MAGNITUDES AND PREDICTORS OF ONCHOCERCIASIS AMONG INHABITANTS CLOSE TO IVERMECTIN TREATED AREA ALONG COLOMBO RIVER, GOMMA DISTRICT, JIMMA ZONE, SOUTH WEST ETHIOPIA

BY

DANIEL DANA (BSC)

A RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF MEDICAL LABORATORY SCIENCE AND PATHOLOGY, COLLAGE OF PUBLIC HEALTH AND MEDICAL SCIENCE, JIMMA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MEDICAL PARASITOLOGY

SEPTEMBER, 2012

JIMMA, ETHIOPIA

JIMMA UNIVERSITY, COLLEGE OF PUBLIC HEALTH AND MEDICAL SCIENCES, DEPARTMENT OF MEDICAL LABORATORY SCIENCE AND PATHOLOGY

MAGNITUDES AND PREDICTORS OF ONCHOCERCIASIS AMONG INHABITANTS CLOSE TO IVERMECTIN TREATED AREA ALONG COLOMBO RIVER, GOMMA DISTRICT, JIMMA ZONE, SOUTHWEST ETHIOPIA

BY

DANIEL DANA (BSC)

ADVISORS

SERKADIS DEBALKE (MSc)

DR. DELENASEW YEWHALAW (PhD)

WONDOWOSEN KASSAHUN (PhD CANDIDATE)

SEPTEMBER, 2012

JIMMA, ETHIOPIA

ABSTRACT

***Background**: Human onchocerciasis is parasitic diseases caused by O. volvulus and results in devastating skin and eye disease mostly in Africa. It was targeted for elimination from most parts of Africa and America targeting both the vector and the parasite. Parasitological and epidemiological studies showed that onchocerciasis is highly endemic in Southwestern parts of Ethiopia.*

Objective: *To assess the magnitude and predictors of onchocerciasis among inhabitants close to Ivermectin treated area along Colombo River, Southwest Ethiopia.*

***Methods**: The magnitudes and predictors onchocerciasis was carried out from April 23 to May 23, 2012 and by employing community based cross-sectional study design. Random sampling technique was employed to select the study subjects from each household for sociodemograpic, clinical, parasitological data and for knowledge, attitude and practice towards onchocerciasis. The data was analyzed by using SPSS version 16.0 statistical packages for different variables and the results presented using frequency tables and graphs.*

***Results**: The overall prevalence of O.volvulus in the study area was 22.5% with 26.6% and 17.6%, for males and females, respectively. The overall prevalence of onchocercial skin diseases was 29.80 % with the community microfilarial load 2.70 microfilarias per milligram (mg) of skin snips. Age, sex, educational status, occupation and duration of stay in the community had shown a significant association (P <0.05) with O.volvulus infection but only duration of stay in the village was the independent predictor for O.volvulus infection. Individuals who stayed 1-10 years in the study area were at lower risk of infection than those who stayed >60 years (OR =0.15, 95% CI, 0.035, 0.682). Moreover among 440 respondents for knowledge, attitude and practice towards onchocerciasis 88.2 % (388/440) reported that they didn't hear about onchocerciasis by its local name before.*

***Conclusion and Recommendations**: According to WHO onchocerciasis endemicity classification, the study area could be classified as mesoendemic for onchocerciasis and the observed onchocercial skin diseases might results in social stigma and reduced productivity among infected individuals. The prevalence of onchocerciasis, onchocercial skin diseases and microfilarial loads of males were higher than female counterparts (P-vale <0.05) and the duration stay in the village was the independent predictor for O.volvulus infection. Knowledge, attitude and practice of the community towards onchocerciasis and the vector were very poor. Implementation of mass drug administration and integrated vector control strategies very crucial and further wide studies assessing the epidemiology of onchocerciasis in remaining villages adjacent to intervened area will support the elimination programs. Moreover, sustainable provision of health information can build the Knowledge, attitude and practice gaps and may reduce disease burden and further transmission.*

ACKNOWLEDGEMENT

I am extremely happy to thank my advisors Miss. Serkadis Debalke, Dr. DelenasawYehualaw and Wondowosen kassahun for their consistent and valuable advices, suggestions, comments and guidance from the preparation of proposal to thesis writing.

I would like to thank Jimma University for facilitating the opportunity for the study to be undertaken and financial support.

My gratitude goes to Jimma zone health bureau, Gomma district health office and Kasoohixii Kebele administration for assisting in site selection, giving all the necessary information about the study area and supporting Ivermectin for infected individuals.

I have special thanks to Mr. Mitiku Bajiro and my lovely wife Genet Girma for the intensive support during data collection and compilation without tiredness.

I am proud of Mr. Kefelegn Getahun for his contribution by preparing standard map of the study area.

Lastly but not least, I would like to thank my brothers Tadele Dana, Teshome Bekana and Mr. Yonas Alemu for their strong suggestions and comments from the beginning of proposal preparation to till now on different components the thesis.

Above all I have exceeding thanks to Almighty God who helped me from the beginning to till now and in all my life in the name of Jesus.

TABLES OF CONTENTS

Contents **Pages**

LISTS OF FIGURES

LISTS OF TABLES

LISTS OF ACRONYMS AND ABBREVIATIONS

APOC	African Program for Onchocerciasis Control
APOD	Acute Papular Oncho Dermatitis
ATR	ATROPHY
CDTI	Community Directed Treatment with Ivermectin
CMFL	Community Micro Filarial Load
CPOD	Chronic Papular Oncho Dermatitis
DALYs	Disability Adjusted Life Year
DEC	Di Ethyl Carbamazine
GM	Geometric Mean
Ha	Hectare
KAP	Knowledge, Attitude and Practice
MASL	Meter above Sea Level
MDA	Mass Drug Administration
MDG	millennium development goals
Mf	Microfilaria
MFCR	Microfilarial Carrier Rate
Mg	milligram
NGDO	Non Governmental and Development Organizations
NTD	Neglected Tropical Disease
OCP	Onchocerciasis Control Program
OEPA	Onchocerciasis Elimination Program of America
OSD	Onchocercal Skin Disease
REA	Rapid Epidemiological Assessment
REMO	Rapid Epidemiological Mapping for Onchocerciasis
RHEW	Rural Health Extension Workers
WHO	world Health Organizations

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Human onchocerciasisis is caused by *Onchocerca volvulus (O.volvulus)* and the adult can live over a decade in subcutaneous nodules and connective tissues releasing millions of microfilariae that cause debilitating itching and blindness [1]. Nodules are found in different parts of the body but mostly at the pelvic region of extremities and scalp. Between one and several worms are found tightly coiled inside each nodule [2] . Microfilariae (Mf) are mostly found in the cutaneous layer and lymphatics of the connective tissue but occasionally found in the sputum, urine, peripheral blood can live up to 2 years [3].

Globally, onchocerciasis still endemic in 37 countries, 30 in world health organizations (WHOs) African Region, but main public health problem remains in the countries of sub-Saharan Africa. In Americas, new foci have been found, and the disease may spread still further as infected workers continue to exploit areas of virgin forest [4-5]. From 37 million infected people and 120 million at risk population ,95% live in Africa [6]. In Ethiopia, an estimated 3 million people were already infected with *O.volvulus* and about 10 million people at risk of infection. Keffa Sheka, Gamo Gofa, Wellega, Gambella, Illubabor and Gondar provinces are endemic to the disease and Gojam, Sidama and Shewa provinces were considered as probably endemic [7-8].

According to WHO onchocerciasis endemicity classification, villages were classified as hypoendemic if the microfilarial carrier rate (MFCR) and/or nodule carrier rate (NCR) < 20 %; mesoendemic: 21-59% MFCR or 20-39% NCR and hyperendemic: > 60% MFCR or > 40% NCR. Mesoendemic and hyperendemic areas targeted for mass treatment but hypoendemic communities targeted for health institution based treatment [4, 9-10]. Even though determining the prevalence and intensity of onchocerciasis by the demonstrating and counting of microfilariae by skin snipping is very specific, this technique is inadequate for detecting early, light or prepatent infections [11].

The major and first visible symptom of human onchocerciasis is onchodermatitis and usually begins with intense itching and progressing to a manifestation of irritating papular rashes .This acute papular dermatitis presents with small pruritic papules that may develop into pustules or vesicles. The condition could later lead to hyperpigmentation and thickening of the skin followed

by lichenification of the skin resulting in mosaic patterns popularly known as lizard skin (crocodile skin or sowda) while the advanced stage is characterized by depigmentation known as leopard skin, loss of elasticity and atrophy of the skin. In prolonged onchocercal dermatitis, the skin generally becomes atrophic, fragile, wrinkled and inelastic [12].

Presence of palpable nodules is another evidence of onchocerciasis and the nodules are more numerous and widely distributed in the rainforest than in the savanna but numbers of microfilariae in the skin are higher in the savanna. Skin depigmentation, lymphadenopathy and hanging groin are more frequent in the rainforest than in the savanna but severe skin atrophy is more common in the savanna [13].

In addition to skin and eye diseases, onchocerciasis may cause musculoskeletal pain, epilepsy and growth retardation. Moreover there is pain manifestations secondary to subcutaneous nodule, lymphadenopathy, hanging groin and Lymphoedema [14]. The severity of onchocerciasis is the cumulative effects of cellular inflammatory response to the immobile and dead microfilariae in the skin and eyes [15]. Since the severity of skin and eye lesions is mainly related to the worm burden, a reduction of Mf number is associated with a lower incidence of disease manifestations.

Nowadays Mass Drug administration (MDA) by using Ivermectin (Mectizan), is the best recommended by WHO African program for onchocerciasis control (APOC) for prevention and control of the disease. It is the drug of choice for treatment and effective against microfilariae by significantly reducing the microfilarial loads and the risk of developing ocular lesion and onchocercial skin disease (OSD) [16]. Its main drawback, however, is its lack of any demonstrable direct macrofilaricide effect, it must be given repeatedly every year for up to 12–15 years, that is the time it takes for most adult worms to die [10].

Vector-borne disease control programmes mostly rely on controlling the parasite and/or vector and have often overlooked the importance of the target population's knowledge, beliefs and behavior in the transmission and control of disease. Understanding the KAP of the population towards onchocerciasis is extremely important for the successful control and elimination of the disease. However, there is a lack of such information in many suspected onchocerciasis endemic communities in Ethiopia [17].

Knowledge of onchocerciasis ; the recognition of its name, the ways of transmission and the complex of signs and symptoms of the disease is poor in endemic communities in Africa and the Americas nevertheless; the studies conducted to date indicate populations aware about onchocerciasis. The consequences of the skin lesions have been less well studied because researchers have focused mainly on the West Africa where blindness is a major public health problem. However, in Nigeria, there have been reports of social stigmatization and rejection of those with skin disease because of the belief that it is caused by dirtiness [18].

KAP studies used to assess the knowledge, attitude and practice gaps towards the risk factors of onchocerciasis, its ways of transmission and control measures. KAP studies includes the illness term recognition, outcome of untreated onchocercal infection, definition and cause of onchocerciasis, treatment, attitudes toward the intervention program and perceived seriousness of the infection [19].

Even in the Ivermectin treated communities as prevention and control measures onchocerciasis, in Southwester Ethiopia the KAP studies towards onchocerciasis reported that the target population has misunderstanding, misconception and ignorance about causes, transmission, prevention and control measures of onchocerciasis [20].

1.2 STATEMENT OF THE PROBLEM

Onchocerciasis still poses a threat to public health in many tropical regions of Africa and more focally in Latin America despite an intensive research effort, high expenditure on control programs and much research has been conducted on the biology and epidemiology of the host-parasite interaction. In an attempt to further understand such processes, a number of researchers have explored the properties by simple and complex mathematical models of the transmission dynamics of human onchocerciasis [21].

Globally, neglected tropical diseases (NTDs) affect more than one billion people and put at least two billion at risk. WHO has identified 14 diseases in this group and one is onchocerciasis which is most "tropical" diseases in the poorest countries. NTDs inhibit the capacity of poor and neglected communities to achieve sustainable development [22].

Onchocerciasis produces grave socio-economic consequences by affecting the productivity, social and sexual lives of sufferers due to blindness and other debilitating effects. Until recently onchocerciasis constituted a major public health problem in many parts of Africa and Latin America. It often led to depopulation of the severely affected fertile river valleys. Blindness in onchocerciasis, however, is only one feature of the medical, social, and economic tragedy the disease represents [23].

Onchocerciasis control program (OCP) has successfully reduced the prevalence of onchocerciasis by interfering with vectors. Despite these laudable efforts, the socioeconomic burden resulting from the disabilities caused by onchocerciasis, however, remains enormous [8]. The disease has a high damaging potential to the social life of patients especially the stigmatizing , premature ageing and lizard skin [24]. The disease is responsible for immense suffering, as it may cause severe and worrisome OSD, as well as disfiguring and embarrassing conditions, such as hanging groin and genital elephantiasis [25].

Ethiopia is a member of APOC that aimed primarily to reduce community microfilaria burdens to levels that are associated with negligible morbidity [26]. In Ethiopia, Nigeria and Sudan , onchocercial skin disease is just as damaging, being responsible for poor school performance and a higher dropout rate among infected children; low productivity, low income, and higher health

related costs among infected adults; and extreme forms of social stigmatization, especially among women [27]. Even onchocerciasis may not directly cause death; it carries great social and economic consequences. OSDs are leading cause of morbidity in endemic areas, resulting in psychosocial consequences and isolation. The disease burden due to onchocerciasis has been estimated at 987,000 Disability Adjusted Life Years (DALYs), 60% of which is accounted for OSD [28] .

Onchocerciasis has been targeted for elimination from Ethiopia along 19 African countries. In nine surveyed regions in Ethiopia , river blindness were shown to be endemic; the endemic areas extend from the North-West part to South-West part of the country that borders Sudan [7]. In complete national survey (1997–2004) in Ethiopia , onchocerciasis was much more widespread than originally believed [20].

Lack of knowledge and incorrect beliefs can lead to negligence in prevention, control measures and in accepting inappropriate treatment. To attain community participation and design socially acceptable control strategies, health program planners and implementers must be familiar with people's knowledge and beliefs in relation to onchocerciasis [29].

Onchocerciasis is really a barrier to health, social, economic, psychological and political problem for developing countries to achieve their millennium development goals (MDGs) and it is targeted for elimination by different bodies. But most onchocerciasis studies nowadays conducting in hyperendemic communities and relatively there are few studies assessing new foci for endemicity level. The current study was conducted among inhabitants adjacent to intervened area (non intervened community) to shed light in the current burden of onchocerciasis by assessing different epidemiological parameters.

CHAPTER TWO: LITERATURE REVIEW

Onchocerciasis tends to affect people living in poor rural areas by far; the highest prevalence is in Africa and has high burden in isolated foci in East and South-Central Africa and in one country of the Middle East (Yemen). It is also prevalent in small and scattered foci in six countries of Central and South America [30].The species of *Simulium* that serve as the intermediate hosts for vectors breed in fast flowing streams, there is occupational risk to farmers, fishermen, road construction workers and other field workers who spend time around infested streams [31] .

Ninety five percent (95%) of all cases of onchocerciasis are found in Africa south of the Sahara, in a wide belt stretching from West to East and the period of greatest transmission is in the rainy season coinciding with high agricultural activities and the period of maximal *Simulium* breeding [32]. Socioeconomic differences have been clearly identified as a contributing factor in onchocerciasis. Although no reported differences of exposure exist between men and women, men may be afflicted more often because of farming and field occupations [33].

Findings from Amazonian suggest that both social and economic consequences of the onchocerciasis are huge and considerable human sufferings. The prevalence of blindness in villages near fast flowing rivers may reach 15%, often affecting males (working age, perhaps 30-40 years old) more frequently than females, but this probably an occupational hazard. The overall observed prevalence of Mf was 32.8%, although the variation between communities was large, ranging from 0% to 100% [34].

In the survey carried out in a rural community in Nigeria, by house to house census based on the skin snip positivity for *O.volvulus,* the overall prevalence rate of infection was 47.5%. The symptomatic effects includes: Leopard skin (40.5%), itching or prurities (18.5%); ocular lesion (14%), nodules (10.5%) and lizard skin (7.5%). Males had a higher prevalence of onchocerciasis (27.5%) than the females (20%). However, age had a significant effect on the prevalence of onchocerciasis. People in the 70 years and above had the highest prevalence of infection (68%) closely followed by those in the 60 – 69 years age group who also exhibited all the symptoms recorded in the study [35].

In another similar epidemiological study conducted among farmers in Nigeria, 33.3% farmers were infected with *O. Volvulus* comprising 38.0% males and 26.7% females. The highest infection rate of 55.3% was observed in subjects aged of 50 years and above while the least infection was within the age range of 20 - 29 of age 15.5%. Skin lesions were detected 19% of infected males and 6% females [36].

The MFCR onchocerciasis in southwestern Sudan was 94% and Mf intensities, ranging up to 1,094 Mf/mg of skin. Nodule presence and number was significantly related to skin microfilarial intensity. OSDs were widespread and severe, ranging from acute maculopapular eruptions to chronic, diffuse, and degenerative changes, even in young adults. However, high skin Mf intensities were found in asymptomatic individuals; conversely, lowest intensities were in those with severest maculopapular lesions, suggesting that host response was a major determinant of disease outcome [37].

The endemicity of onchocerciasis in Ethiopia ranges from highest (82.7%) in Teppi Southwest Ethiopia to lowest (6.9%) in Kuwara province of Northwest Ethiopia [38]. In a survey of onchocerciasis in male field workers in coffee plantation projects Southwestern Ethiopia , the prevalence rate of onchocerciasis 82.7% and the intensity of infection were very high [8] and the high prevalence 81% of skin MFCR in Ethiopia was reported among peoples residing along the Blue Nile River [39].

Another similar investigation among workers of coffee plantation farm Southwestern Ethiopia, the prevalence of OSD was 85.3% and the overall NCR was 44.2% while MFCR was 77.6%. Mean Mf count was determined to be 38.1 per mg of skin snip or 44.4 per mg of infected skin snips. The geometric mean (Gm) of Mf load per infected skin was 23.8. The CMFL was estimated to be 14.0 per mg skin snips [40].

In West Wellega, Western Ethiopia, the overall prevalence MFCR was found to be 74.8% and Clinical spectrum for pruritis, leopard skin, onchocercomata and hanging groin was 64.27 %, 18.94 %, 12.12 %, and 2.51%, respectively. The overall prevalence of NCR was found to be 12.2%.The NCR was 16.38% in males and 8.15% in females. The Mf density ranged from 0.00 to 711.00 per mg of skin snip with a mean density of 23.9 mf per mg of skin snip and the CMFL was 19.6. The CMFL of females was found to be 15.2 and that of males was 25.6 [41].

In Blue Nile Valley of western Ethiopia, the prevalence of onchocerciasis was 38% and only 23% had typical clinical signs and symptoms of onchocerciasis [42] but among Bebeka coffee plantation workers in Ethiopia, the overall prevalence was 30.9% and among male persons the prevalence was higher than the female counterparts [43].

The clinico-epidemiological and entomological study of onchocerciasis in Bure area, Southwest Ethiopia the MFCR was 24.6% ; with a mean of 11.7 Mf per mg of skin snips [44].

In Southwest Ethiopia, the mean number of Mf per infected person was 3.6 mf/mg of skin. The infection rate in males was about three times higher than in females [45].

The study in Gilgel Gihbe River Valley Southwest Ethiopia, the prevalence of the onchocerciasis was 17%, being higher in males (19%) than in females (14%) [46].

According to the reports from southwest Ethiopia, Mf load ranged from one to 855 Mf per mg of skin snip and the presence of any of skin microfilaria, nodule and/or leopard skin were taken as diagnostic criteria, and the overall prevalence rate of onchocerciasis would be 88%. Hanging or pendular scrotum, which has been rarely reported in Africa but not until now in Ethiopia, was found in 19% (46/246) of the male patients. There was neither negative nor positive correlation between Mf load and severity of clinical manifestations of the disease [47].

In secondary schools in Kafa zone the overall MFCR was 15.6% while the density of infection was 1.4 mf/mg skin snips. Males had significantly higher rate of infection than females but the difference rate of infection among different age groups was not significant. The prevalence of infection was significantly higher among the students who had reported frequent bathing, swimming, fishing and collecting firewood at/or near the rivers identified as the probable breeding sites of the vector, while there was no statistically significant association between infection and washing clothes, fetching water or crossing over the rivers [48].

Behavioral and community factors are most important in the planning, implementing and evaluation of control measures. In savanna areas, the intensity of exposure to transmission is determined by the distance between a community and a fly breeding site and by the presence or absence of other human settlements in the intervening area; these considerations have led to the

characterization of villages as first-, second- and third-line. Furthermore, individuals who frequently visit the breeding site(s) or whose work requires them to spend long periods on the river bank (e.g. fishermen) tend to have very severe manifestations of onchocerciasis. The density of the human population in relation to the vector population emerging from local breeding sites is also an important determinant of intensity of infection, as is the presence of cattle near rivers, since it reduces the contact of the human population with zoophilic vectors of *O.volvulus.* In addition, the regular inoculations of the human population with bovine/animal *Onchocerca* L3 larvae may provide an immunological stimulus to the host and thus help prevent infection with *0. Volvulus [49].*

In KAP studies conducted in Nigeria, 36% of the participants were uncertain and could not give any cause for leopard skin, onchodermatitis or nodules. But 19% percent attributed the presence of the three manifestations to adverse effect of the sun while another 18% felt they were hereditary, 6%Witchcraft, 15% excessive eating of cola nut and 3% mosquito bites are believed to be associated with onchocerciasis[50].

Another similar KAP studies in Nigeria 30.5% respondents named the disease correctly as onchocerciasis or river blindness; caused by worms, and transmitted by black flies/insects. Sixty nine point five percent (69.5%) responded with wrong answers by stating one symptom such as itching, nodules, bad skin, eye sigh ” as the name of the disease. They could not name the causative agent or the vector of the disease[51].

Towards the vectors of onchocerciasis in Nigeria only 3% knew that onchocerciasis was caused through *Simulium* bites and the knowledge of the breeding site of the flies was also poor. No one mentioned the fast flowing river as breeding ground of *Simulium* flies. The early morning, late evening hours and the wet season were commonly cited by both the affected and unaffected individuals as period with high *Simulium* density [50].

According the Nigerian study, onchocerciasis occurred more among people who lacked aetiological knowledge (ignorant) of the disease (29%) than among those who were knowledgeable (3.5%). Most male volunteers, who were farmers, admitted that they were usually thinly clothed with shorts and sleeveless singles while at work on the farms. Also most males in the community often bathed in nearby streams reputed to be breeding sites of black flies in the area. Sixty nine point five percent (69.5%) regarded some recorded symptomatic effects of

onchocerciasis in the community, namely: itching, nodules, leopard skin, lizard skin and ocular lesion as separate diseases, and not linked to the same causative nematode, *O vulvulus.* 12.5% admitted using traditional herbal medicines for the treatment of onchocerciasis. Adequate knowledge of *O Volvulus*; its mode of transmission; disease manifestation; and the efficacy of ivermectin treatment would bring about the desired positive change of attitude and perception or behavior that would enhance individual and community acceptance of prevention and control [51].

In a cross-sectional study conducted to assess the knowledge and beliefs about causes, transmission, prevention and control of onchocerciasis among rural inhabitants in endemic areas of Ethiopia 75.9% of study subjects were aware about onchocerciasis. During the survey, 66.9% of affected, and 45.5% of unaffected respondents knew that onchocerciasis was transmitted through black fly bites. About 53% of unaffected and 60% of affected respondents thought that onchocerciasis was preventable and the majority of the affected respondents felt that it was curable. Although the majority of respondents had ample awareness, a sizable proportion still had misconceptions and misunderstandings about causes, transmission, prevention and control of onchocerciasis [52].

Socio-demographic characteristics, life style, distance from the river, length of stay in the village, and KAP towards onchocerciasis might be attributable factors for infection of *O.volvulus* infection.

CONCEPTUAL FRAME WORK

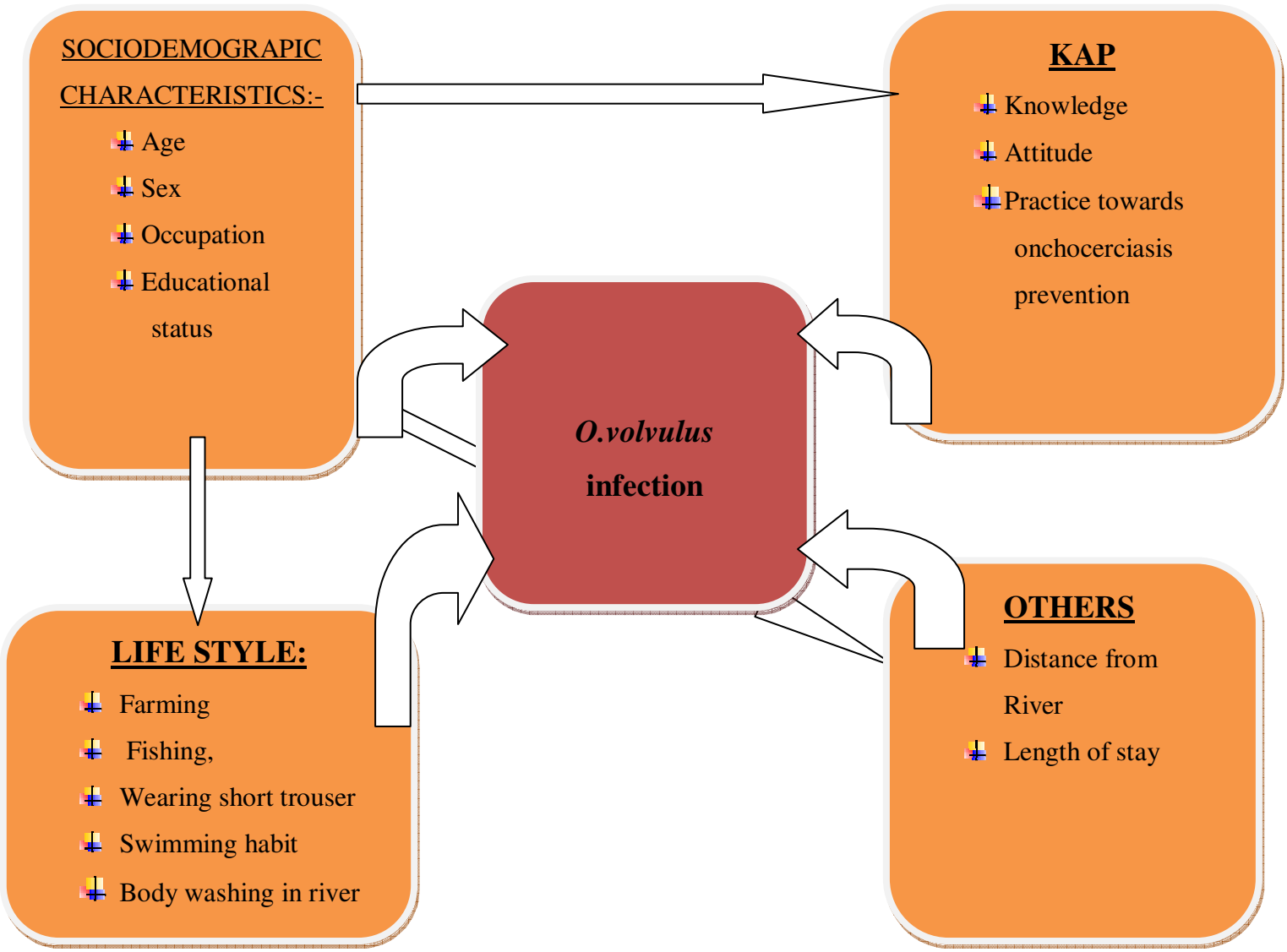


Fig1: Conceptual frame work explaining the relationships between different factors and *O.volvulus* infection

SIGNIFICANCE OF THE STUDY

Onchocerciasis is one of the neglected tropical parasitic diseases targeted for elimination from most part of endemic countries in Africa. Developing appropriate ways to deliver the microfilarial drug to communities affected by human onchocerciasis has become an important area of research. One of the objectives of epidemiological studies is to identify high-risk communities to prioritize for mass treatment with ivermectin.

Since human onchocerciasis suspected along fast flowing rivers and streams and the long flight ranges of black fly, villages adjacent to intervened communities should be assessed periodically to predict the endemicity level of onchocerciasis. Our study area was bordered by hyperendemic communities (Manna district) where the MDA with Ivermectin was implemented before eight years. Moreover, due to different onchocerciasis case reports from local health facilities, Colombo River was suspected to be the breeding site for infected black flies from the nearby hyperendemic district that might be responsible for transmission of the disease. The study was assessed these high risk communities for the endemicity level of onchocerciasis so as to prioritize for preventive and control measures according to the objectives of APOC by using MDA .The study was aimed to tackle the transmission of onchocerciasis in the community and to provided better relief by minimizing OSD by distributing Ivermectin. Moreover this study may contribute some in the achievement of the country in eliminating onchocerciasis as public health problem.

Moreover the results of this investigation will serve as baseline data to develop an appropriate onchocerciasis control strategy in the future and will serve as the baseline for further evaluation of the intervention if the MDA implemented in the community.

CHAPTER THREE: OBJECTIVE

3.1 General Objective

To assess the magnitude and predictors of onchocerciasis among inhabitants close to Ivermectin intervened areas along Colombo River , Kasoohixii kebele , Gomma district, Jimma zone, south west Ethiopia

3.2 Specific Objectives

To determine the prevalence of *O.volvulus* infection in the study areas

To determine the community microfilarial loads of the study area

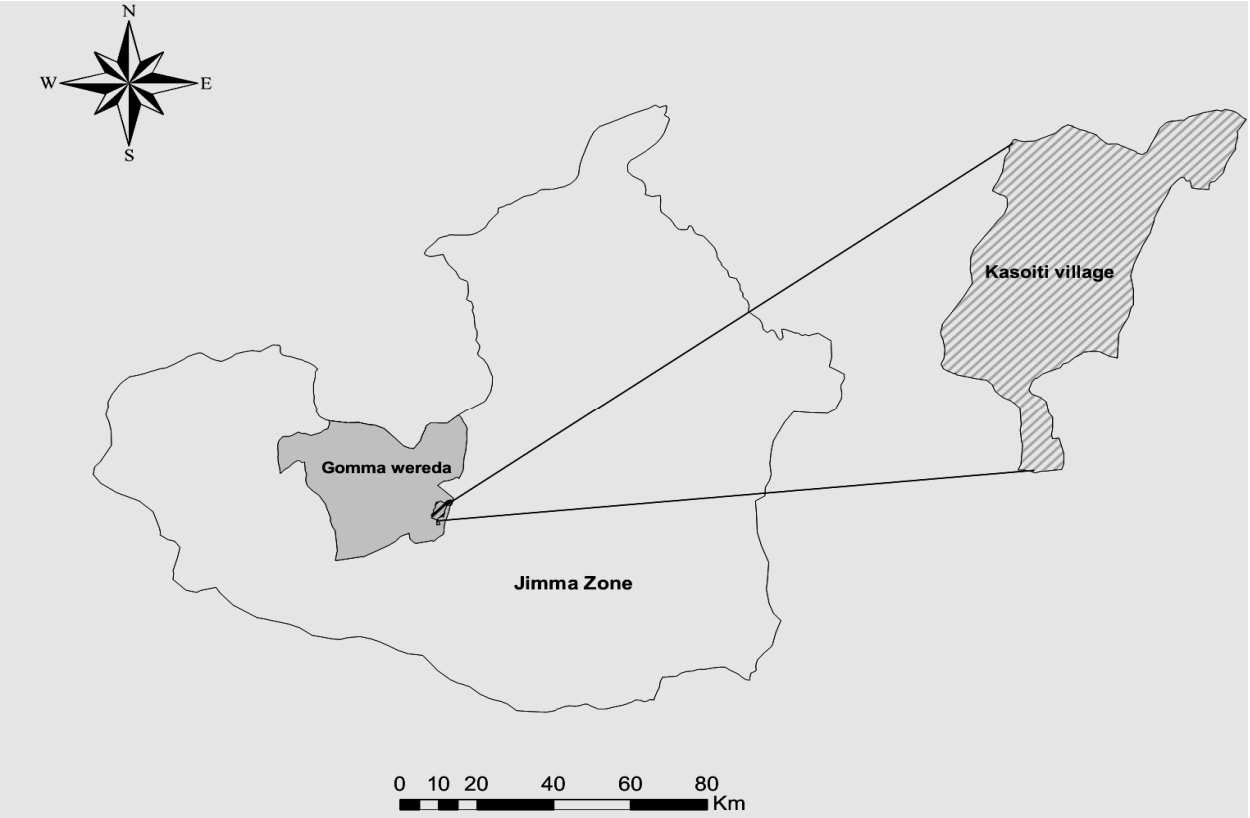
To assess the knowledge, attitude and practice of the community towards onchocerciasis

To assess the associated factors with *O.volvulus* infection in the study areas

CHAPTER FOUR: MATERIALS AND METHODS

4.1 Study area and period

Gomma district is located 390 km Southwest of Addis Ababa and about 50 km west of the Jimma town. The district is predominantly growing coffee and the average annual rainfall of the district is 1524 mm with low variability. It is bimodally distributed in which the small rains are from March to April and the main rainy season lasts from June to October. Agro ecologically, the district is classified as 96% wet Weina Dega and 4% Kolla. Altitude ranges from 1387 to 2870 masl [53]. Kasoohixii kebele is about 997.7 hectare and bordered by Choche, Omogobo, Bosooka and Balfo kebeles North, South, East and West, respectively. Colombo, Suunde, and Urgessa rivers cross different villages the kebele. But the Colombo is the largest River that enters the kebele from west and cross different villages in the kebele and exit at north of the kebele. There are six villages in the kebele consisting of about 5289 population and 1015 households. The study was conducted from April 23 to May 23, 2012 on the epidemiology of the onchocerciasis



Maps of Jimma Zone, Gomma woreda, Kasoohixii kebele

4.2 Study Design

A community based cross-sectional study was employed for the epidemiology of onchocerciasis.

4.3 Populations

4.3.1 Source population

All inhabitants in the Kasoohixii kebele along Colombo River

4.3.2 Study Population

A sample of randomly selected individuals from the Kasoohixii Kebele comprises the study population.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

Individuals age greater than 15 years were included

4.4.2 Exclusion Criteria

New dwellers who stayed less than 3 years in the village and individuals who treated for onchocerciasis before was excluded from the study.

4.5 Sample Size Determination

Sample size of the study was determined by using single population proportion formula for community based epidemiological studies [54] by using the prevalence rate of 17% among inhabitants along Gibe River from previous studies [46].

$N = (Z\ \alpha/2)^2 \frac{p(1-p)}{d^2} = (1.96)^2 \frac{0.17(1-0.17)}{0.05^2}$ =216.8199

Where:

N = Sample size

Z α/2 = standard normal value at α 0.5 level

P = Prevalence of onchocerciasis (17%)

d= margin of error

Since the sampling is multistage, the total sample size was multiplied by two to minimize the design effect and the final sample size becomes 216 *2= 432 and with 10% non response rates it became 475 study participants.

4.6 Sampling Techniques

Simple random sampling was employed to select four hundred seventy five (475) households from a total of 1015 households and one participant from each household was selected randomly.

4.7 Study variables

4.7.1 Dependent Variable: *O.volvulus* infection

4.7.2 Independent variables: Age, sex, occupation, educational status, ethnicity, religion, duration lived in the village, distance from river and streams.

4.8 Data Collection procedures and Instruments

Interviewer administered structured questionnaire were prepared and some of it was adapted from different onchocerciasis epidemiological and KAP studies by principal investigator so as to be conducive to the local situation. After adequate community mobilization and sensitization by rural health extension workers and community leaders, a total of 475 individual randomly selected for sociodemograpic characteristics, clinical and parasitological examinations and KAP status assessments.

4.8.1 Sociodemograpic variables and KAP

Prior to parasitological and clinical data collection, the sociodemograpic and KAP data was collected by two trained rural health extension workers by using well prepared questionnaires.

4.8.2 Clinical data collections

Each study participants undergone clinical examination to assess any clinical manifestation of human onchocerciasis according to WHO 1995 and/or Murdoch1993 for generalized or localized body itching (prurities), atrophy of the skin, depigmentation of the skin (leopard skin), thickened and rough skin (lizard skin), subcutaneous nodule, lymphadenopathy, hanging groin and Lymphoedema. Every study subjects were assessed intensively from the head to sole of the leg by trained and experienced health professionals (clinical nurses and health officer) from the nearby onchocerciasis endemic communities. Privacy and confidentiality about the study participants were kept by coding his/her names, facilitating separate room for examination and disclosing the results only to the study subjects.

4.8.3 Parasitological Data Collection

By experienced medical laboratory technologists and principal investigators, two bloodless skin snips from right and left gluteal folds were collected from each study subjects following standard operating procedure after applying antiseptics and using sterilized razorblades. Each skin snips from left and right were weighted by using sensitive analytical balance (sensitivity 0.01mg) and the average weight was recorded. Then the skin snips were placed in Eppendorf tubes containing 100µl of physiological saline labeled with study subjects' identification number. The snips was left in physiological saline for 24 hrs so as to enable the complete emergence of microfilaria from the snip. Snips were examined microscopically for Mf of *O.volvulus* by low power filed objectives (4x and 10x). From all positive skin snips the number of *O.volvulus* Mf was counted microscopically and the average number of Mf was recorded on the prepared format. Average number of Mf recorded as Mf per weight of skin snips and was converted into Mf/mg of skin snips. The number of Mf from each mg of skin snip was expressed as Mf per milligram (mf/mg) of the skin snip. The mf load of each person was expressed as the number of mf per weight of skin snip. The mean microfilarial load (MFL) was calculated for all skin-snip positive persons and the community microfilarial load (CMFL) was calculated as the MFL for all subjects aged ≥ 20 years [55] .The geometric mean of the Mf from all subjects above ≥ 20 years including positive and negatives were calculated by transforming in to logarithmic functions so as to used as a measure of CMFL (intensity of infection) in males , females and six villages by using SPSS version 16.0 . All positives skin snip samples were dried, fixed with methanol and stained with Giemsa staining solution to identify the Mf of *O. Volvulus* from other blood born Mf comparing morphological characteristics.

4.9 Operational definitions of terms and concepts

OSD: onchocercial skin disease including pruritis, palpable nodule, leopard skin, lizard skin, atrophy of skin, Lymphoedema, and hanging groin

Microfilarial load: the number of Mf per weight of skin snip

Mean microfilarial intensity: the average number of microfilaria per mg of skin snip in infected person

Community microfilarial load: the geometric mean of microfilarial load per mg of skin snips for all subjects age ≥ 20 years including positive and negatives to indicate the transmission potential of the infection

Foci: the area suspected to be endemic to the causative agents of onchocerciasis

Knowledge: the information stored in participant's memory about the onchocerciasis and the vector.

Attitude : the predisposition to respond in a favorable or unfavorable manner towards a onchocerciasis.

Practice: the practice refers to health behaviors with respect to onchocerciasis.

Behavior: the way in which a person acts or reacts under a set of imposed conditions for onchocerciasis.

Community: refers to a group of people in the study area with social interaction in a geographical area and sharing a common social and cultural life.

4.10 Data quality assurance

To ensure the reliability of the data, the following quality assurance components were followed:

Pre-analytical

Before the beginning of data collection, data collection tools was tested and evaluated for appropriateness for sociodemograpic and KAP study in Bosooka kebele (Manna district) which is border of the KasooHixii as pre test. Adequate training was given to the data collectors and completeness of the data collection materials was assured. The consistency of questionnaires was secured by translating in to afaan Oromo and back to English language. Reagents concentration and expiry date was checked and all specimens were labeled by permanent marker. Three specimens with blood excluded from the sample.

Analytical

During data collection any unclear ideas and terms was explained well for the study subjects in local language. History and physical examination of the participants was undertaken to assess any clinical manifestation of onchocerciasis .Each skin snip sample was examined and reported by two experienced laboratory technologists for presence or absence of Mf and the principal investigator confirmed absence or presence of *O.volvulus* Mf and its average number of counts.

Post analytic

For sociodemograpic and KAP data the principal investigator checked the questionnaires for completeness and any incomplete or misfiled questionnaire was sent back to the respective data collector for correction by asking participants again. The result of clinical examination was recorded on well prepared coded format carefully and finally attached with the Sociodemograpic

and KAP questionnaire. Parasitological examination results were reported in pre coded format and positive results reported the number of Mf per skin snips in the space provided finally converted in to mf/mg of skin snips.

4.11 Data Analysis

Data was checked for completeness and consistency, cleaned, coded and entered in to database and analyzed using SPSS version 16.0 statistical soft ware. The frequency and descriptive statistics was used for different variables. Cross-tabulation was used for Chi-square test for dependent and independent variables to see the association and P-value < 0.05 was used as cut-off points for significance. Moreover logistic regressions were used for bivariate and multivariate analysis for candidate variables shown significance association by chi-square test. Stepwise variable selection method by using likelihood ratio test was used in multivariate analysis to control cofounders and to select the independent predictors for *O.volvulus* infection.

4.12 Ethical Consideration

The study was conducted after obtaining ethical clearance letter from ethical review committee of Jimma University. The objective of the study was explained to the Jimma zone health office, Gomma district health office and support letter was obtained before data collection. The objectives of the study were explained to participants or their guardians in local language and oral and written consent from the study participants or their parents/guardians was secured before data collection. Results of the examination was only disclosed to participants by keeping confidentiality and all positive study subjects were treated with standard dose of Ivermectin in Gembee health center.

4.13 Dissemination of Results

The result of this study will be presented to Jimma University as final thesis defence and further dissemination for concerned bodies by appropriate media and publishing attempts will be made in reputable local and international journals so as to help the local and international planners and policy makers. Moreover, the results of study were disseminated to the study participants, Jimma Zone health office, Gomma district health office and kasoohixii kebele.

4.14 Limitations: the low sensitivity of microscopic examination of skin snips, low sensitivity of nodule palpation

Chapter Five: Results

5.1 Sociodemograpic Characteristics of Respondents

From the selected 475 individuals, 440 individuals were undergone clinical examination, parasitological examinations and KAP assessment with a response rate of 92.6%. From total respondents male and female accounts 241 (54.7%) and 199 (45.3%), respectively. Majorities of the respondents were in 25-34 years age groups and the mean age of participants was 38.3 years (±1.6SD). Of the total respondents 223 (50.7%) had no formal education, while 7.5% of respondents were grade nine and above. Occupationally, 59.1% of the respondents were farmers followed by housewives (18.9%) and students (16.8%).

Table: 1. Sociodemograpic characteristics of study subjects along Colombo River, Gomma district, Jimma zone, Southwest Ethiopia, (2012)

Variable		Frequency	Percentage
Sex			
	Male	241	54.7%
	Female	199	45.3%
Age			
	15-24	89	20.2%
	25-34	112	25.5%
	35-44	85	19.3%
	45-54	65	14.8%
	55-64	49	11.1%
	> 64	40	9.1%
Ethnicity			
	Oromo	306	69.5%
	Amhara	50	11.5%
	Dawro	43	9.8%
	*Others	41	9.3%
Religion			
	Muslim	332	75.5%
	Orthodox	78	17.7%
	Protestant	30	6.8%
Educational status			
	No formal education	223	50.7%
	Grade 1-8	184	41.8%
	Grade 9 and above	33	7.5%
Occupations			
	Farmers	260	59.1%
	House wives	83	18.9%
	Students	74	16.8%
	**Others	23	5.2%
Distance from the River			
	<2km	261	59.3%
	≥2Km	179	40.7%
Duration of stay in the villages			
	1-10	15	3.40%
	11-20	96	21.80%
	21-30	127	28.86%
	31-40	96	21.80%
	41-50	48	10.90%
	51-60	37	8.47%
	>60	21	4.77%

*Others: Kambata, Yem, and Hadiya **Others: Daily labor, Governmental employer

5.2 Parasitological Examination

The prevalence of *O.volvulus* among inhabitants along Colombo River was 22.5% (99/440) and significantly higher among males (26.6%) than females counter parts (17.6%) (P =0.026). The intensity of microfilaria ranged from 1.00 to 160 per mg of skin snip and the mean intensity was 15.70 per mg of skin snip.

The prevalence of *O.volvulus* in Silikoo, Daabuu, Baroochii, Kabuu, Ganjii, and Chilluu villages along Colombo River was 36.2%, 26.3%, 25.0 %, 23.3%, 16.5 %, and 13.8%, respectively. There is no significant association between villages and the prevalence of *O.volvulus*.

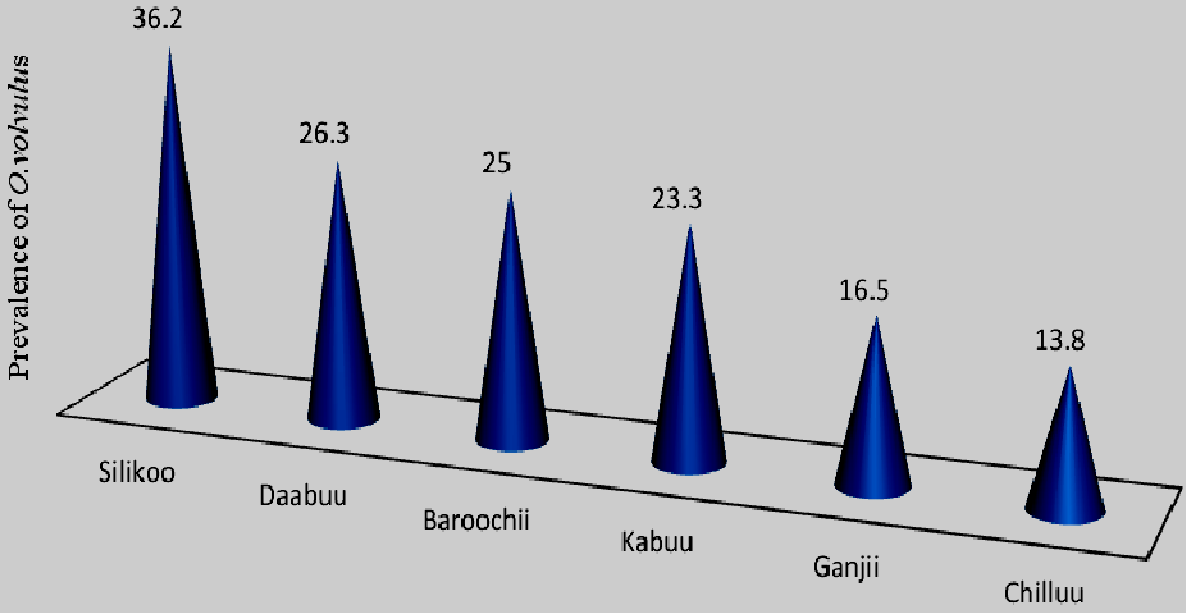


Fig 2: Prevalence of O.volvulus in villages along Colombo River ,Southwest Ethiopia, 2012

5.3.1 *O.volvulus* Infection and Occupation of study subjects

The prevalence of *O.volvulus* among farmers were higher than (27.7%) than housewives (19.2%) and students (4.1%)

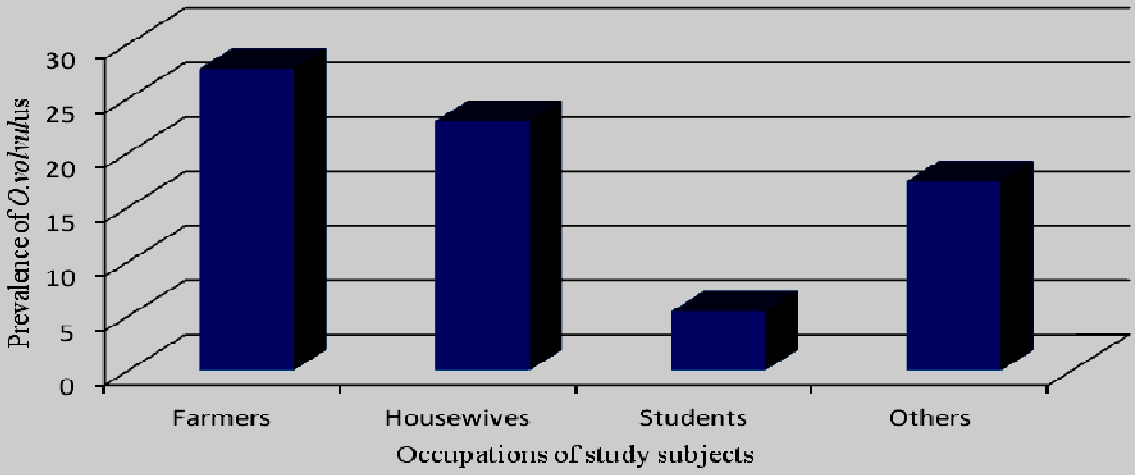


Fig 3 : Prevalence of O.volvulus and occupations of the study subjects along Colombo River,Southwest Ethiopia,2012

5.3.2 *O.volvulus* Infection and the Age Groups of Respondents

Higher prevalence of *O.volvulus* infection was reported among age groups >64 years and the least prevalence rate reported among the age groups 15-24years .As the age of participant increase, the prevalence rate of *O.volvulus* increase proportionally.

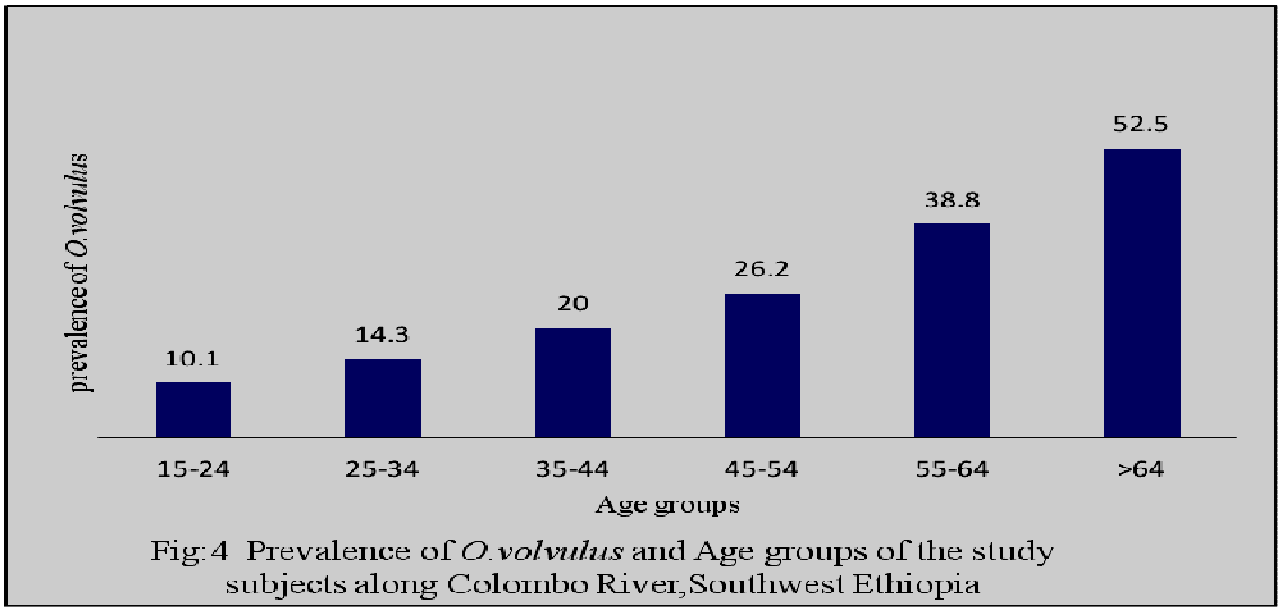


Fig:4 Prevalence of *O.volvulus* and Age groups of the study subjects along Colombo River,Southwest Ethiopia

5.3.3 *O.volvulus* infection and educational status

Higher prevalence of *O.volvulus* reported among respondents without formal education (28.3%) was as low prevalence rate was reported among respondents with grade 1-8 (15.2%).

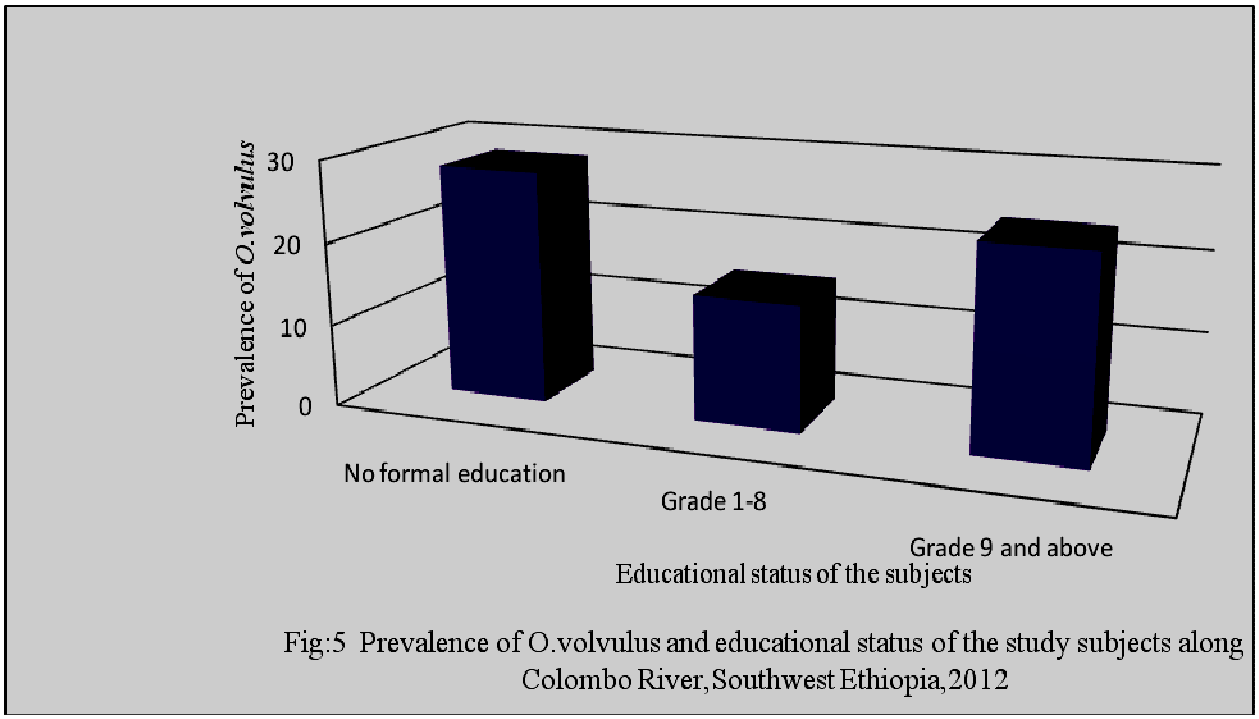


Fig:5 Prevalence of O.volvulus and educational status of the study subjects along Colombo River,Southwest Ethiopia,2012

5.2.8 *O.volvulus* infection and the length of residence in the villages

Respondents who lived longer had higher rate of infection than respondents who lived in the area for short period of time. Highest prevalence rate was recorded among participants who lived in the villages for >64 years.

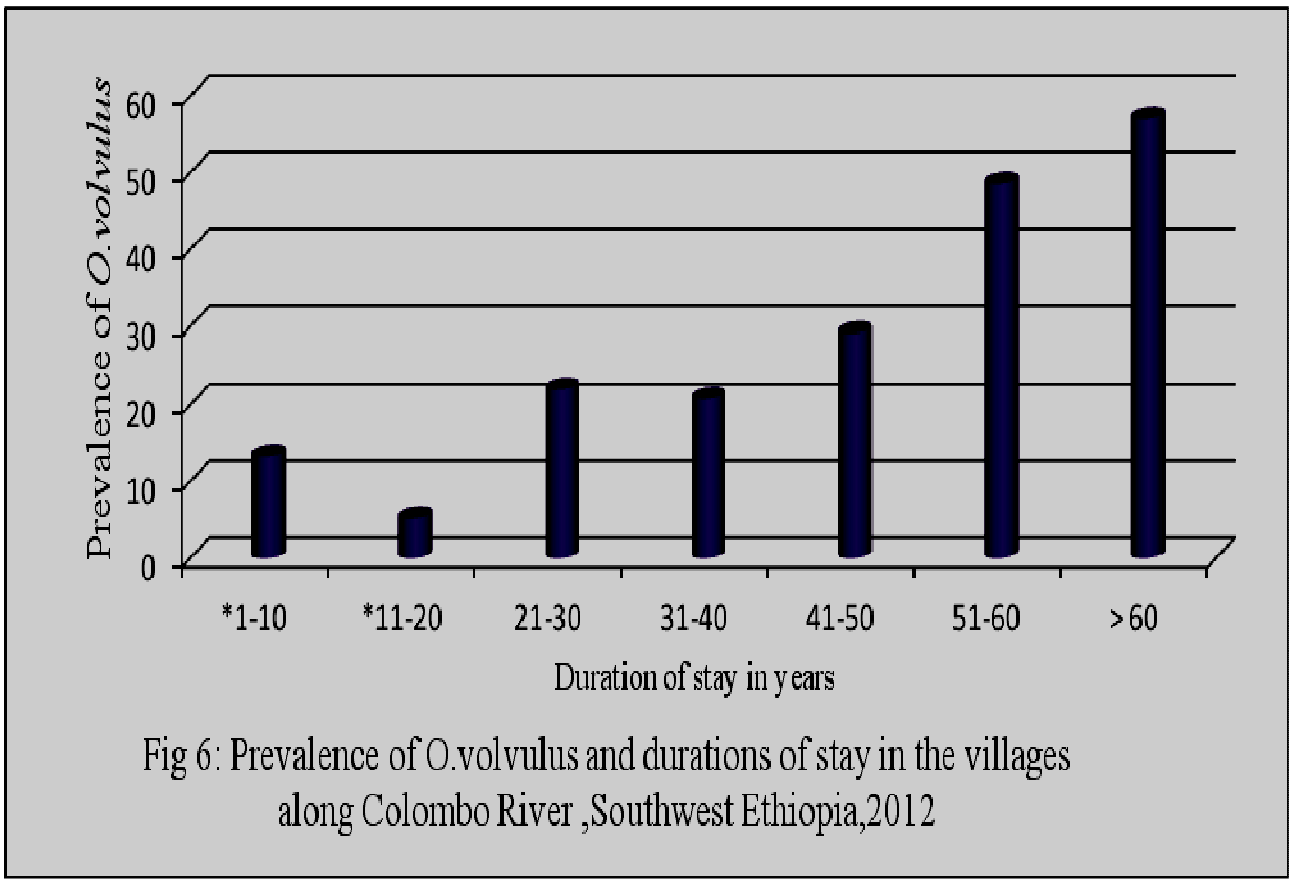


Fig 6: Prevalence of O.volvulus and durations of stay in the villages along Colombo River ,Southwest Ethiopia,2012

5. 3 Sociodemograpic factors associated with *O.volvulus* infection

In chi-square test sex, age, educational status, occupation, and duration of stay in the villages showed significant association with the infection of *O.volvulus* (P<0.05). Sex had shown significantly association with onchocerciasis (P=0.026), more male study participants affected than the female counterparts. As the age of the study participants increase, the prevalence of onchocerciasis increase significantly (P=000). Occupation of study participants and prevalence of onchocerciasis shown significant association (P=0.001), the prevalence is significantly higher among farmers than other occupations. Participants without formal education shown significant association (P=0.007) with onchocerciasis infections. More proportions of study participants without formal education infected with *O.volvulus* than others. As the durations of residence increase, the risk of onchocerciasis increases (P=0.000) and study participants with durations of residence 1-10 years and 11-20 years were 85% and 94.5 less likely infected than participants who stayed in the villages over 60 years.(Table: 2 and Table: 3).

Table 2: Sociodemograpic characteristics associated with *O.volvulus* infection among respondents along Colombo River, Gomma district, Jimma zone, southwest Ethiopia (2012)

Variables	Results		P- value
	Positive	Negative	
Age			
15-24	9(10.1%)	80(89.9%)	
25-34	16(14.3%)	96(85.7%)	
35-44	17(20.0%)	68(80.0%)	0.000
45-54	17(26.2%)	48(73.8%)	
55-64	19(38.8%)	30(61.2%)	
> 64	21(52.5%)	19(47.5%)	
Sex			
Male	64(26.55%)	177(73.44%)	
Female	35(17.58%)	164(82.44%)	0.026
Educational status			
No formal education	63(28.3%)	160(71.7%)	
Grade 1-8	28(15.2%)	156(84.8%)	0.007
Grade 9 and above	8(24.2%)	25(75.8%)	
Occupational status			
Farmer	72(27.7%)	188(72.3%)	
Housewife	19(22.9%)	64(77.1%)	
Student	4(5.4%)	70(94.6%)	0.001
**Others	4(17.4%)	19(82.6%)	
Duration of stay in the villages			
1-10	2(13.3%)	13(86.7%)	
11-20	5(5.2%)	91(94.8%)	
21-30	28(22.0%)	99(78.0%)	
31-40	20(20.8%)	76(79.2%)	0.000
41-50	14(29.2%)	34(71.8%)	
51-60	18(48.6%)	19(51.4%)	
>60	12(57.1%)	9(42.9%)	

**Others: Daily labor, Governmental employer

Table 3: Association of *O.volvulus* infection and length of stay in the community among study subjects along Colombo River, Gomma district, Jimma zone, south west Ethiopia, (2012)

Duration of stay in villages (years)	Number of participants		Sig.	Exp(B)	95.0 % C.I. for EXP(B)	
	Positive	Negative			Lower	Upper
1-10	2	13	.014	.154	.035	.682
11-20	5	91	.000	.055	.022	.135
21-30	28	99	.000	.283	.186	.430
31-40	20	76	.000	.263	.161	.431
41-50	14	34	.005	.412	.221	.767
51-60	18	19	.869	.947	.497	1.805
***>60	12	9				

***Reference Duration in years

5.3 Community Microfilarial Load (CMFL)

The CMFL among study subjects along Colombo River was 2.70 and CMFL of females was found to be 2.12 and that of males was 3.31. The highest CMFL 4.47 was detected in Silikoo and the lowest (1.93) in Ganjii. CMFL among study subjects in the six villages were shown in figure below.

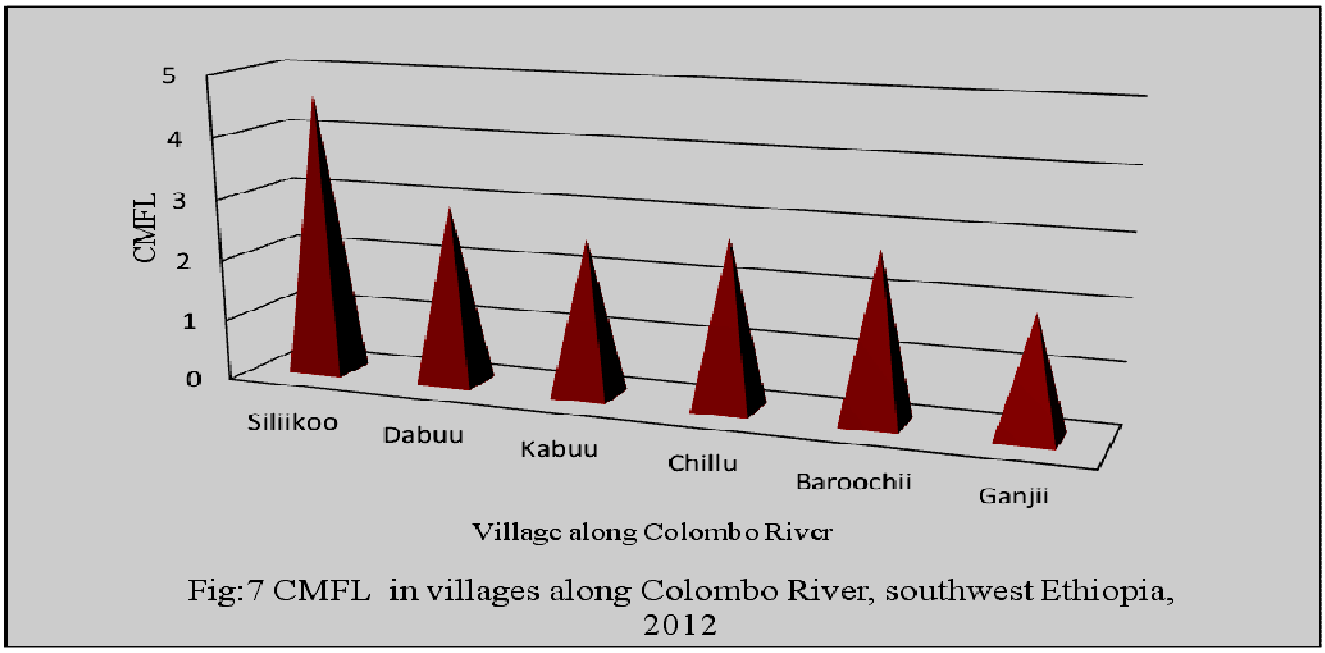


Fig:7 CMFL in villages along Colombo River, southwest Ethiopia, 2012

5.4 Clinical manifestations

The overall prevalence of OSD was 29.80 % (131/440) and the prevalence for male and female was 36.93% and 21.11%, respectively. The prevalence of pruritis, palpable nodule, leopard skin and hanging groin were, 21.14 %, 3.65 %, 3.41 % and 1.60 %, respectively. Pruritis was the major clinical manifestation of the onchocerciasis in the study villages. All subjects with leopard skin, palpable nodule and hanging groin had pruritic manifestations. (Table: 4)

Table 4: Clinical manifestations of onchocerciasis among study subjects along Colombo River, Gomma district, Jimma zone, southwest Ethiopia (2012)

Clinical manifestation	Male	Female	Prevalence of OSD
Pruritis			
Positive	62(25.7%)	31(15.6%)	21.14
Negative	179(74.3%)	168(74.4%)	
Leopard Skin	11(4.6%)	4(2.0%)	3.40
Positive	230(95.4%)	195(98.0%)	
Negative			
Palpable Nodule			
Positive	9(37.0%)	7(3.5%)	3.60
Negative	232(96.3%)	192(96.5%)	
Hanging Groin	7(2.9%)	0(0%)	1.60
Positive	234(97.1%)	199((100%)	
Negative			

Results of clinical manifestations showed that, prurities was the most common manifestation in all study villages and palpable nodule was more prevalent in Silikoo and Daabuu but hanging groin was not detected in both Kabuu and Daabuu. Relatively the prevalence of f leopard skin was higher in Daabuu and Baroochii.

Table 5: Clinical manifestations of onchocerciasis in villages along Colombo River, Southwest Ethiopia, (2012)

Clinical manifestations	**Villages**						
	Silikoo	**Daabuu**	**Kabuu**	**Chilluu**	**Baroochii**	**Ganjii**	**Total (%)**
Prurities							
Present	29	15	20	7	13	9	93(21.1%)
Absent	29	42	40	73	75	88	347(78.9%)
Palpable nodule							
Present	4	4	0	3	2	3	16(3.6%)
Absent	54	53	60	77	86	94	424(96.4%)
Hanging groin							
Present	1	0	0	1	3	2	7(1.6%)
Absent	57	57	60	79	85	95	433(98.4%)
Leopard skin							
Present	2	4	2	1	4	2	15(3.4%)
Absent	56	53	58	79	84	95	425(96.6%)

5.5 KAP towards Onchocerciasis

5.5.1 Knowledge of Respondents towards Onchocerciasis

Of 440 respondents, only 52(11.8%) heard the disease in its local name ''Ankoo'' and the majorities of respondents 388(88.2%) didn't hear about the disease before. Even though 11.8% (52/440) heard about the disease before, there was poor knowledge towards the cause, nature of the disease, the ways of transmission, parts of the body affected, and treatment aspects of the disease. Only 30 %(16/52) of the respondents who heard about the disease cited that the cause of the disease was due to the bite of blackfly and 53.8 %(28/52) knew the disease mostly affects the skin. Seventy eight point eight (78.8%) of the respondents had misconceptions and misunderstanding towards the transmission of onchocerciasis (Table: 6)

Table 6: Knowledge towards onchocerciasis among respondents along Colombo River, Gomma district, Jimma zone, South west Ethiopia, (2012)

Variables	Frequency	Percentage
Ever heard of onchocerciasis		
Yes	52	11.8%
No	388	88.2%
Type of disease		
Skin disfiguring	22	42.3%
Itching skin condition	22	42.3%
I don't know	8	15.4%
Body affected		
Skin	28	53.8%
Any part	22	42.3%
I don't know	2	3.8%
causes of onchocerciasis		
Black fly bite	16	30.8%
Farm work	6	11.5%
Contact with infected	9	17.3%
*Others	8	15.4%
I don't know	13	25%
Modes of transmission		
Black fly bite	11	21.2%
Contact with infected individuals	16	30.8%
I don't know	13	25%
**Others	12	23.1%
Type of treatments for onchocerciasis		
Herbs	6	11.5%
Modern medicine	6	11.5%
***Others	5	9.6%
I don't know	35	67.3%
Most affected group of people		
Adults	1	1.9%
Young	1	1.9%
All age groups	26	50%
I don't know	24	46.2%

*Others: Dirtiness, Excessive sun light**others: Mosquito bite, Sexual intercourse ***others: Soap washing, Tebel

5.5.2 Knowledge of Respondents towards the Blackfly

Only 16.4% (72/440) of the respondents cited their knowing the blackfly and they cited that the common biting sites were along fast flowing river 16.7% (12/52) and from the subjects who know blackfly 48.6% (35/52) of the respondents didn't know the major biting season .Morning and afternoon were mentioned to be the common biting period in the day time by 18.1% (13/52) and 11.1% (8/52) respectively. Only 27.8% (20/52) of the respondents who knew the blackfly, mentioned correctly about the breeding site of the blackfly as fast flowing river and streams but 36.1% (26/52) of the respondents didn't know the activities that expose to blackfly bite.

Table 7: Knowledge towards blackfly among respondents along Colombo River, Gomma district, Jimma zone, South west Ethiopia, 2012

Variables	Frequency	Percentage
Know Black fly		
Yes	72	16.4%
No	368	83.6%
Common biting sites		
Along fast flowing river	12	16.7%
Farm	12	16.7%
Anywhere	17	23.6%
I don't know	31	43.1%
Major biting season		
Dry season	10	13.9%
Wet season	23	31.9%
Any time	4	5.6%
I don't know	35	48.6%
Common day biting time		
Morning	13	18.1%
Afternoon	8	11.1%
Evening	6	8.3%
Any time	10	13.9%
I don't know	35	48.6%
Breeding site of black fly		
Fast flowing river	20	27.8%
Stagnant water	11	15.3%
*Others	4	5.6%
I don't know	37	51.4%
Activities expose to blackfly bite		
Farming	14	19.4%
Washing	8	11.1%
Any activities	24	33.3%
I don't know	26	36.1%

*Others: Farm, Forest

5.5.3 Attitude and Practice of Respondents towards Onchocerciasis

Concerning the attitudes of respondents towards the onchocerciasis; disease seriousness, disfiguring ability, treatability, and possibility of prevention was agreed by, 86.5 %(45/52) 73.1% (38/52), 92.3(48/52), 38.5 %(20/52) and 53.8% (28/52) of the respondents, respectively. But, none of the participants believed the curability of onchocerciasis. All respondents/their families have practice of bathing in rivers. There was no reported preventive practice mentioned by respondents towards onchocerciasis. (Table: 8)

Table 8: Attitude and practice towards onchocerciasis among respondents along Colombo River, Gomma district, Jimma zone, South west Ethiopia, (2012)

Variables	Frequency	Percentage
onchocerciasis is Seriousness disease		
Disagree	6	11.5%
Undecided	1	1.9%
Agree	45	86.5%
Disfiguring disease		
Disagree	11	21.2%
Undecided	3	5.8%
Agree	38	73.1%
Onchocerciasis is treatable		
Disagree	2	3.8%
Undecided	2	3.8%
Agree	48	92.3%
Onchocerciasis is curable		
Disagree	14	26.9%
Undecided	38	73.1%
Agree	0	0%
Onchocerciasis prevention is possible		
Disagree	8	15.4%
Undecided	24	46.2%
Agree	20	38.5%
The role of community is important		
Disagree	4	7.7%
Undecided	20	38.5%
Agree	28	53.8%
Practice towards preventive measures		
Yes	1	1.9%
No	51	98.1%
Using health facility for onchocerciasis		
Yes	3	5.8%
No	49	94.2%
Use modern medicine for onchocerciasis?		
Yes	2	1.9%
No	50	98.1%
Do you/your families have any practice to wear protective clothes during daily outdoor activities?		
Yes	1	1.9
No	51	98.1
You/your families use river for bathing/washing		
Yes	52	100%
No	0	0%

Chapter Six: Discussion

In Ethiopia, several studies on the epidemiology of onchocerciasis were undertaken in different regions and majorities of the burden reported from Southwest and North West bordering Sudan. The current study was aimed at shedding light on the epidemiology of onchocerciasisis among inhabitants closed to Ivermectin intervened area in Southwester Ethiopia.

The overall prevalence of *O.volvulus* among inhabitants along Colombo River was 22.5% and according to WHO onchocerciasis endemicity classification the area could be classified as mesoendemic for onchocerciasis. The MFCR in the area was less than the study conducted in Nigeria by house to house census based on the skin snip positivity, where overall prevalence rate of infection was 47.5%. Long time endemicity of onchocerciasis in Nigeria (40% of the burden of onchocerciasis in Africa) and the strain of parasite might be attributable to higher prevalence of the disease in the mentioned study [35].

In parasitological and clinical studies in Southwestern Sudan, 94% (189/202) were positive for microfilariae of *O. volvulus* and microfilarial intensities ranging up to 1,094 mf/mg of skin. The high prevalence rate in the mentioned study might be due to the strain of *O.volvulus* that is similar to the West African strain that has high transmission potential [37].

Higher MFCR was also reported from different epidemiological studies undertaken in Ethiopia than current study .In the study conducted among coffee plantation workers in Teppi , Southwestern Ethiopia , the prevalence rate of onchocerciasis was 82.7% and similar studies among the Nilotic people residing along the southern banks of the Blue Nile River, prevalence was 81%. Moreover another reports among Teppi coffee plantation farm workers , the skin mf carrier rate was 77.6% and similarly higher prevalence rate of onchocerciasis (74.8%) was reported from West Wellega [8, 39-41]. The lower prevalence rate of onchocerciasis in our study area might be due to the intervention measures in adjacent villages close to our study area for the last eight years and the high population density in coffee plantation area attributable for high prevalence rates in the areas.

The MFCR along Colombo River was almost consistent with the MFCR that was reported from the clinico-epidemiological and entomological study of onchocerciasis from Bure area,

Illubabor Southwestern Ethiopia. The similar epidemiology of onchocerciasis might be due to ecological and parasitic strain similarities [44].

Moreover, the MFCR in our study area was higher than other studies from Northwestern Ethiopia, the microfilaria and nodule carriers rate 19.5% and 1.5% respectively and the Gilgel Gihbe River Valley, southwester Ethiopia , the prevalence rate was low (17%). Similarly among secondary schools in Kafa zone, Southwestern Ethiopia, the overall MFCR was 15.6% [45-46, 48]. The lower MFCR in the mentioned three studies might be due to the absence of hyperendemic villages closed to the studied area and in case of school study; students spent most of their time inside the home and less likely to be infected by *Simulium*. Moreover, our study area was coffee farming, rich in bush and shade, with heavy rainfall and numerous rivers that were ideal for vector breeding and transmission of the infective stages [53].

Along Colombo River, the prevalence of *O.volvulus* infection in males and females was 26.6% and 17.6 % respectively. This figure is comparable with two Nigerian studies ; males had a higher prevalence (27.5%) of onchocerciasis than females (20%) [35] and males had higher prevalence of *O. volvulus* (19.6%) than females (18.3 %) [56]. Almost in all onchocerciasis epidemiological studies, males were more afflicted than the female counter parts possibly associated with occupational/behavioral risk factors attributable to males [41, 45, 47].

Age has significant association with onchocerciasis (P= 000) and as the age of the study subjects increased, the risk of infection had also increased due to high exposure time for bite of *Simulium* species. Similar findings was reported from West Wellega, Western Ethiopia [41].

There was a significant association between occupation and prevalence of onchocerciasis in our study community; farmers were (27.7%) (P=0.001) the most affected by the disease. The higher prevalence rate of onchocerciasis among farmers had also been reported from different endemic countries where farming was the major occupation [41, 46, 57] because farmers could be highly engaged in outdoor activities in proximity to the breeding sites of blackflies. Similar trends of prevalence rate of onchocerciasis were reported among farmers from different regions in Ethiopia [43-44, 58].

In our study, low proportions of students were affected than farmers and house wives , that might be due long period of indoor stay in schools and home [48].

Duration of residence has significant association with onchocerciasis infection (P=0.000) and study participants who lived long in the study villages had higher risk of infection and similar findings was reported from West wellega [41] .Even though age, sex, occupation ,educational status and duration of stay in the village had significant association with *O.volvulus* infection in bivariate analysis ,only duration of stay in the villages was shown to be independent predictor .

The microfilariae density in the community ranged from 0.00 to 160.00 per mg of skin snip. The CMFL was 2.70 in the community and the CMFL for males and females age ≥ 20 years was 2.12 and 3.31, respectively. Our findings were much lower than similar studies [45, 46, and 48]. These variations might be due to intervention measures adjacent to our study villages or the hyper endemicity of onchocerciasis in those communities with higher CMFL.

In our study, the overall prevalence of OSD was 29.80 % (131/440) and the prevalence for male and female was 36.93% and 21.11%%, respectively. The pervasiveness of OSD in our study was lower than similar studies conducted in Nigeria [56] . High proportions of leopard skin in the Nigerian study might be due to long time endemicity of onchocerciasis in that community and relatively high proportion of pruritic manifestation in our setting might be the recent distribution of the disease from neighboring endemic foci.

The OSD in our study was lower than similar reports from Anfillo district West Wellega, Western Ethiopia .In the mentioned study the clinical spectrum of the surveyed population for Pruritis, leopard skin, onchocercomata and hanging groin was , 64.27 %, 18.94 %, 12.12 %, 2.51% respectively [41]. Even though NCR used as RAM for the endemicity of onchocerciasis according to WHO, the prevalence in our studied community was only 3.6% and it was difficult to measure endemicity level in our setup by using nodule palpation (NCR) .There are similar reports from other onchocerciasis studies in Ethiopia [41, 46, 58].

Among 440 interviewed subjects, 388(88.2%) didn't hear about the onchocerciasis by its local name "Ankoo". Even though few participants heard about onchocerciasis, they might had low knowledge about the nature, the causative agent and the ways of transmission of the disease.

Only 16.4% of the respondents knew the vector (blackfly), but there was lack of knowledge about biting time, the breeding site, activities that expose to blackfly bite. Of few participants who heard about onchocerciasis before, none of the respondents recognized the curability of onchocerciasis. Moreover no respondent mentioned preventive practice in the community towards onchocerciasis. Similar findings were reported from studies conducted in Nigeria , only 3% of the respondents knew that onchocerciasis was caused by *Simulium* bites. The knowledge of breeding site of the vector was also poor. None of the participants mentioned the fast flowing river as breeding ground of black flies [50].

According to studies conducted in the endemic area of Ethiopia , although the majority of respondents had awareness, sizable proportion still had misconceptions and misunderstandings about causes, transmission, prevention and control of onchocerciasis [20]. Misconception about modes of transmission was reported in another study from Bebeka, Southwestern Ethiopia. In mentioned study only 10% of the respondents cited that black fly breeding in fast flowing rivers and streams as a cause for the transmission. Even though our study area adjacent to hyperendemic villages, the KAP status of the inhabitants was lower than any similar studies undertaken in different parts Ethiopia[29].

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

Conclusions

Assessing the epidemiology of onchocerciasis in communities adjacent to intervened areas is very crucial for onchocerciasis elimination strategy.

The overall prevalence of onchocerciasis among study participants along Colombo River by using MFCR was at mesoendemic level and its distribution higher among males than females.

The overall prevalence of OSD among inhabitants along Colombo River was high and the prevalence among males higher than females.

The CMFL was low in the study area when we compare with other studies undertaken in endemic areas and higher in males study participants

Even though there was significant association between *O.volvulus* infection age, sex, education, occupation and duration of stay in the community, only duration of stay in the study area become the independent predictor of the infection.

High proportions of interviewed participants didn't hear onchocerciasis before by its local name and there was poor knowledge, attitude and practice towards onchocerciasis.

Recommendations

- Since onchocerciasis is mesoendemic in the study area, Jimma zone health office, Oromia regional health bureau, federal minister of health and WHO (APOC) should include implementation of MDA in the study area.
- Regional health bureau and zonal health office onchocerciasis program coordinators should apply integrated vector management towards the blackfly (*Simulium*).
- Since the ecology of Gomma district is conducive for the breeding of the black fly and bordered by hyperendemic district, further large scale studies should be carried by researchers in the remaining kebeles close to endemic area.
- Even though the prevalence of microfilaria relatively high, there was low level of nodule carrier rate in the study area, therefore researcher should further study the strain of *O.volvulus* and the species of the vector in the community.
- Since the major proportions of the population had poor KAP, appropriate health information regarding the nature onchocerciasis, cause, and ways of transmission, prevention and control measures should be given to the communities at risk by nearby health facilities.

REFERENCES

1. Richards F, *et al.* Control of onchocerciasis today: status and challenges. *Trends in Parasitology* 2001;**17**(12): 558-563.
2. Burnham G. Onchocerciasis. *Lancet* 1998;**351**(9112): 1341.
3. Plaisier A, *et al.* The reproductive lifespan of *Onchocerca volvulus* in West African savanna. *Acta Tropica* 1991;**48**(4): 271-284.
4. Etya'ale D. Vision 2020: update on onchocerciasis. *Community Eye Health* 2001; **14**(38): 19.
5. Molyneux D and Davies J. Onchocerciasis control: moving towards the millennium. *Parasitology Today* 1997;**13**(11): 418-425.
6. Remme J, *et al*. Tropical diseases targeted for elimination: Chagas disease, lymphatic filariasis, onchocerciasis, and leprosy. *A custom publication of the Disease Control Priorities Project* 2006;**147**.
7. Hotez P, *et al*. Control of neglected tropical diseases. *New England Journal Of Medicine* 2007;**357**(10): 1018-1027.
8. Workneh W, Fletcher M and Olwit G. Onchocerciasis in field workers at Baya Farm, Teppi Coffee Plantation Project, southwestern Ethiopia: prevalence and impact on productivity. *Acta Tropica* 1993;**54**(2): 89-97.
9. Blanks J , *et al*. The Onchocerciasis Elimination Program for the Americas: a history of partnership. *Revista Panamericana de Salud Pública* 1998;**3**(6): 367-374.
10. Etya'alé D. Eliminating onchocerciasis as a public health problem: the beginning of the end. B*ritish Journal of Ophthalmology* 2002;**86**(8): 844-846.
11. Boatin B , *et al*. Diagnostics in onchocerciasis: future challenges. *Annals Of Tropical Medicine And Parasitology* 1998;**92**(1): 41-45.
12. Ramaiah K , *et al.* Treatment costs and loss of work time to individuals with chronic lymphatic filariasis in rural communities in south India. *Tropical Medicine & International Health* 1999;**4**(1): 19-25.
13. Hagan M. Onchocercal dermatitis: clinical impact. *Annals Of Tropical Medicine And Parasitology* 1998;**92**(1): 85-96.

14. Somo R , *et al*. A community-based trial of ivermectin for onchocerciasis control in the forest of southwestern Cameroon: clinical and parasitologic findings after three treatments. *The American Journal Of Tropical Medicine And Hygiene* 1993;**48**(1): 9.
15. Whitworth J, *et al.* A community trial of ivermectin for onchocerciasis in Sierra Leone: clinical and parasitological responses to the initial dose. *Transactions Of The Royal Society Of Tropical Medicine and Hygiene* 1991;**85**(1): 92-96.
16. Remme J , *et al.* A community trial of ivermectin in the onchocerciasis focus of Asubende, Ghana: Effect on the microfilarial reservoir and the transmission of Onchocerca volvulus. *Tropical medicine and parasitology* 1989;**40**(3): 367.
17. Manafa O and Isamah A. Local knowledge and attitudes about onchocerciasis in Oji-River local government area of Enugu State, Nigeria. *Epidemiology and infection* 2002; **129**(3): 629-633.
18. Bradley A. Effects of onchocerciasis on settlement in the Middle Hawal Valley, Nigeria. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 1976;**70**(3): 225-229.
19. Richards F, *et al.* Knowledge, attitudes and perceptions (KAP) of onchocerciasis: A survey among residents in an endemic area in Guatemala targeted for mass chemotherapy with ivermectin. *Social Science & Medicine* 1991;**32**(11): 1275-1281.
20. Basanez M and Ricardez-Esquinca J .Models for the population biology and control of human onchocerciasis. *Trends in Parasitology* 2001;**17**(9): 430-438.
21. Moran M, *et al.* Neglected disease research and development: how much are we really spending? *PLoS medicine* 2009;**6**(2).
22. Nwoke B. The socio-economic aspects of human onchocerciasis in Africa: present appraisal. *Journal Of Hygiene, Epidemiology, Microbiology, And Immunology* 1990;**34**(1): 37.
23. Okulicz J, *et al.* Cutaneous onchocercoma. *International Journal Of Dermatology* 2004; **43**(3): 170-172.
24. Connor D and Palmieri J. Blackfly bites, onchocerciasis and leopard skin. T*ransactions Of the Royal Society Of Tropical Medicine and Hygiene* 1985;**79**(3): 415.
25. Hopkins D, Richards F and Katabarwa M. Whither onchocerciasis control in Africa? *The American Journal Of Tropical Medicine and Hygiene* 2005;**72**(1): 1-2.

26. Benton B. Economic impact of onchocerciasis through the African Programme Onchocerciasis Control: control for an overview. *Annals Of Tropical Medicine And Parasitology,* 1998. **92**(1):33-39.

27. Osei-Atweneboana M , *et al*., Prevalence and intensity of Onchocerca volvulus infection and efficacy of ivermectin in endemic communities in Ghana: a two-phase epidemiological study. *The Lancet*, 2007. **369**(9578):2021-2029.

28. Karunamoorthi K, Kassa E and Endale A. Knowledge and beliefs about onchocerciasis among rural inhabitants in an endemic area of Ethiopia. *International Health* 2008; **2**(1): 59-64.

29. Yirga D , *et al*. knowledge and belief about cause and prevention of onchocerciasis in Bebeka, Southwest Ethiopia. *Ethiop Journal of Health Sciences* 2008;**18**(3).

30. Oluwasola A, Oluwasola D and Osungbade K. Onchocerciasis as a public health perspective. *African Journal of Clinical and Experimental Microbiology* 2004;**5**(2):165-172.

31. Hoerauf A, *et al*. Onchocerciasis. *British Medical Journal* 2003;**326**(7382): 207-210.

32. Whitworth J, *et al.* A community trial of ivermectin for onchocerciasis in Sierra Leone: adverse reactions after the first five treatment rounds. *Transactions Of The Royal Society Of Tropical Medicine and Hygiene* 1991;**85**(4): 501-505.

33. Mackenzie C, Geary T and Gerlach J. Possible pathogenic pathways in the adverse clinical events seen following ivermectin administration to onchocerciasis patients. *Filaria Journal* 2003; **2**(1): 5.

34. Carabin H, *et al.* Prediction of community prevalence of human onchocerciasis in the Amazonian onchocerciasis focus: Bayesian approach. *Bulletin of the World Health Organization* 2003;**81**(7): 482-490.

35. Wogu M and Okaka C. Prevalence and socio-economic effects of onchocerciasis in Okpuje, Owan West Local Government Area, Edo State, Nigeria. *International Journal of Biomedical & Health Science* 2008;**4**(3).

36. Innocent O, *et al.* Epidemiology of human onchocerciasis among farmers in Ebonyi State, Nigeria. *International Journal of Medicine and Medical Sciences* 2010;**2**(8): 246-250.

37. Mackenzie C , *et al*. Onchocerciasis in southwestern Sudan: parasitological and clinical characteristics. *The American Journal Of Tropical Medicine And Hygiene* 1987; **36**(2): 371.

38. Rasheed M. Onchocerciasis in Different Regions of Ethiopia. *The International Journal of Parasitic Diseases* 2007;**1**(2).

49. Jira C. Prevalence of onchocerciasis in Blue Nile valley of western Ethiopia. *Indian Journal of Public Health* 1993;**37**(4): 135.

40. Hailu A , *et al*. Prevalence of onchocercal skin disease and infection among workers of coffee plantation farms in Teppi, southwestern Ethiopia. *Ethiopian Journal of Health Sciences* 2002;**40**(3): 259.

41. Dori G , *et al.* Parasitological and clinico-epidemiological features of onchocerciasis in West Wellega, Ethiopia. *Journal of Parasitic Diseases* 2011:1-9.

42. Gundersen S, Schmitt-Lechner A and Bjorvatn B. Onchocerciasis in the Blue Nile Valley of western Ethiopia. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 1988;**82**(1): 122-127.

43. Taticheff S, *et al*. Onchocerciasis: a prevalence study in Bebeka, Ethiopia. *Tropical Medicine and Parasitology* 1987;**38**(4): 279-282.

44. Yeneneh H, Mengistu F and Ayele T. A multidisciplinary study of onchocerciasis in Bure area, Ethiopia. *Ethiopian Journal of Health Sciences* 1989;**27**(3): 121.

45. Zein Z. The epidemiology of onchocerciasis in Northwestern Ethiopia. *Tropical And Geographical Medicine* 1986;**38**(1): 33.

46. Taye A, Gebre-Michael T and Taticheff S. Onchocerciasis in Gilgel Ghibe River valley Southwest Ethiopia. *East African Medical Journal* 2009;**77**(2).

47. Mengistu G, Balcha F and Britton S. Clinical presentation of onchocerciasis among indigenous and migrant farmers in southwest Ethiopia. *East African Medical Journal,* 1999; **76**(11): 635.

48. Argaw H. Onchocerciasis among school children in Kafa, South West Ethiopia. *Ethiopian Journal of Health Sciences* 1999; **37**(4): 223.

49. Awolola T ,*et al*. Knowledge and beliefs about causes, transmission, treatment and control of human onchocerciasis in rural communities in south western Nigeria. *Acta Tropica* 2000;**76**(3): 247-251.

50. Wogu M and Okaka C. The knowledge, attitude and perception of onchocerciasis and ivermectin treatment by the people in Okpuje, Edo State, Nigeria. *International Journal Of Biomedical & Health Sciences* 2008; **4**(3).

51. Karunamoorthi K, Kassa E and Endale A. Knowledge and beliefs about onchocerciasis among rural inhabitants in an endemic area of Ethiopia. *International Health 2008;* **2**(1): 59-64.

52. Kebede Y, *et al*. Environmental impact of coffee processing effluent on the ecological integrity of rivers found in Gomma woreda of Jimma zone, Ethiopia. *Ecohydrology & Hydrobiology* 2010;**10**(2): 259-270.

53. Kasiulevičius V, *et al*. Sample size calculation in epidemiological studies. *Gerantologija* 2006;**7**(4): 225-231.

54. Anosike J and Onwuliri C. Studies on filariasis in Bauchi State, Nigeria. I: Endemicity of human onchocerciasis in Ningi Local Government area. *Annals of Tropical Medicine and Parasitology* 1995;**89**(1): 31-38.

55. Okoye I and Onwuliri C. Epidemiology and psycho-social aspects of onchocercal skin diseases in northeastern Nigeria. *Filaria Journal* 2007;**6**(1):15.

56. Akinboye D , *et al*. Onchocerciasis among inhabitants of Ibarapa local government community of Oyo state, Nigeria. *Biomedical Research* 2009;**21**(2): 174-178.

57. Adugna N, *et al.* Assessment of the infection rate of onchocerciasis in the resettled and indigenous communities of Asossa Western Ethiopia. *Ethiopian Journal Of Health Development* 1996;**10**: 89-96.

Annex I: Sociodemograpic Characteristics of inhabitants along Colombo River

SN	QUESTIONS	RESPONSE CODE
101	Sex	Male…….. ……1 Female……2
102	Age	…….....1
103	Household size	……..……..1
104	Ethnicity	Oromo ……..…… …1 Amhara ……..…….....2 Gurage ……..…….....3 Others……..4
105	Religion	Muslim ……..... ...1 Ortodox…….…….....2 Protestant……3 Others…… …….....4
106	Educational status	Illiterate……..…….....1 Read and write……..…….....2 Grade 1-4 completed...…….……3 Grade 5-8 completed...……..……..…. …4 Grade 9-12 completed…….5 College/University completed ……..…..……6 Other specify ……..…..7
107	Occupation	Farmer ……..1 Private business…….……2 Civil servant…….……3 Housewife……..4 Daily laborer……...5 Student……...6 Unemployed……..……7 Others (specify)……..……8
108 109	Distance from the river Duration of stay in the village	……. Km /minute …….....1 …….years

Anneexii I: Seenaa Jireenyaa Jiraatota Naannoo Laga Colombo

T.L	Gaaffii	Deebii Koodii
101	Saala	Dhi…….. …...1 Dha…….....2
102	Umurii	…….....1
103	Baay'ina maatii	……..……1
104	Sanyii	Oroomoo ……..……. .1 Amaaraa ……..…….....2 Guraagee ……..…….....3 Kan biraa adda baasii……...4
105	Amantaa	Muslima ……..... .1 Ortoodoksii…….....2 Pirootestanti.……3 Kan biroo yoo jiratee ibsi …….....4
106	Sadarkaa barnootaa	Kan hin barane…….....1 Barreessuu fi dubbisu…….....2 Kutaa 1-4 kan xumuree…….…….3 Kuta 5-8 kan xumuree……..……..…… ..4 Kuta 9-12 kan xumure…….5 Kooleejii/uniiversitii kan xumuree……..…..……...6 Kan biraa adda baasii …….....7
107	Hojii	Qotee bulaa…….……1 Hojii dhuunfaa…….……2 Hojjetaa mootummaa…….…3 Haadha-manaa…….…4 Dafqaan bulaa……..5 Barataa…….…6 Hojii dhabaa……..……..7 Kan biraa (adda baasi)…….8
108	Fageenya manni lagicha irraa qabu	…….kilo.metira/daqiiqaa ……1

Annex II: KAP towards Onchocerciasis among inhabitants along Colombo River

SN	QUESTIONS	RESPONSE CODE
201	Have you heard of onchocerciasis before?	Yes ……..1 No … ……2
202	If yes, what type of disease is it?	Skin disease……..1 Itching skin condition……...2 I don't know…….3 Others specify ……...4
203	What part of the body does the disease affect?	Skin……..……1 Leg…….……...2 Eye ……..…...3 Buttock…….4 Any part of the body…….5
204	What do you think the cause of onchocerciasis?	Blackly bit…….…….....1 Mosquito bites ……..……2 Farm works……...…..…3 Heredity…….……4 specify if others …….5
205	What could be the mode of transmission for onchocerciasis?	Black fly bite……..……1 Contact with infected person……...….2 Mosquito bite……....3 Fomite……...4 Dirty (polluted)water……....5 Heredity ……..6
206	How can you prevent onchocerciasis?	Isolation of sick person ……1 Use of drugs ……..2 Killing the blackflies ……3 Avoid contact with river……4 Wearing protective cloths……..5 If Others specify …….....6
207 208	What types of the treatment for onchocerciasis do you know? Do you know black fly before? ……..yes…….no	Use of herbs……1 Prayers……...2 Modern medicine……...3 Soaps……..……4 Others specify ……...5
209	Where could be the major biting site for blackly?	Farm ……..1 River side ……..2 Village ……...3 Any place…….……...4

		If others specify……..5
210	What is the common biting seasons for the black fly?	Dry season……..1 Wet season…….. ……..2 Both ……3
211	Which period of the day are the flies mostly found?	Morning hours……1 Afternoon hours……..2 Evening hours……..3 All of the above……..…….....4
212	Where do you think the breeding sites?	Tree holes ……1 Stagnant water ……...2 Flow water ……..3 Not known ……..4
213	Which groups of people do you believe are at greatest risk of onchocerciasis?	Infants……1 Young children……...2 School age children……....3 Adults……4 Pregnant women……5 Elderly people……6 All……7
214	What activities can expose the individuals for the bite of blackly?	Fetching ……1 Fishing ……..…....2 Bathing ……..3 Washing ……....4 All ……..5

S.N	Characteristics	Disagree	undecided	Agree
301	Onchocerciasis is a serious disease	1	2	3
302	Onchocerciasis is disfiguring disease	1	2	3
303	onchodermatitis treatable	1	2	3
304	Onchocerciasis is curable disease	1	2	3
305	Onchocerciasis can lead to death	1	2	3
306	Prevention of onchocerciasis possible	1	2	3
310	The role of community in controlling onchocerciasis important	1	2	3
S.N	Characteristics		YES	NO
401	Do you have any practice towards the preventive measure for onchocerciasis?		1	2
402	Did you /your family use health care facilities for onchocerciasisis?		1	2
403	Do you/your family use modern medicine for the treatment of onchocerciasis?		1	2
404	Do you /your family have any practice to wear protective cloth during daily outdoor activities?		1	2
405	Do you/your families use river for bathing /swimming?		4	5

Anneexii II: Beekumsa, Ilaalchaa Fi Shaakallii Inni/Isheen Onkoosarkiyasis

T.L	Gaaffii	Deebii Koodii
201	Kanaan dura waa'ee dhukubaa onkoo dhagesse beekta?	Eeyee ……1 Miti…. ……...2
202	Yoo dhageesseta ta'e dhukkuba gosa akkamiiti?	Dhukkuba gogaa……1 Kan nafa hooksisu……...2 Hin beeku……3 Kan biraa adda baasii……..4
203	Dhukkubichi nafa keenya keessaa kamiin miidha?	Gogaa……..1 Miilla……...2 Ija……3 Naannoo teesumaa keenyaa…….....4 Qaama kamiyyuu(hunda)……....5
204	Sababii ka'umsii onkoo maalii?	Titiisa gurrachan hiddamuu……...1 Bookeebusa……2 Hojii qonnaa……...3 Sanyiidhaan……....4 Kan biraa adda baasii…….5
205	Akkaataan dadarbii dhibee onkoo maali?	Titiisa gurrachan(blackfly) hiddamuu……1 Walitti dhufeenya nama dhibee kanaan qabame.…2 Bookee busaan hiddamuu……..…….3 Moofaa ciccitaadhaan……..……...4 Bishaan xura'aan…….……5 Sanyiidhaan…….6

206	Dhukkubni onkoo akkaamiin ittisuun danda'ama?	Dhukkuba kan qabu adda baasuun……..……...1 Qorricha (dawaa) fayyadamu……..…… 2 Titiisa gurracha (blackfly) ajjeesuu…….3 Bishaan xuquu dhiisu……..4 Huccuu ittisu uffachuu……5 Kan biraa ibsii…….6
207	Dawaa /qoricha dhukkuba onko kan akkamii beekta?	Qoricha / dawaa aadaa fayyadamuu…… 1 Kadhannaa……..2 Dawaa jabanaa…….…… 3 Samunaa…….4 Kan biraa ibsii…….5
208	Eessatti yeroo baay'ee titiisi gurrachii nama hidda?	Bakka qonnaa……..……1 Qarqara lagaa…….……2 Naannoo qe'ee…….3 Bakka hunda……4 Kan biraa ibsii……...……..5
209	Waqtii akkamiitti titiisni gurrachii nama hidda?	Bona ……...……1 Ganna…….……2 Lamaanuu……...…….3
210	Titisni gurraachii yeroo yeroo kami baayyatu?	Ganama……..……1 Guyyaa……..……..2 Galgala……..…….3 Hunduma……..……..4
211	Iddoon wal hormaata titiisa gurraachaa eessa jettee yaadda?	Holqa muka keessaa……1 Bishaan ciisaa……..……2 Bishaan yaa'uu……3 Hin beekamu……...…….4
212	Onkoon warra umurrii meqa meeqaa midhuu danda'aa?	Araasii…….1 Da'iimmoota……...2 Ijoollee umuurin isaani barumsaaf ga'aan…….…3 Nama guddaa……...……...4 Nitii ulfaa……...…….5 Jaarsoota…….……6 Hunduuma……..……7
213	Hojii akkamituu kan namoota titiisa gurrachaan hiddamuuf saaxila baasuu?	Bishaan waraabu…….1 Qurxummii qabu…….2 Nafa dhiqachuu…….……..3 Uffata/huccuu miccuu……..…..……4 Hundinuu ta'uu danda'a…….……5

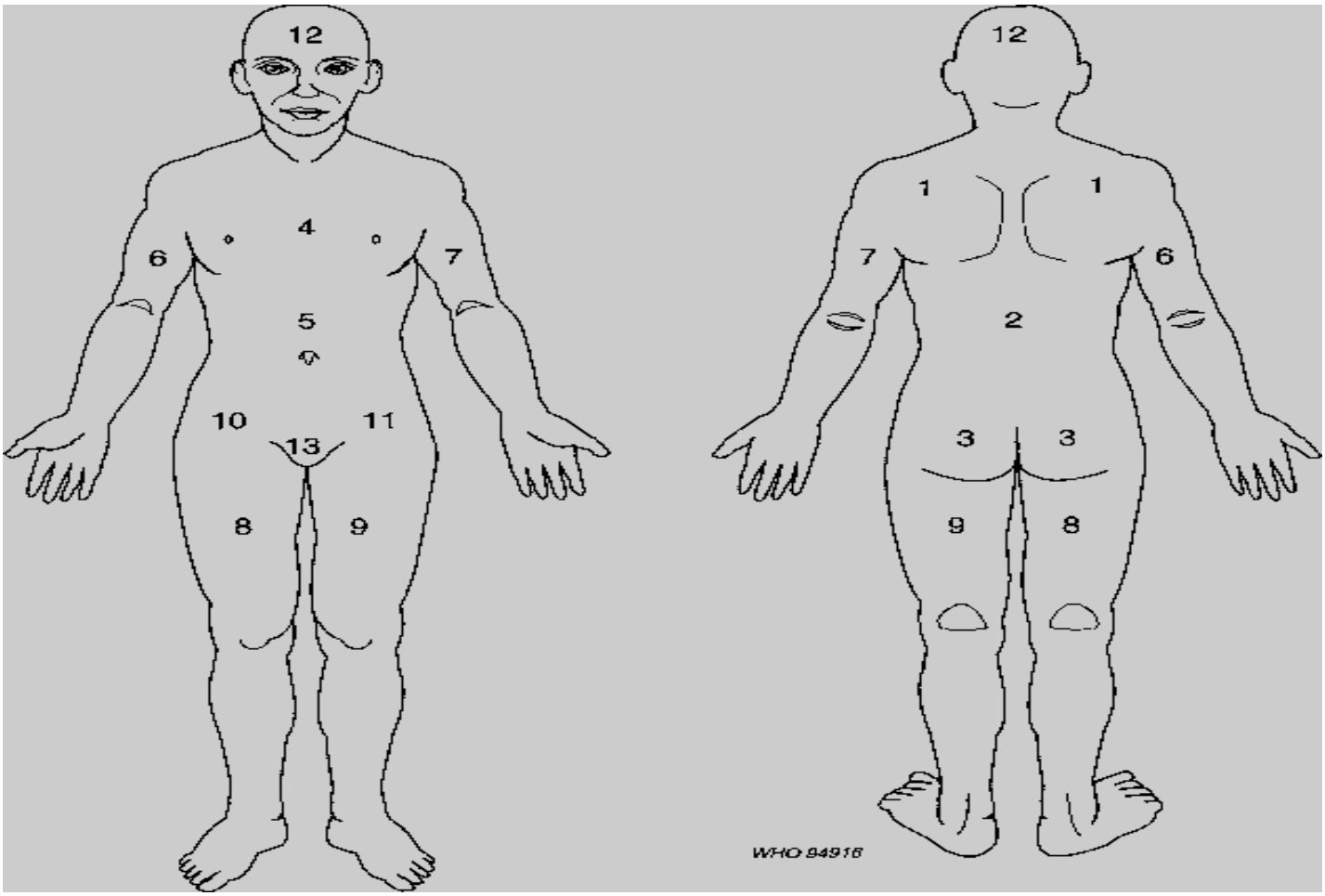
T.L	Ulaagaa	Ni morma	Kan hin murtoofne	Itti waligala
301	Onkoon dhukkuba ciimaa dha	1	2	3
302	Onkoon dhukkuba fuula namaa garmalee balleessuudha	1	2	3
303	Onkoon akkamachuun nibada	1	2	3
304	Onkoon dhukkuba fayyuun danda'amuudha	1	2	3
305	Onkoon dhukkuba nama ajjeesuu danda'udha	1	2	3
306	Onkoo ittisuun ni danda'ama	1	2	3
307	Titiisa gurraachaan hiddamuun ka'umsa onkooti	1	2	3
308	Onkoon nama dhukkuba irraa gara isa fayyaatti ni darba	1	2	3
309	Dalagaa naannoo bishaan itti dalaganu onkoon qabamuuf saaxila nama baasa	1	2	3
310	Ga'een uummata onkoo ittisuu keessatti murtessaadha	1	2	3

	Ulaagaa	Eeyee	Hi'iyyoo
401	Kanaan duura onkoo ittisuuf shakaala goote qabdaa?	1	2
402	Ati/maatiin onkoodhaaf mana yaalaa dhaqxanii beektuu?	1	2
403	Ati /maatiin kee qorricha ammayaa fayyadamtanii beektuu onkoo yaalaamuudhaaf?	1	2
404	Ati /maatiin kee yeroo hojii guyyaa hojjetaan huccuu akka titiisa gurraachi akka nama hin hiddine ittisu ufattanii beektuu?	1	2
405	Ati/maatiin kee bishaan gurguddaa nafa dhiqachuu/daakkuuf fayyadamtanii beektuu	4	5

Annex III: Clinical Classification of Onchocerciasis

1. One or both shoulders
2. Back;
3. One or both buttocks;
4. Anterior chest;
5. Abdomen;
6. Right arm;
7. left arm;
8. right leg;
9. left leg;
10. right groin;
11. left groin;
12. head and neck;
13. Perineum.

Body map showing anatomical sites for use in distribution of cutaneous changes of onchocerciasis



Acute papular onchodermatitis (APOD)

General description: Acute papular onchodermatitis consists of small, widely scattered pruritic papules which progress to vesicles and pustules in more severe cases. Erythema and oedema of the skin may also be present, affecting a single limb or area of the trunk or face. Oedema of a limb with the papular eruption accentuated on that limb may be seen. A similar clinical pattern is seen post-dosing with antimicrofilarial drugs such as diethylcarbamazine or ivermectin. APOD may also develop in an individual from an area non-endemic for onchocerciasis after visiting an endemic area.

Grade	Clinical features
Severity grading	0=AOD absent
	1=APOD present
small 1-3-mm-diameter solid scattered papules *and*	
lesions itchy	

Chronic papular onchodermatitis (CPOD)

General description: The skin lesions are scattered flat-topped papules which vary greatly in size (from approximately 3 to 9 mm in diameter) and height above the skin surface (some lesions are almost macular, others are elevated up to 5 mm). Itching occurs in some lesions but is not a constant feature. Post-inflammatory hyperpigmentation is characteristic. Individuals with this type of skin disease may also have acute lesions and other changes due to onchocerciasis. Sites of predilection: buttocks, waist area, shoulders or elsewhere.

Severity grading	
CPOD absent	
CPOD present	
papules larger than those in APOD but variable in size and height and often flat-topped *and*	
lesions itchy (except in late resolving stage) *and*	
eruption hyperpigmented compared with surrounding skin and macular areas of post-inflammatory hyperpigmentation common	

0	CPOD absent
1	Only one anatomical site involved (e.g. buttocks)
2	More than one anatomical site involved (e.g. buttocks and Shoulders)

Absolute criteria for CPOD = (a + (b) + c)

Atrophy (ATR)

General description*:* Atrophic skin adopts many of the characteristics of aging, such as loss of elasticity and contours, and the skin appears excessively wrinkled. Hairs may be lost and sweating in affected areas is reduced. In order to avoid confusion with senile atrophy, ATR is only scored as a significant abnormality in individuals aged less than 50 years.

Sites of predilection: buttocks, less commonly limbs. Atrophy is recorded as present or absent.

Severity grading

0

1 ATR absent ATR present

skin appears wrinkled and dry *and*

when the edge of a finger is pushed firmly along the skin, many additional fine wrinkles appear on the surface

skin is easily lifted in certain sites between the thumb and forefinger; it returns to the normal position slowly on release

there is usually no itching

small wounds and cuts may bleed for a long time and heal slowly

the skin appears prematurely aged in younger persons

Distribution grading

0 ATR absent

1 Only one anatomical site involved (e.g. buttocks)

2 More than one anatomical site involved (e.g. buttocks and legs)

Absolute criteria for ATR = (a + b)

Depigmentation (DPM)

General description*:* Onchocercal depigmentation is often described as "leopard skin". Patches of complete pigment loss are seen, with islands or "spots" of normally pigmented skin centered on hair follicles. The surrounding areas of skin may be normal or hyperpigmented. Lesions are rarely itchy and are flat or slightly depressed. Sometimes the skin is not fully depigmented and is

seen as yellow-brown areas on black skin. Such lesions may represent early or incomplete depigmentation. Sites of predilection: shins, less commonly lateral groins, lower abdomen.

Severity grading

	DPM absent
1	DPM present

areas of incomplete pigment loss with islands or "spots" of normally pigmented skin centered around hair follicles

areas of complete pigment loss with islands or "spots" of normally pigmented skin centered around hair follicles

absence of itching

Distribution grading

0 DPM absent

1 Only one anatomical site involved (e.g. one shin)

2 More than one anatomical site involved (e.g. both shins)

Absolute criterion for DPM = (a) or (b)

The following changes associated with onchocercal skin disease may also be recorded simply as follows:

Palpable onchocercal nodules

0 Nodules absent

1 Nodules present

N.B. The site of the nodules may be documented on a diagram, with each point representing a single nodule or single cluster of adjoining nodules. If desired, the location of nodules may be recorded for computer entry by noting the number of discrete nodules or discrete nodule masses for each of the following anatomical sites: head, neck, right arm, left arm, upper trunk (above umbilicus), right axilla, left axilla, lower trunk (below umbilicus), right iliac crest, left iliac crest, right trochanter, left trochanter, right groin, left groin, right buttock, left buttock, sacrum, right knee, left knee, right ankle, left ankle, right foot and left foot.

Lymphadenopathy

0 Lymph nodes not greater than 1 cm diameter

1 Lymph nodes greater than 1 cm diameter, non-tender

2 Lymph nodes greater than 1 cm diameter, tender

N.B. The site of lymphadenopathy may be specified if desired.

Hanging groin (HG)

Hanging groin(s) are unilateral or bilateral folds of skin present in the inguinal region. These are inelastic and may contain enlarged lymph nodes.

0. HG absent

1. Early HG with inguinal or femoral lymph nodes grossly protuberant

2. HG present, with loose, redundant folds of atrophic skin

+/- palpable inguinal or femoral lymph nodes

Lymphoedema (LYM)

0 LYM absent

1 LYM of limb present

2 LYM of the external genitalia present

Annex IV: Parasitological Examination of Onchocerciasis

Two skin snips from gluteal folds was collected from each study subjects following standard operating procedure and after cleaning the site with antiseptics, using sterile blade razors. Each skin snip was weighed by highly sensitive analytical balance with the sensitivity of 0.1mg and the average weight was recorded. Then the skin snip was placed in Eppendorf tubes containing 100µl of physiological saline labeled with study subjects' identification number. Physiological saline enables the complete emergence of Mf from the skin snips. After 24 hrs incubation at room temperature, the skin snips was examined for the presence Mf and for the intensity of Mf. Mf was counted microscopically with low power objective and recorded on the prepared format. On completion of microscopic examination and count of Mf, each skin snip was allowed to be dry and fixed with alcohol. The number of Mf from each biopsy expressed as Mf per weight of the skin snips and the mean intensity was calculated for all positive skin snips. The geometric mean (intensity of infection) was calculated for all positive and negative subjects age greater than 20years by transforming in to logarithmic functions as log(X+1) used as a measure of CMFL. All 99 positive skin snips was stained with Giemsa staining solution to identify the Mf of *O. Volvulus* from morphologically similar Mf of other filaria like *Dipetalonemastreptocerca.*

Materials used: surgical blade, globe, alcohol, lancet, tissue forceps, normal saline, formaldehyde, Giemsa staining solution , Eppendorf tubes, pipette, pipette tips, microscopic slide, analytical balance, tissue paper, cotton,

Annex V: Consent Form

Consent form for participation as a volunteer in the research undertaking

Explanation on procedures and conditions of agreement

We are from Jimma University, college of public health and medical science. We are here to study the problem of the disease called onchocerciasis. The objective of the study is to know the extent of the problems associated with onchocerciasis in your community, and subsequently to help in the initiation of the control programs. We are asking you and others in this community to participate in this study. What we are asking everyone is to be examined for these diseases. Examination will involve physical and laboratory examinations. Laboratory examination will involve a tiny bit of skin snip from expected parts of your body. All samples will be collected using disposable blades and blood lancets. These procedures of sample collection are neither harmful nor experimental procedures. They are routine medical practices. However, if in case any problems arise during sample collection, we shall offer you the necessary medical interventions. If the diagnosis is confirmed, you will receive the necessary drug(s) from the control program that will commence soon after this study. In the end of the study, we plan to write a report about the results of the study. The reports will not bear any information relating to your personality e.g. your name, personal address or identity. We assure of the confidentiality of such information. If you have understood the explanation well enough, we are asking you to participate in this study. If you decide to volunteer, we kindly ask you to put your signature as illustrated below.

I, the undersigned, will like to confirm that, as I give consent to participate in this study, it is with a clear understanding and recognition of:

a. The objectives of the intended study, and

b. The procedures of diagnosis and treatment

I confirm that the proposal has been explained to me in the language I am fluent and conversant.

Name of participant/patient: _____Signature:_____

Date_____

Name of researcher: _____Signature_____

Date_____

Anneexii: V Guca Wadda

Nutti kan dhufne Jimma uniiverisitti koollejjii fayyaa hawaasa fi saayinsii meedikaala irraatti.Nutti kan asii dhufneef rakkina wa'ee dhukkuba Onkoosarkiyaas qorraachuudhaaf.Kaayyoon qorraanoo kana babal'ina fi walitti dhufeenya onkoosarkiyaas uummata kan kessaatti qabu baruudhaaf akkasumaas kaka'umsa sagaanta ittisaf godhamu gargaarudhaf. Nutti siif kanneen birra kan gaffanu akka isinii qorrana kan keessaatti hirmaatan.Kan nutti nama hunda gaffanu akka isini dhukkuba kanaf qorratamtaniidha.Qorraannoon isakan ofii keesaatti qabatuu ilaalcha qamaa fi laabratoriin yaalamuudha. Yaaliin laabratorii kan geggefamuu goga baay'isee xiqqoo ta'e naannnoo nafa keenya inni itti shakamuu irra kutuun fudhaachuun ta'a.Sampiliin hundii kan ittin fudhaamuu milaaccii steeriyilii fi lanseetii dhiigaa ergaa nama tokkoo fayyadamne bodaa gatamuun.Sampiliin nuttu fudhaanuu kun kan nama miidhuu ykn kan yaalii irraatti geggefamuu oso hin ta'ane kan dhukkuba onko qabachu fi dhisuu keessaan itti adda basanu qofadha.Haata'u iyyuu malee yoo rakkini isinii mudate yeroo sampilii funnanuu oggeesaa fayyattiin akka isinii ilaalmtani isini gargaara.Yoo dhukkuba kana qabachuun keessaan mirkana'e qorraanno kan booda qorricha(dawwaa) akka isiniin argataan tasifama dhabata saganta to'anoo fi ittisaa onkoottin.Dhumma qorraanoo kana irratti kaayyoon keenyaa waa'ee bu'a qorraanicha gabaasudha.Gabaasini bu'a qorraanoo kan odeeffanoo wa'ee enyumaa keetti kan ibsuu hin qabu.Fakkeenyaaf maqaa kee,nannoo kee kan ibsuu ykn eenyumaa kee kkf akka inni hin qabnee jala mure ofitti ammanmuumadhaan isin beeksisuu barbaadna.yoo atti barbaachisumaa fi ibsa isaa sirriiti hubaate akka atti qorraanna kan keesaatti hirmatu isini/sii gafaana.Yoo atti fedhii keen keessaatti hirmachuuf muteessite ta'e kan sii gaffanu akka atti mallattoo kee mallatesituu sii gafana akka kan gadii jirutti.

Anni kan armaan gaditti mallateesse,kan sii mirkaanessu barbaadu fedhii kootiin qorraanicha kessaatti hirmaachuu gutumma gutuutti hubadhee bu'a isaa wajj in innis:-

kaayyoon qorranichaa fi

adeemsaa qorraana fi yaalamuu isaa

Kan mirkaneeffachuu barbaadu proposaaliin kun afaan anni sirritti beekuun sirriitti jijjirame naf ibsamerra .

Maqaa hirmaata/dhukkubsata_____

Mallattoo_____Guyyaa_____

Maqaa abba qorraannoo geggeessu_____

Mallattoo_____ Guyyaa_____

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: Daniel Dana

Signature: _____

Name of the institution: Jimma University

Date of submission: _____

This thesis has been submitted for examination with my approval as University advisor

Name of the first advisor : Serkadis Debalke (MSc)

Signature: _____

Name of the second advisor: Delenasew Yewhalaw (PhD)

Signature: _____

Name of internal examiner: Endalew Zemene (MSc)

Signature: _____

Name of Department Head: Ahmed Zeinudin (Asst.Prof)

Signature: _____