”*.

Purpose of the study

This study aims to collect information on factors associated with persistence transmission of onchocerciasis among community members living in Ulanga district.

What Participation Involves

If you agree to participate in this study the following will occur;

1. You will sit with a trained interviewer and will be required to answer questions that have been prepared for the study through interview in order to obtain the intended information. The interviewer will be recording your responses in the questionnaire.

2. No identifying information such as name will be collected from you during this interview, except your gender, age, level of education, marital status and your current occupation.
3. You will be interviewed only once for approximately 30 minutes in a private setting.

Confidentiality

The collected information will be kept confidential, identification numbers will be used instead of names. Only investigator working in this research study will have access to the information.

Benefits

If you agree to take part in this study, the information you provide will be very important and valuable. It will help to know the factors associated with persistence of onchocerciasis as well as knowledge, attitudes and perceptions of community members and community drug distributors in Ulunga district. Research findings will also provide informed practical information that will aid in planning and implementing effective strategies to improve and modify onchocerciasis control program.

Potential risks

You will be asked questions about your personal particulars and understanding regarding onchocerciasis. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

Rights to Withdraw and Alternatives

Your participation in this study is completely voluntary. If you choose not to participate in the study or if you decide to stop participating in the study you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve loss of any benefits to which you are otherwise entitled.

In case of injury

We are not expected that any harm will occur as a result of your participation in this study.

Compensation

There will be no compensation of time spent during the interview or focused group discussion; however your participation is highly appreciated.

Contacts

If you have any questions about this study, you may contact the study Principal Investigator;

Vivian Mushi,

Muhimbili University of Health and Allied Sciences,

P. O. Box 35869,

Dar es Salaam.

Mobile number: +255 653 942973 or +255 789 458561.

Email: vmushi31@gmail.com.

Also you may contact;

Prof. D.S Tarimo, (Supervisor of this study)

Muhimbili University of Health and Allied Sciences,

P. O. Box 65001,

Dar es Salaam.

Mobile number: +255 754 578528

Signature

Do you agree to participate and answer questions in this study?

Participant Agrees [__]

Participant Disagree [__]

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

Signature of Participant _____

Signature of witness (if participant cannot read) _____

Signature of research assistant _____

Date of signed consent _____

Appendix II: Consent Form (Swahili Version)**CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI****KURUGENZI YA UTAFITI NA MACHAPISHO****FOMU YA RIDHAA**

Namba ya Utambulisho.... /...../.....

Ridhaa ya kushiriki katika utafiti huu

Habari, jina langu naitwa **Vivian Mushi** (mwanafunzi wa shahada ya uzamili katika Kudhibiti magonjwa ya Kitropiki) natoka **Chuo Kikuu cha Sayansi za Afya Muhimbili, Dar es Salaam**. Ninafanya utafiti wenye lengo la kuangalia “*Mambo yanayohusiana na usugu wa maambukizi ya usubi baada ya miongo miwili ya jamii kuelekezwa matibabu (kingatiba) na dawa ya ivermectin katika wilaya ya Ulanga*”.

Malengo ya utafiti

Utafiti huu unalenga kukusanya taarifa juu ya mambo yanayohusiana na usugu wa maambukizi ya usubi miongoni mwa wanajamii wanaoishi katika wilaya ya Ulanga.

Ushiriki unahusisha nini?

Ukikubali kushiriki katika utafiti huu yafuatayo yatatokea:

1. Utakaa na mtafiti alipewa mafunzo jinsi ya kuhoji na utatakiwa kujibu maswali ambayo tayari yameshaandaliwa kwa ajili ya utafiti kwa njia ya mahojiano ili kupata taarifa iliyokusudiwa. Mtafiti atakuwa ananukuu majibu yako katika dodoso.
2. Hakuna taarifa zozote za utambulisho tutakazokusanya wakati wa usaili isipokua jinsia, umri, kiwango cha elimu, hali yako ya ndoa na kazi yako kwa sasa.

3. Utahojiwa mara moja tu kwa takriban dakika 30 kwenye sehemu ya faragha.

Usiri

Taarifa zitakazokusanywa zitahifadhiwa kwa siri, nambari za utambulisho zitatumika badala ya majina. Mtafiti anayehusika na utafiti huu ndio atakeyeweza fikia taarifa zilizokusanywa.

Faida

Kama unakubali kushiriki katika utafiti huu, taarifa unayotoa itakuwa muhimu sana na ya thamani. Itasaidia kujua mambo yanayohusiana na usugu wa usubi kama vile uelewa na mtazamo wa wanajamii na wasambazaji wa dawa za kutibu na kuzuia usubi katika wilaya ya Ulanga. Utafiti pia utatoa taarifa ambayo itakuwa msaada katika kupanga na kutekeleza mikakati madhubuti ili kuboresha na kurekebisha program ya udhibiti wa usubi.

Madhara

Utaulizwa maswali juu ya ufahamu, mwelekeo na mitizamo yako kuhusu ugonjwa wa usubi. Baadhi ya maswali yanaweza kukufanya usijisikie vizuri hivyo unaweza kukataa kujibu swali lolote na unaweza kusimamisha usaili wakati wowote.

Haki ya kujitoa na mbadala wowote

Ushiriki wako katika utafiti huu ni wa hiari, kama utachagua kutokushiriki au utaamua kusimamisha ushiriki wako hutapata madhara yoyote. Unaweza kusimamisha kushiriki katika tafiti hii muda wowote hata kama ulisharidhia kushiriki. Kukataa kushiiriki au kujitoa katika utafiti hakukufanyi upoteze stahili yoyote unayotakiwa kupata.

Endepo utaumia

Hatutegemi madhara yoyote kutokea kwa kushiriki kwako katika utafiti huu.

Fidia ya muda

Hakutakuwa na fidia ya muda uliotumika wakati wa kufanya mahojiano au majadiliano katika utafiti huu, ijapokuwa kuwa ushiriki wako katika utafiti huu utashukuriwa na kuthaminiwa.

Watu wa kuwasiliana nao Kama una maswali katika utafiti huu usisite kuwasiliana na:

Vivian Mushi,

Chuo Kikuu cha Afya Muhimbili,

S.L.P 65015,

Dar es Salaam.

Simu no: +255 653 942973 au +255 789 458561.

Barua pepe: vmushi31@gmail.com.

Pia unaweza kuwasiliana

Prof. D.S Tarimo, (Msimamizi wa utafiti huu)

Chuo Kikuu cha Afya Muhimbili,

S.L.P 65001,

Dar es Salaam.

Mobile number: +255 754 578528.

Sahihi

Mshiriki amekubali [___]

Mshiriki amekataa [___]

Mimi _____ nimesoma/nimeielewa hii fomu, maswali yangu yamejibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki _____

Sahihi ya shahidi (kama hawezi kusoma na kuandika) _____

Sahihi ya mtafiti msaidizi _____

Tarehe ya makubaliano _____

Appendix III: Household Questionnaires (English version)**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****DIRECTORATE OF RESEARCH AND PUBLICATIONS**

**KNOWLEDGE, ATTITUDES AND PERCEPTIONS OF COMMUNITY MEMBERS
TOWARDS ONCHOCERCIASIS AND ACCEPTABILITY OF IVERMECTIN
TREATMENT SURVEY QUESTIONNAIRE**

COD E	QUESTION	RESPONSE AND CODING
	Questionnaire ID no	.....
	Number of Household	.....
	Name of Interviewer	.....
	Date of Interview	.....

A: Demographic characteristics of the respondent

CODE	QUESTION	RESPONSE AND CODING
A1	Ward Name	.....
A2	Village Name	.....
A3	Sex	Male.....1 Female.....2
A4	Age	[Years.....]
A5	Marital status	Married.....1 Single.....2

		Divorced.....3 Cohabiting.....4 Widow(er).....5
A6	Education level	Never attended school.....1 Pre-primary.....2 Primary not completed.....3 Primary completed.....4 Secondary.....5 Post-secondary training.....6 University.....7
A7	Occupation	Peasant.....1 Animal keeper.....2 Trader.....3 Employed.....4* Other specify.....5 4* Employed (put specific occupation)
A8	Duration lived in the village	[Years.....]

B: Knowledge questions

COD	QUESTION	RESPONSE AND CODING
B1	Have you ever heard about a disease called onchocerciasis?	Yes.....1 No.....2
	Causative agent	
B2	What is the causative agent of onchocerciasis?	Filarial worm.....1 Black fly.....2 Mosquito.....3

		Witchcraft.....4 Do not know.....5
	Transmission	
B3	Is onchocerciasis transmitted from person to person?	Yes.....1 No.....2 I don't know.....3
B4	What is the mode of transmission of the disease?	Black fly bite.....1 Contact with infected person.....2 Mosquito bite.....3 Through breath.....4 I don't know.....5
	Sign and symptoms	
B5	What are the signs and symptoms of onchocerciasis?	Itching Yes.....1 No.....2 I don't know.....3 Lesion Yes.....1 No.....2 I don't know.....3 Skin depigmentation Yes.....1 No.....2 I don't know.....3 Blindness Yes.....1 No .....2 I don't know.....3 Skin rashes

		Yes.....1 No .....2 I don't know.....3
Treatment and prevention		
B6	What type of treatment is used to treat onchocerciasis?	Modern.....1 Traditional.....2
B7	If Modern, which drug is needed to treat the disease?	Ivermectin.....1 Albendazole.....2 I don't now.....3
B8	Is onchocerciasis a preventable disease?	Yes.....1 No.....2 I don't know.....3

C: CDTI acceptability questions

CODE	QUESTION	RESPONSE AND CODING
C1	Will you take ivermectin as prescribed by community drug distributors when given to you?	Yes.....1 No.....2
C2	If no what will be the reason?	Fear of side effects.....1 Mistrust of the method of dose calculation.....2 Other specify.....3
C3	Are you willing to comply with the duration of ivermectin treatment for 12 to 15 years in order to eliminate onchocerciasis?	Yes.....1 No.....2 Not sure.....3
C4	Have you experienced any side effects as result of using ivermectin medication?	Yes.....1 No.....2 I don't remember.....3
C5	What were side effects of the drug?	Itching.....1

		Dizziness.....2
		Headache.....3
		Vomiting.....4
		Diarrhea.....5
		Swelling .....6
		Body pain.....7
		Other(specify).....8

D: Attitude questions [Am going to read several statements regarding onchocerciasis and CDTI, please rate the degree which you are agree or disagree with each].

COD E	QUESTION	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
D1	Onchocerciasis is a bad disease.	1	2	3	4	5
D2	It is very sad when you see a person with onchocerciasis.	1	2	3	4	5
D3	Affected individual worries about consequences of onchocerciasis.	1	2	3	4	5
D4	Affected individual avoids contact with other community members.	1	2	3	4	5
D5	Sometimes I feel itching after taking ivermectin.	1	2	3	4	5
D6	I feel comfortable when a female drug distributor gives me ivermectin.	1	2	3	4	5
D7	Community drug distributors are happy to help onchocerciasis patients even without payment.	1	2	3	4	5

E: Perception questions [Am going to read several statements regarding onchocerciasis and CDTI, please rate the degree which you are agree or disagree with each]

COD E	QUESTION	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
E1	Onchocerciasis is common in this village.	1	2	3	4	5
E2	Onchocerciasis is a dangerous disease.	1	2	3	4	5
E3	Onchocerciasis is a curable disease.	1	2	3	4	5
E4	You are considering yourself to be at the risk of contracting onchocerciasis.	1	2	3	4	5
E5	There is association between onchocerciasis with witchcraft.	1	2	3	4	5
E6	Ivermectin treatment will eliminate parasite causing onchocerciasis.	1	2	3	4	5
E7	Ivermectin has other health benefit.	1	2	3	4	5
E8	Home visit of community drug distributors increase the uptake of ivermectin.	1	2	3	4	5
E9	Community drug distributors are prepared to handle side effects of the drug.	1	2	3	4	5
E10	Community drug distributors should be paid.	1	2	3	4	5
E11	Women are more persuasive and patient compared to men when it came to ivermectin distribution.	1	2	3	4	5
E12	CDTI is efficient way in fighting and preventing onchocerciasis.	1	2	3	4	5
E13	People with onchocerciasis should live alone because they can transmit the disease to other people.	1	2	3	4	5
E14	Onchocerciasis is a threat to the socio-economic wellbeing of this community.	1	2	3	4	5
E15	Onchocerciasis control should be best run by the gvt	1	2	3	4	5

Appendix IV: Household Questionnaires (Swahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI



KURUGENZI YA UTAFITI NA MACHAPISHO

MSIMBO	SWALI	JIBU NA MSIMBO
0	Namba ya utambulisho ya hojaji	.....
1	Namba ya kaya	.....
2	Jina la mhojaji	.....
3	Tarehe ya mahojiano	.....

A: Taarifa za Kidemografia

MSIMBO	SWALI	JIBU NA MSIMBO
A1	Jina la Kata	.....
A2	Jina la kijiji	.....
A3	Jinsia	Mwanaume.....1 Mwanamke .....2
A4	Umri	[Miaka.....]
A5	Hali ya Ndoa	Ndoa.....1 Hujaoa/olewa.....2 Talaka.....3 Kimada.....4 Mjane/Mgane.....5
A6	Kiwango cha elimu	Hajawai kwenda shule .....1 Elimu ya awali.....2

		Hajamaliza elimu ya msingi.....3 Elimu ya msingi.....4 Elimu ya sekondari.....5 Elimu ya ufundi.....6 Elimu ya juu.....7
A7	Kazi inayokuingizia kipato	Mkulima mdogo mdogo.....1 Mfugaji.....2 Mfanyabiashara.....3 Umejiriwa.....4* Nyingine taja.....5 4* Umejiriwa (weka kazi maalum)
A8	Muda ulioishi katika kijiji hiki	[Miaka.....]

B: Maswali ya Uelewa

MSIMBO	SWALI	JIBU NA MSIMBO
B1	Je, umewahi kusikia kuhusu ugonjwa uitwao usubi?	Ndiyo.....1 Hapana.....2
	Kisababishi ugonjwa	
B2	Ni nini husababisha usubi?	Minyoo.....1 Nzi weusi.....2 Mbu.....3 Uchawi.....4 Sijui .....5
	Maambukizi	
B3	Je usubi huambukizwa kutoka mtu mmoja kwenda kwa mwingine?	Ndiyo.....1 Hapana.....2 Sijui.....3

B4	Je ni kwa njia ipi ugonjwa wa usubi huambukizwa?	Kuumwa na nzi weusi....1 Kugusana na mtu aliye na ugonjwa.....2 Kuumwa na mbu.....3 Kwa njia ya hewa.....4 Sijui.....5
Dalili		
B5	Je zipi ni dalili za usubi?	Miwasho Ndiyo.....1 Hapana.....2 Sijui.....3 Vidonda Ndiyo.....1 Hapana.....2 Sijui.....3 Kuchuchuka ngozi Ndiyo.....1 Hapana.....2 Sijui.....3 Upofu Ndiyo.....1 Hapana.....2 Sijui.....3 Vipele vya ngozi Ndiyo.....1 Hapana.....2 Sijui.....3
Matibabu na kuzuia		
B6	Je ni matibabu gani hutumika?	Ya kisasa.....1

		Ya asili.....2
B7	Kama ni ya kisasa, ni dawa gani hutumika kutibu usubi?	Ivermectin.....1 Albendazole.....2 Sijui.....3
B8	Je unadhani usubi ni ugonjwa unaozuilika?	Ndiyo.....1 Hapana.....2 Sijui.....3

C: Maswali yanahohusu kukubalika kwa mpango wa kingatiba ya usubi

MSIMBO	SWALI	JIBU NA MSIMBO
C1	Je, utameza kingatiba ya usubi kama inavyotakiwa pale unapopewa na mgawa dawa?	Ndiyo.....1 Hapana.....2
C2	Kama ni hapana, ipi itakuwa ni sababu?	Hofu ya madhara ya dawa.....1 Hofu ya kipimo kinachotumika katika ugawaji wa dawa.....2 Nyingine (taja).....3
C3	Je, uko tayari kuzingatia muda wa matibabu ya usubi kwa miaka 12 hadi 15 ili kutokomeza ugonjwa huu?	Ndiyo.....1 Hapana.....2 Sina uwakika.....3
C4	Je, umepata madhara yoyote kama matokeo ya kutumia kingatiba ya usubi?	Ndiyo.....1 Hapana.....2 Sikumbuki.....3
C5	Je yapi yalikuwa madhara yatokanayo na dawa za usubi?	Kuwashwa.....1 Kizunguzungu.....2 Kichwa kuuma.....3 Kutapika.....4

		Kuhara.....5 Kuvimba mwili.....6 Maumivu ya mwili.....7 Nyingine(Taja).....8
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D: Maswali ya mwelekeo [Nitasoma sentensi kadhaa zinazohusiana na ugonjwa wa usubi na mpango wa kingatiba, tafadhali chagua kiwango unachokubalian au kukataa kwa kila sentensi.]

MSIMBO	SWALI	Sikubaliani kabisa	Sikubaliani	Sinauwakika	Nakubaliana	Nakubaliana sana
D1	Usubi ni ugonjwa mbaya katika jamii.	1	2	3	4	5
D2	Inahuzunisha unapomuona mgonjwa wa usubi.	1	2	3	4	5
D3	Waliothirika na ugonjwa wa usubi wana wasiwasi juu ya madhara yatokanayo na huu ugonjwa.	1	2	3	4	5
D4	Walioathirika na ugonjwa wa usubi wanaepuka kuonana na wanajamii wenzao.	1	2	3	4	5
D5	Wakati mwingine nahisi mwili kuwashwa nikimeza kingatiba ya usubi.	1	2	3	4	5
D6	Nahisi amani pale ninapogawiwa kingatiba ya usubi na mwanamke.	1	2	3	4	5
D7	Wagawa dawa za usubi wanafuraha kuhudumia wagonjwa wa usubi bila hata malipo yoyote.	1	2	3	4	5

E: Maswali ya mtazamo [Nitasoma sentensi kadhaa zinazohusiana na ugonjwa wa usubi na mpango wa kingatiba, tafadhali chagua kiwango unachokubalian au kukataa kwa kila sentensi.]

MSIMBO	SWALI	Sikubaliani kabisa	Sikubaliani	Sinawakika	Nakubaliana	Nakubaliana sana
E1	Usubi ni ugonjwa wa kawaida katika kijiji hiki.	1	2	3	4	5
E2	Ugonjwa wa usubi ni hatari.	1	2	3	4	5
E3	Usubi ni ugonjwa unaotibika.	1	2	3	4	5
E4	Unadhania upo katika hatari ya kuambukizwa ugonjwa wa usubi.	1	2	3	4	5
E5	Kuna uhusiano kati ya ugonjwa wa usubi na imani za kishirikina.	1	2	3	4	5
E6	Kingatiba ya usubi itatokomeza vimelea vya ugonjwa huu.	1	2	3	4	5
E7	Kingatiba ya usubi ina faida zingine mwilini.	1	2	3	4	5
E8	Kutembelewa na kugaiwa dawa nyumbani na wagawa dawa unaongeza unywaji wa dawa.	1	2	3	4	5
E9	Wagawa dawa za kingatiba ya usubi wameandaliwa kushughulikia madhara yoyote yatokanayo na dawa hizo.	1	2	3	4	5
E10	Wagawa dawa za usubi wanatakiwa walipwe.	1	2	3	4	5
E11	Wanawake wana ushawishi na uvumilivu kuliko wanaume wakati wa ugawaji wa dawa.	1	2	3	4	5
E12	Mpango wa kingatiba ya usubi ni njia bora katika mapambano ya kuzuia ugonjwa huu.	1	2	3	4	5
E13	Wagonjwa wa usubi wanatakiwa watengwe kwa sababu wanaweza kuambukiza wengine.	1	2	3	4	5
E14	Usubi ni tishio katika ustawi wa uchumi wa jamii hii.	1	2	3	4	5
E15	Mpango wa udhibiti wa usubi ni vizuri uendeshwe na serikali.	1	2	3	4	5

Appendix V: Interview guide for community drug distributors (English Version)**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****DIRECTORATE OF RESEARCH AND PUBLICATIONS****Consent to participate in this study**

My name is **Vivian Mushi** from **Muhimbili University of Health and Allied Sciences**, Dar es salaam. At the moment I am carrying a study to determine *“Factors associated with persistence of onchocerciasis transmission after two decades of community-directed treatment with Ivermectin in Ulanga District Tanzania”*.

The purpose of the study

The purpose is to establish baseline information that will aid in planning and implementing effective strategies to improve and modify onchocerciasis control program.

Participation

You will sit with principal investigator and asked question about knowledge, attitudes and perception towards onchocerciasis and drug distribution. Your responses will be recorded in questionnaires and I will be taping the session because I can not write fast enough to get it all down. The session will last for not more than 45 minutes.

Confidentiality

The collected information will be kept confidential, identification numbers will be used instead of names. Only investigator working in this research study will have access to the information.

Rights to Withdraw and Alternatives

Your participation in this study is completely voluntary. If you choose not to participate in the study or if you decide to stop participating in the study you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve loss of any benefits to which you are otherwise entitled.

Potential risks

You will be asked questions about your personal particulars and understanding regarding onchocerciasis. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

Benefits

Information you provide us is very important and valuable in planning and implementing effective strategies to improve and modify onchocerciasis control programs. There is no direct benefit however; individual benefits will be obtained through intervention that will be modified and implemented in this community.

Compensation

There will be no compensation of time spent during the interview or focused group discussion; however your participation is highly appreciated.

Are there any questions about what I have just explained?

Are you willing to participate in this discussion? Y/N

Introduction

- ID Number/...../.....
- Village.....
- Ward.....
- Participants.....
- Name of facilitator.....
- Date...../...../.....

Personal information

- Sex
- What is your education level?
- What is your occupation?
- How long have you been living in this village?

EXPERIENCE, SELECTION AND TRAINING

- How long have you work as CDD?
- How were you selected to be in your position?
- What type of trainings have you received?
- What do you know about Onchocerciasis?

Probe;

- Causative agent.
- Transmission mode.
- Sign and symptoms.
- Treatment and Control.

PARTICIPATION, DISTRIBUTION AND COVARAGE

- What do you do to ensure community participates in control program?
- How do you distribute drugs?

Probe;

- Methods of drug distribution.
- Measurement of dose calculations.
- How is the coverage of drug distribution in the village?

Probe;

- According to gender.

SIDE EFFECTS AND MANAGEMENT

- Does the drug have serious side effects in the community?
- How do you detect and manage side effects?
- Is there anyone who has interrupted the treatment?

Probe;

- What was the reason for interrupting the treatment?
- What was done to solve the issue?
- What is the perception of the community towards ivermectin treatment?

Probe;

- Benefits.
- Side effects.
- Methods of dose calculations.

CHALLENGES AND BENEFITS

- What are the challenges in distribution of drugs?
- What are the benefits of using ivermectin in the community?
- What do you benefit as CDD?

RECOMMENDATIONS

- What are your recommendations for continuity of the program?

Probe;

- In distribution and coverage.
- Health education regarding onchocerciasis.
- Incentives to CDDs.

Closing component

(Thank you for your time)

Appendix VI: In depth interview guide for community drug distributors (Swahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI



KURUGENZI YA UTAFITI NA MACHAPISHO

Ridhaa ya kushiriki katika utafiti huu

Habari! Jina langu naitwa **Vivian Mushi** (mwanafunzi wa shahada ya uzamili katika Kudhibiti magonjwa ya Kitropiki) natoka **Chuo Kikuu cha Sayansi za Afya Muhimbili**, Dar es salaam. Ninafanya utafiti wenye lengo la kuangalia *“Mambo yanayohusiana na usugu wa maambukizi ya usubi baada ya miongo miwili ya jamii kuelekezwa matibabu (kingatiba) na dawa ya ivermectin katika wilaya ya Ulanga”*.

Malengo ya utafiti

Lengo ni kuweka msingi wa taarifa ambayo itakuwa msaada katika kupanga na kutekeleza mikakati madhubuti ili kuboresha na kurekebisha mipango ya kudhibiti usubi.

Ushiriki

Utakaa na mtafiti na atakuuliza maswali yanayohusu uelewa na mtazamo juu ya ugonjwa wa usubi na ugawaji wa kingatiba ya usubi. Mtafiti nitandikaa majibu yako kwenye dodoso na nitaakuwa ninatapu mahojiano hicho kwa sababu siwezi kuandika kasi ya kutosha kupata yote. Mahojiano si zaidi ya dakika 45.

Usiri

Taarifa zitakazokusanywa zitahifadhiwa kwa siri, nambari za utambulisho zitatumika badala ya majina. Mtafiti anayehusika na utafiti huu ndio atakeyeweza fikia taarifa zilizokusanywa.

Haki ya kujitoa na mbadala wowote

Ushiriki wako katika utafiti huu ni wa hiari, kama utachagua kutokushiriki au utaamua kusimamisha ushiriki wako hutapata madhara yoyote. Unaweza kusimamisha kushiriki katika tafiti hii muda wowote hata kama ulisharidhia kushiriki. Kukataa kushiiriki au kujitoa katika utafiti hakukufanyi upoteze stahili yoyote unayotakiwa kupata.

Madhara

Utaulizwa maswali juu ya ufahamu, mitizamo na mazoea yako kuhusu ugonjwa wa usubi. Baadhi ya maswali yanaweza kukufanya usijiskie vizuri hivyo unaweza kukataa kujibu swali lolote na unaweza kusimamisha usaili wakati wowote.

Faida

Maelezo unayotoa kwetu ni muhimu sana na ya thamani katika kupanga na kutekeleza mikakati madhubuti ili kuboresha na kurekebisha mipango ya kudhibiti usubi. Faida binafsi itapatikana kupitia kurekebisha na kutekelezwa kwa mpango wa kingatiba ya usubi katika jamii hii.

Endepo utaumia

Hatutegemi madhara yoyote kutokea kwa kushiriki kwako katika utafiti huu.

Fidia ya muda

Hakutakuwa na fidia ya muda uliotumika wakati wa kufanya mahojiano au majadiliano katika utafiti huu, ijapokuwa kuwa ushiriki wako katika utafiti huu utashukuriwa na kuthaminiwa

Je kuna maswali yoyote kuhusu nilichoelezea?

Je uko tayari kushiriki katika mjadala huu? N/H

Utangulizi

Mahali pa majadiliano.....

- Namba ya utambulisho/...../.....
- Kijiji.....
- Kata.....
- Namba ya mshiriki.....

- Jina la anayehoji.....
- Tarehe/...../.....

Taarifa binafsi

- Jinsia.....
- Kiwango cha elimu cha juu kabisa ulichofikia?
- Unafanya kazi gani?
- Ni kwa muda gani umekaa katika kijiji hiki?

Maswali

UZOEFU, UCHAGUZI NA MAFUNZO

- Je ni kwa muda gani umefanya kazi ya ugawaji kingatiba ya usubi?
- Je ni utaratibu gani ulitumika kukuchagua kwenye nafasi hii uliyopo?
- Je ni mfunzo gani ulipewa kwenye huu mpango wa kingatiba ya usubi?
- Je unafahamu nini juu ya ugonjwa wa usubi?

Dodosa;

- Kisababishi cha ugonjwa.
- Njia za maambukizi.
- Dalili.
- Matibabu na njia za kuzuia.

USHIRIKI, MTAWANYO NA MAENEO YALIYOFIKIWA

- Je unafanya nini kuhakikisha jamii inashiriki katika mpango wa kingatiba ya usubi?
- Je unagawaje dawa za usubi?

Dodosa;

- Njia zipi zinatumika katika ugawaji wa dawa.
- Vipimo vinavyotumika katika ugawaji wa dawa .
- Je ni kwa kiasi gani usambazaji wa dawa kijijini unafikia walengwa?

Dodosa;

- Kwa jinsia.

MADHARA NA USIMAMIZI

- Je dawa za usubi zina madhara yoyote katika jamii?
- Je ni jinsi gani unaweza kugundua na kutibu madhara yanayotokana na dawa za usubi?
- Je unamjua mtu yeyote aliyekatisha kutumia kingatiba ya usubi?

Dodosa;

- Ipi ilikuwa sababu ya kukatisha matumizi ya kingatiba ya usubi?
- Nini kilifanyika kutatua tatizo ilo?
- Je jamii ina mtazamo upi juu ya kingatiba ya usubi?

Dodosa;

- Faida.
- Madhara.
- Vipimo vya dawa.

CHANGAMOTO NA FAIDA

- Je ni changamoto zipi unakutana nazo ukiwa kama mgawaji wa dawa za usubi?
- Je kuna faida zipi za kutumia kingatiba ya usubi?
- Je ni faida zipi unapata ukiwa kama mgawaji wa dawa za kingatiba ya usubi?

MAPENDEKEZO

- Je ni yapi mapendekezo yako ili mpango wa kingatiba ya usubi uendelee?

Dodosa;

- Juu ya mtawanyo na maeneo yaliyofikiwa.
- Elimu juu ya ugonjwa wa usubi.
- Posho kwa wagawa dawa.

Kufunga

Asante kwa mda wako

Appendix VII: Focused group discussion guide (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



DIRECTORATE OF RESEARCH AND PUBLICATIONS

Consent to participate in this study

My name is **Vivian Mushi** from **Muhimbili University of Health and Allied Sciences**, Dar es salaam. At the moment I am carrying a study to determine *“Factors associated with persistence of onchocerciasis transmission after two decades of community-directed treatment with Ivermectin in Ulanga District Tanzania”*.

The purpose of the study

The purpose is to establish baseline information that will aid in planning and implementing effective strategies to improve and modify onchocerciasis control programs.

Participation

You will sit with principal investigator and other 8 to 10 participants as a group to discuss issues about knowledge, attitudes and perception towards onchocerciasis. Your responses will be recorded through note taking and I will be taping the session because I can't write fast enough to get it all down. The session will last for not more than 1:30 hours

Confidentiality

The collected information will be kept confidential, identification numbers will be used instead of names. Only investigator working in this research study will have access to the information.

Rights to Withdraw and Alternatives

Your participation in this study is completely voluntary. If you choose not to participate in the study or if you decide to stop participating in the study you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve loss of any benefits to which you are otherwise entitled.

Potential risks

You will be asked questions about your personal particulars and understanding regarding onchocerciasis. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

Benefits

Information you provide us is very important and valuable in planning and implementing effective strategies to improve and modify onchocerciasis control programs. There is no direct benefit however; individual benefits will be obtained through intervention that will be modified and implemented in this community.

Compensation

There will be no compensation of time spent during the interview or focused group discussion; however your participation is highly appreciated.

Are there any questions about what I have just explained?

Are you willing to participate in this discussion? Y/N

Introduction

Place of discussion

- ID Number...../...../.....
- District name.....
- Village.....
- Number of participants.....
- Profile of participants.....

- Name of facilitator.....
- Date/...../.....

Questions

PROBLEMS OF THE COMMUNITY

- What are the common diseases known to affect people of this community village?
- What is being done to address these problems?
- Is onchocerciasis one among the disease that affect people of this community?

UNDERSTANDING OF ONCHOCERCIASIS

- How do people of this community understand onchocerciasis?

Probe;

- What are the local terms used to describe onchocerciasis?
- What is the meaning of onchocerciasis?
- What causes it?
- What is the mode of transmission?
- How does a person infected with onchocerciasis look like?

DISCRIMINATION

- Is there any discrimination/stigmatization among affected individuals?

Probe;

- How are they treated?
- What are challenges facing them?
- What can be done to eliminate the challenges mentioned?

PERCEPTION

- How do people in this community perceive this disease?

Probe;

- Is this community at risk of acquiring the disease?
- Where do people go when they first see a fellow with symptoms of onchocerciasis?
- Is there any association between onchocerciasis with local beliefs such as superstition

TREATMENT

- How is onchocerciasis treated in the community?

Probe;

- How often people take medication?
- How is the dose measured?
- What happen if a community member misses distribution of ivermectin?

INFORMATION ABOUT THE DISEASE

- How do community members get information about onchocerciasis and its medication?

Probe;

- What type of information is given about onchocerciasis?
- What information regarding the medication is given?
- Who gives the above information?

SELECTION OF COMMUNITY DRUG DISTRIBUTORS

- Is the community involved in selection of CDDs

Probe;

- How are CDDs selected in the village?
- What qualifications are considered?

BENEFITS AND CHALLENGES

- What are the benefits of CDTI program?
- What are challenges facing CDTI program?

ADDITIONS AND RECOMMENDATIONS

- Are there any recommendations towards improvement of CDTI?
- Is there any aspect of CDTI program that we did not address?
- Is there any addition comments about CDTI program that you would like to share?

Closing component

Thank you for your time

Appendix VIII: Focused group discussion guide (Swahilis version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI



KURUGENZI YA UTAFITI NA MACHAPISHO

Ridhaa ya kushiriki katika utafiti huu

Habari! Jina langu naitwa **Vivian Mushi** (mwanafunzi wa shahada ya uzamili katika Kudhibiti magonjwa ya Kitropiki) natoka **Chuo Kikuu cha Sayansi za Afya Muhimbili**, Dar es salaam. Ninafanya utafiti wenye lengo la kuangalia “*Mambo yanayohusiana na usugu wa maambukizi ya usubi baada ya miongo miwili ya jamii kuelekezwa matibabu (kingatiba) na dawa ya ivermectin katika wilaya ya Ulanga*”.

Malengo ya utafiti

Lengo ni kuweka msingi wa taarifa ambayo itakuwa msaada katika kupanga na kutekeleza mikakati madhubuti ili kuboresha na kurekebisha mipango ya kudhibiti usubi.

Ushiriki

Utakaa na mtafiti na wanakijiji wengine 8 mpaka 10 kwa lengo la kujadili maswali yanayohusu uelewa na mtazamo juu ya ugonjwa wa usubi na ugawaji wa kingatiba ya usubi. Mtafiti nitandikaa majibu yako kwenye dodoso na nitaakuwa ninatapu mahojiano hicho kwa sababu siwezi kuandika kasi ya kutosha kupata yote. Mahojiano si zaidi ya dakika lisaa moja na nusu.

Usiri

Taarifa zitakazokusanywa zitahifadhiwa kwa siri, nambari za utambulisho zitatumika badala ya majina. Mtafiti anayehusika na utafiti huu ndio atakeyeweza fikia taarifa zilizokusanywa.

Haki ya kujitoa na mbadala wowote

Ushiriki wako katika utafiti huu ni wa hiari, kama utachagua kutokushiriki au utaamua kusimamisha ushiriki wako hutapata madhara yoyote. Unaweza kusimamisha kushiriki katika tafiti hii muda wowote hata kama ulisharidhia kushiriki. Kukataa kushiiriki au kujitoa katika utafiti hakukufanyi upoteze stahili yoyote unayotakiwa kupata.

Madhara

Utaulizwa maswali juu ya ufahamu, mitizamo na mazoea yako kuhusu ugonjwa wa usubi. Baadhi ya maswali yanaweza kukufanya usijiskie vizuri hivyo unaweza kukataa kujibu swali lolote na unaweza kusimamisha usaili wakati wowote.

Faida

Maelezo unayotoa kwetu ni muhimu sana na ya thamani katika kupanga na kutekeleza mikakati madhubuti ili kuboresha na kurekebisha mipango ya kudhibiti usubi. Faida binafsi itapatikana kupitia kurekebisha na kutekelezwa kwa mpango wa kingatiba ya usubi katika jamii hii.

Endepo utaumia

Hatutegemi madhara yoyote kutokea kwa kushiriki kwako katika utafiti huu.

Fidia ya muda

Hakutakuwa na fidia ya muda uliotumika wakati wa kufanya mahojiano au majadiliano katika utafiti huu, ijapokuwa kuwa ushiriki wako katika utafiti huu utashukuriwa na kuthaminiwa

Je kuna maswali yoyote kuhusu nilichoelezea?

Je uko tayari kushiriki katika mjadala huu? N/H

Utangulizi

Mahali pa majadiliano.....

- Namba ya utambulisho/...../.....
- Kijiji.....
- Kata.....
- Namba ya mshiriki.....
- Jina la anayehoji.....
- Tarehe/...../.....

Maswali

MATATIZO YALIYOPO KWENYE JAMII

- Je ni magonjwa yapi yanayojulikana kuathiri watu wa kijiji hiki?
- Je ni kipi kinafanyika kutatua na kutibu magonjwa haya?
- Je usubi ni mojawapo ya magonjwa yanayoathiri watu wa kijiji hiki?

UELEWA JUU YA UGONJWA WA USUBI

- Je mnaelewa nini juu ya ugonjwa wa usubi?

Dodosa;

- Je ni majina gani ya asili hutumika kuelezea ugonjwa wa usubi?
- Usubi ni nini?
- Ni nini kinasababisha usubi?
- Je ni kwanjia zipi usubi huambukizwa?
- Mtu anayeumwa usubi anaonekanaje?

UBAGUZI

- Je wagonjwa wa usubi wanatengwa na kunyanyapaliwa hapa kijijini?

Dodosa;

- Je watu wanawachukuliaje?
- Ni changamoto zipi wanakutana nazo?
- Nini kinaweza kufanyika ili kutokomeza unyanyapaaji wa wagonjwa?

MTAZAMO

- Je ni upi mtazamo wenu juu ya ugonjwa wa usubi?

Dodosa;

- Je jamii hii ipo katika hatari ya kupata ugonjwa huu?
- Ni wapi wanakijiji wanaenda wakimuona mwenzao mwenye dalili za ugonjwa wa usubi?
- Je kuna mahusiano yoyote kati ya ugonjwa wa usubi na imani potofu kama za kishirikina?

MATIBABU

- Je usubi unatibiwaje katika jamii?

Dodosa;

- Je ni mara ngapi watu wanakunywa dawa?
- Je ni jinsi gani dawa inapimwa kabla ya kugaiwa?
- Je nini hufanyika kama ugawaji wa dawa ukimpita mtu?

HABARI JUU YA UGONJWA

- Je jamii inapataje habari juu ya ugonjwa wa usubi na matibabu yake?

Dodosa;

- Je ni taarifa za aina gani mnapata juu ya ugonjwa wa usubi?
- Ni taarifa zipi mnapata juu ya matibabu ya ugonjwa?
- Nani anawapa taarifa hizo?

UCHAGUZI WA WAGAWA DAWA

- Je jamii inahusishwa kwenye uchaguzi wa wagawaji wa dawa?

Dodosa

- Ni jinsi gani wanachaguliwa hapa kijijini?
- NI vigezo vipi vinaangaliwa?

FAIDA NA CHANGAMOTO

- Je faida za mpango wa ugawaji wa kingatiba ya usubi ni zipi?
- Je changamoto za mpango wa ugawaji wa kingatiba ya usubi ni zipi?

MAPENDEKEZO NA NYONGEZA

- Je mna mapendekezo yoyote juu ya mpango wa kingatiba ya usubi?
- Je kuna jambo lolote linalohusu mpango wa kingatiba ya usubi ambalo hatujaongelea?

Kufunga

Asante kwa mda wako

Appendix IX: Ethical Clearance Letter

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

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TANZANIA
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Telefax: +255-22-2150465
E-mail: dpgs@muhas.ac.tz

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

19th June, 2018

Ms. Vivian Mushi
MSc. Tropical Disease Control
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: "FACTORS ASSOCIATED WITH PERSISTENCE OF ONCHOCERCIASIS TRANSMISSION AFTER TWO DECADES OF COMMUNITY DIRECTED TREATMENT WITH IVERMECTIN IN ULANGA DISTRICT COUNCIL"

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 15th May, 2018 to 10th June, 2019. In case you do not complete data analysis and dissertation report writing by 10th June, 2019, 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

Appendix X: Introduction Letter from Ulanga District

HALMASHAURI YA WILAYA YA ULANGA

Simu Na: 023-2620311
Fax No: 023-2620307/311
E-mail: dmomahenge@gmail.com



Idara ya Afya,
S. L. P. 4,
Mahenge/Ulanga.

Kumb. Na. UDC/H/R/1/37

20/06/2018

Afisa Mtendaji,
Kijiji cha Uponera na Kijiji cha Isongo,
S. L. P. 22,
Mahenge/Ulanga.

YAH; UTAMBULISHAO WA KUFANYA UTAFITI.

Husika na kichwa cha habari hapo juu.

Namtambulisha kwako **Ndugu Vivian Mushi** kuja kufanya tafiti katika ya Kijiji cha Uponera na Isongo kuanzia tarehe **21/06/2018** hadi **02/07/2018**.

Kwa barua hii naomba umpe ushirikiano ili kuweza kukamilisha tafiti hiyo.

Nawasilisha.

Dr. Rajabu, A. Risasi
Mganga Mkuu Wilaya
ULANGA

NAKALA;	Afisa Mtendaji, Kata ya Isongo.	-	Kwa taarifa.
	Afisa Mtendaji, Kata ya Uponera.	-	Kwa taarifa.