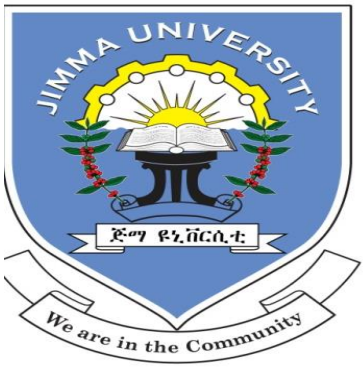
SOIL-TRANSMITTED HELMINTHS INFECTIONS AMONG HEALTH EXTENSION PROGRAM MODEL AND NON-MODEL HOUSEHOLDS OF SELECTED KEBELES OF SEKA CHEKORSA WOREDA, JIMMA ZONE, SOUTHWEST ETHIOPIA



BY:

GETACHEW TESHOME

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JIMMA UNIVERSITY
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BY:

GETACHEW TESHOME

ADVISORS: MR. YONAS ALEMU (BSc, MSc)
MR. TESHOME DEGEFA (MSc, PhD FELLOW)
MR. MITIKU BAJIRO (BSc, MSc)

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ABSTRACT

Background: *Soil-transmitted helminths (STHs) form one of the most important groups of infectious agents in causing a serious global health problem as a result of low standard of living, poor socioeconomic status, poor personal hygiene and poor environmental sanitation. Both individual and community perceptions, knowledge and attitudes of STHs infections and practices on their prevention and treatment are important factors. The provision of training by health extension workers (HEWs) scale up the community health.The households (HHs) use these lessons to make changes to their home and health care system and then become a model after graduating for meeting the requirements.*

Objective: *To assess Soil-transmitted helminths infections among Health extension program (HEP) model and non-model households of selected kebeles of Seka Chekorsa woreda, Jimma zone, southwest Ethiopia.*

Methods: *A community based comparative cross-sectional study was conducted from April to June 2018, by recruiting a total of 612 household members from 120 randomly selected HHs. Stool samples from each study participant and 153 soil samples were collected and examined microscopically using Kato Katz and Zinc Sulphate floatation techniques, respectively. Moreover, questionnaire was used to assess the risk factors associated with STHs infections and Knwledge Attitude and Practice (KAP) of the HHs. The data were entered; analysed using SPSS software version 20 and descriptive statistics was used to give a clear picture of study variables. Logistic regression was performed to determine the risk factors associated with STH infections. Statistical significance was considered at $P<0.05$ during the analysis.*

Result: *The overall prevalence of intestinal parasites was 34.3 %(n=210) while the prevalence of STHs was 32.2 %(n=197). Individuals living in the non-model HHs were six times more likely to be infected with at least one STH as compared to those living in the model HHs(OR=5.96, 95%CI; 3.74-9.52, $P<0.001$). The dominant STH was T.trichiura (21.6%) followed by A.lumbricoides (6.4%) and hookworms (2.1%).Prevalence was highest among the age group >15 years 106(31.6%). No significant difference interms of gender and age distribution ($P>0.05$) was observed. KAPs of HHs towards STHs had significant difference between model and non-model HHs (X^2 =40.35, $P<0.001$). The overall soil contamination rate was 12.4%. The dominant parasite observed was S.stercoralis followed by hookworm species with significant difference between model and non-model villages (X^2 =11.77, $p=0.038$).*

Conclusion and Recommendation: *STHs infections were health problem of non-model HHs than model one. HH status, KAP of HHs about STHs, hygiene related habit and environmental sanitations, and training on Health Service Extension Packages (HSEPs) was more likely contributed to this epidemiological factor. Therefore, there is a need to community based deworming, implementation of HSEPs, awareness creation and health education focusing on the different level of practices of study participants on preventive and control measures.*

Key words: *STHs, KAPs, model, non-model, Intensity, Prevalence*

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ACRONYMS AND ABBREVIATIONS

DALYs	Disability Adjusted Life Years
EPG	Eggs per gram of faeces
FMOH	Federal Ministry of Health
GOE	Government of Ethiopia
HEP's	Health extension programs
HEWs	Health Extension Workers
HHs	Households
HSEP	Health Services Extension Package
KAP	Knowledge, Attitude and Practice
MDA	Mass Drug Administratio
NTDs	Neglected Tropical Diseases
ODF	Open Defecation Free
SOP	Standard Operating Procedure
SSA	Sub-Saharan Africa
STH	Soil Transmitted Helminths
WHO	World Health Organization
YLD	Years Lived with Disability

CHAPTER ONE

1. INTRODUCTION

1.1. Background:

Soil-transmitted helminths (STHs) also known as geohelmiths are among the most common chronic infections worldwide mainly in low and middle income countries. These include roundworms (*Ascaris lumbricoides)*, whipworms (*Trichuris trichiura)* and hookworms (*Ancylostoma duodenale* and *Necator americanus*). The greatest numbers of STH infections occur in Sub-Saharan Africa (SSA), East Asia, China, India and South America(1).

Soil-transmitted helminths(STHs) are mainly transmitted when faeces containing eggs are deposited into the soil, develop to an infective stage and occur via ingestion or across the skin boundary, thus prevalence is highest in areas where hygiene is poor, safe water and sanitation facilities are lacking and health services are insufficient(2).

Despite their public-health importance, STHs remain largely neglected tropical diseases (NTDs). This neglect stems from three features: i)the people most affected are the world's most impoverished, particularly those who live on less than US$2 per day; ii) the infections cause chronic ill health and have insidious clinical presentation; iii)quantification of the effect of STH infections on economic development and education is difficult(3)

Soil contamination by STH is a problem that needs serious solution in the communities. People of all ages are at risk from STHs in regions where human excrement is used as fertilizer for crops. If an infected person defecates outside or if the faeces of an infected person are used as fertilizer, eggs are deposited on soil and need about 3 weeks to mature in the soil before they become infective. The type of soil and the depth at which the eggs are buried are said to influence the survival of the larvae within the egg shells. On the surface of the soil, the life-span is 21-29 days, at a depth of 1- 2cm one and half years and those at 4-6cm deep, two and half years(4).

The concentration of STHs eggs in soil can be very high depending on the sampling site especially in unsanitary environments or where open defecation is practiced. The sample size for soil is measured in dry weights, with sample sizes of 10- 50 g of dry soil. Samples mostly

represent the top 0–5 cm layer of the soil. The development of methods for the detection and quantification of STHs eggs in soil sample is crucial. Floatation achieves separation by creating a gravity gradient that allows particles of interest to float while heavier particles settle. Floatation solutions used includes Zinc sulphate, Magnesium sulphate, Sucrose solutions etc. Zinc sulphate gives a better recovery of STHs eggs(5).

Morbidity is related to the number of worms harboured. People with light infections usually have no symptoms while heavier infections can cause a range of symptoms including intestinal manifestations (diarrhoea and abdominal pain), general malaise and weakness, impaired cognitive and physical development. Hookworms cause chronic intestinal blood losses that can result in anaemia. Some STHs cause loss of appetite, reduction of nutritional intake and physical fitness(6).

Soil-transmitted helminths (STHs) infections are often referred to as being “over dispersed” in endemic communities, such that most individuals harbour just a few worms in their intestines, although a few hosts harbour disproportionately large worm burdens in an endemic area. There is also evidence of familial and household aggregation of infection, with the relative contribution of genetics and common household environment debated (2).

The prevalence and control of STH infections is intimately linked with water quality, sanitation, hygiene practices and socio-economic status in the affected areas. Control is achieved by targeted use of chemotherapy and improvement of sanitation, drinking water, use of pit-latrines instead of open defecation and good hygiene practices. World Health Organization (WHO) recommends periodic deworming (Albendazole 400mg and Mebendazole 500mg) of Mass Drug Administration (MDA) without previous individual diagnosis to all at risk people (preschool children, School age children, women of childbearing age (including pregnant women in the 2^{nd} and 3^{rd} trimesters and breastfeeding women) and adults in certain high-risk occupations such as tea-pickers or miners) living in endemic areas(7).

Sanitation is the best and most sustainable option for STH control and that improved sanitation addresses the underlying causes of many diseases of poverty. While adequate sanitation is an ideal long-term solution, therefore, well-designed, culturally sensitive sanitary

facilities, designed with an understanding of transmission patterns and that will be used regularly or exclusively, are required to realize the maximum benefit from improvements in sanitation(8).

Health education that is effective, targeted and simple is recommended as a first option to create the enabling environment for other strategies to thrive, especially in underprivileged communities. In the same vein, the participation of the community represents one of the cardinal tools of disease control programmes as improvements in the awareness and understanding can greatly increase the realization and sustainability of long-term STH control strategies. However, the success of control initiatives involving the community depends on the level of the communities uptake of the programme, which is linked to the understanding of the community knowledge, practices & perceptions towards the disease were found to be instrumental in designing & implementing effective community-based programmes(9)

The Health Extension Program (HEP) is one of the strategies adopted by the government of Ethiopia (GOE) with a view to achieving universal coverage of primary health care among its rural population in a context of limited resources. The overall goal of HEP is to create a healthy society and to reduce maternal and child morbidity and mortality rates. The HEP is a flagship program of GOE. It was launched by the Federal Ministry of Health in 2003 in the four big agrarian regions, and then expanded to pastoral communities' in 2006 and to urban area in 2009. This is a program that is deeply rooted in communities, providing primary level preventive activities to household members. The program encourages families to be responsible for their own health. The training package focuses mainly on the health behaviors such as hygiene and sanitation, accessing health services, family planning, infant feeding practices, and nutrition. In addition to community activities, HEP also provides health post–based basic services, including preventive health services and limited basic curative services such as first aid and treatment of malaria, intestinal parasites, and other ailments. Case referral to health centers is also provided when more complicated care is needed(10)

The objective of this study is to assess the prevalence & intensity infection of STHs with KAPs & soil contamination rate among Health extension program model & non-model households of selected kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.

1.2. Statement of the problem

Soil-transmitted helminths infections (STHs) are still prevalent and of public health concern. About one third of the world's population is currently infected with one or more species of intestinal helminths. Globally, about 819, 439, and 465 million people were infected with roundworms, hookworms, and whipworms, respectively. Globally, STHs cause the loss of 39 million disability-adjusted life years (DALYs) per year. About 4.94 million years lived with disability(YLDs) are attributable to STHs(11).

Soil-transmitted helminths are found throughout the tropics and subtropics wherever poverty and poor sanitation occur, about 2 billion people are infected with one or more STH species, and more than 4 billion are at risk of infection. Over 450 million, mostly children, suffer from significant morbidity; 44 million pregnant women suffer clinical effects from hookworm-associated anaemia, and the elderly also severely impacted. While rarely fatal, kills 135,000 people a year. The effects of worm infections on health including anaemia, delays in physical growth and cognition, decreased stamina and work output, and complications during pregnancy and the majority of these infections result from low standard of living, poor socioeconomic status, poor personal hygiene, and poor environmental sanitation(12).

In Ethiopia, numerous epidemiological surveys of STHs were conducted and varying infection rates were reported from different regions and communities. Unsafe and inadequate provision of water, unhygienic living conditions and unsanitary waste management allow intestinal parasites particularly STHs to flourish in various localities. So, helminthic infections are the second most predominant causes of outpatient morbidity in Ethiopia(13).

In Ethiopia, the low level of sanitation coverage and high prevalence of communicable diseases account for three quarters of all health problems and this underlines the importance of improving environmental hygiene and raising public awareness about hygienic practices. Widespread poverty, low education levels (especially among women), inadequate access to clean water and sanitation facilities and poor access to health services have contributed to the high burden of ill-health in the country. Ethiopia has one of the lowest rates of coverage for improved water and sanitation in the world. Among rural households 57 %, lack access to an

improved sanitation facility. Nearly 39 million Ethiopians – most of them in rural areas don't have access to safe water (14).

During the past decade, Ethiopia undertook an ambitious investment in primary health care known as the Ethiopian health extension programs (HEPs) to implement health services extension packages (HSEPs).These includes interventions under four main categories (Family Health Services, Infectious disease Prevention and Control, Hygiene and Environmental Sanitation, and health education and communication). The HSEP is implemented by full-time female HEWs who train selected HHs. Those HHs that successfully implement all four components are labelled as "model HHs" and they are officially certified. Implementation of this HSEP indicated that, there were improvements in the community health like latrine construction and utilization, awareness and knowledge on hand hygiene and ways of prevention of communicable diseases, community awareness on different health issues, etc. The health status of model HHs is assumed to be superior to non-model HHs(15).

The vision of the Federal Ministry of Health has been to integrate the health facilities and functions at the woreda level to ensure access and quality of primary health care serving approximately 100,000 people in each woreda(16).

However, there is insufficient empirical evidence to support whether implementation of the health services extension program in Ethiopia in general and in Jimma Zone in particular has met the expectations of its many exponents. In Jimma zone, Seka Chekorsa woreda there are 35 health posts and 84 HEWs thoroughly works with the communities but there is no evidence about the health status, KAPs of the communities on STHs and the impact of HEWs in relation to STHs infections and their involvement in the HSEPs set by the government. Therefore, it is timely to explore whether introduction of the HSEP has improved coverage and comprehensiveness of primary health care services delivered to the population in a part or a whole and to redirect efforts accordingly to enhance coverage and comprehensiveness of Primary Health Care(17).

1.3. Significance of the study

The present study provides information on the prevalence and intensity of STH infections and KAPs of the households. Being an initiatory step towards determining the rate of contamination of soil, it may serve as base line information for further investigation in the study area and other similar areas which may help to design different preventive and control strategies.

It convey guidance for concerned bodies in developing strategies to improve and facilitate communities to use sustainably the latrines, sanitations, open defecation free, etc. to reduce the burdens of STH infections. And also encourage the government introduced community–level intervention called health service extension package and evaluate the impact of health extension workers towards STHs infection prevention and control.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Prevalence and Intensity of Soil-transmitted helminths

The WHO estimates that almost two billion people are infected with one or more of these STHs, accounting for up to 40% of the global morbidity from infectious diseases, exclusive of malaria. More than one dozen different species of STH infect humans, especially in the tropical and sub tropical parts of the developing world, however, *A.lumbricoides*, *A.duodenale, N.americanus* and *T. trichiura* stand out because of their widespread prevalence and distribution that result in hundreds of millions of human infections(18).

A study conducted among geographically and economically distinct Shuar communities in the Ecuadorian Amazon, 65% were infected with at least one STH species, and 25.1% had co infections with at least two STH species. 48% had *A.lumbricoides* and 38% had *T. trichiura*. Most of the individuals infected with *A. lumbricoides* had moderate intensity infections of 51%, and 4% had heavy intensity infections. Similarly, most of the individuals infected with *T. trichiura* had light-intensity infection 91%, a few had moderate intensity infection 9%(19).

A cross-sectional study conducted in two indigenous communities of the Amazonian southern border of Ecuador, at both the HHs and individual levels. At the individual level, the prevalence of geohelmiths infection reached 46.9%, with no differences in terms of gender, age, temporary migration movements. In 72.9% of HHs, one or more members were infected(20).

In Asia a study conducted at the household level had shown individual harbored concurrently at least two to seven different species of parasite with overall prevalence of 86.6% with species of hookworm 76.8%, *A.lumbricoides* 31.7% and *T.trichiura* 25.0% were predominant identified STHs(21)

Another cross-sectional study conducted in Salta province, Argentina, randomly selected for stool/serum sampling for parasitological and serological diagnosis of STH during a deworming program to analyse mechanism of entry as skin-penetrators (hookworms) vs. orally-ingested (*A.lumbricoides* and *T.trichiura*).Unimproved sanitation was significantly

associated with increased odds of infection of skin-penetrators while unimproved drinking water was significantly associated with increased odds of infection of orally-ingested(22).

Mapping of schistosomiasis and STH in the regions of Littoral, North-West, South and South-West Cameroon, an overall STH prevalence was 32.5% across the four regions, with *A.lumbricoides* 19.5%, *T.trichiura* 18.9% and hookworms 7.6%. STH was more prevalent in the South region 52.8%, followed by the South-West 46.2%, the North-West 35.9% and the Littoral 13.0% regions(23).

A study conducted to determine the prevalence and intensity of STH parasites among residents of Era-Awori village located in a Lagos suburb, South West Nigeria, an overall prevalence was 83.3%. *A. lumbricoides* 67.7%, hookworm 45.0%, *T. trichiura* 31.3% and *S.stercoralis* 18.0% were reported. Children (1-10 years) showed higher positive rates with *T. trichiura* 38.1% than adults 17.6%. Multiple parasitic infections was least in the 51-60, 36.0% and 61-80 years, 47.1% age groups; while it reached a peak in the 1-10 years, 62.9% and 11-20 years, 66.0% age groups. Multiple infections were 56.7%, while 27.0% had single infection and 16.3% no infection at all(24).

Report on Epidemiological Mapping of Schistosomiasis and STH in 19 States & the Federal Capital Territory (FCT), Nigeria, all three STHs species were observed with the prevalence of hookworm 47%, *A. lumbricoides* 42% and *T. trichiura* 11%. All the 19 States and FCT showed presence of *A. lumbricoides* and hookworm infections. Only one State had no prevalence of *T. trichiura*(25).

A study conducted on the prevalence and intensity of hookworm infection and *A.lumbricodes* in the eleven communities in Nsukka zone, Enugu state, Nigeria, 52.8% were infected with H.worm and 74.3% with *A.lumbricoides*, suggesting that overall prevalence of ascariasis was about a third higher than that of hookworm. About 50.3% were positive for both infections while 76.7% were infected with either hookworm or ascariasis suggesting that less than a quarter were free of infection(26).

A cross sectional survey conducted on the hypothesis that MDA of Ivermectin and Albendazole for the treatment of Onchocerciasis and Lymphatic filariasis could have an impact on STH, in Kebbi State (three states), Nigeria after 5-years (2010–2015). Zuru LGA

(Local Government Area) had the highest prevalence of STH 41.89%, followed by Dandi LGA 24.66%, and Bagudo LGA 3.36%(27).

Cross-sectional epidemiological and parasitological studies were conducted on *S.mansoni* and STHs in Bushullo village, southern Ethiopia, on School age children and other residents. The overall prevalence was 67.3% with infection rates of *S.mansoni*, *T.trichiura, A.lumbricoides* and hookworm were 73.7%, 41.5%, 37.2% and 28.4%, respectively. The rates of single, dual, triple and quadruple infections were 29.6%, 32%, 20.3% and 7.4%, respectively(28).

A community based survey on Intestinal polyparasitism with special emphasis to STHs among residents around Gilgel Gibe Dam, Southwest Ethiopia; 532 individuals were infected with at least one parasite and overall prevalence was 52.1%. 76.1%, 21.4%, and 2.5% were infected with only one, two and three species of parasites respectively. The overall prevalence of intestinal polyparasitism was 12.4%. The predominant STH was hookworm 44.1%. Hookworm and *A.lumbricoides* were the most frequently recorded combination in cases of polyparasitic infection(29).

2.2. Soil contamination Rate

Multiple studies have identified infective ova and larvae in soil. A study in Titagarh, India found that 68.6% of samples from wastewater irrigated soil were positive for STH infective forms that included embryonated ova of *A.lumbricoides, T.trichiura* and hookworms(30).

A study conducted on contamination of soil with helminth eggs, in Kathmandu Valley and outside of Valley in Nepal, the overall soil contamination rate was 36.5%. The prevalence was uniform in Kathmandu Valley 36.9% and outside of the valley 35.3% and the species of nematodes recovered were *A.lumbricoides*, *Toxocara* species, *T.trichiura*, *H.nana* and *H.diminuta*(31).

Another study conducted to determine the prevalence of parasites in soil texture (loam) by using four techniques (salt floatation, zinc sulphate floatation, sedimentation and filter paper technique). 70 soil samples were collected and analysed from six various sites of Baghdad City (house garden, vicinity of house, vicinity of gutter, waste dumps, vegetable farm and hospital garden). The prevalence of soil parasites was: *Toxocara* spp. eggs isolated by salt and

zinc floatation techniques, while protozoan cysts appeared highly significant in zinc floatation technique. In addition, larvae of *S.stercoralis* showed highly significance in sedimentation and filter paper technique. *A.lumbricoides* showed highly significant in sedimentation technique(32).

A study conducted in urban and periurban areas of Ebonyi State in Nigeria, 300 soil samples obtained from five different locations for the incidence of STHs using a modified Cobb's decanting and sieving methods, 92 (30.7%) of soil samples were positive for different species of the parasites. Six helminthes were implicated for soil samples, hookworms 19 (6.3%), *A.lumbricoides* 24 (8.0%), *S.stercoralis* 17 (5.7%), *T.trichiura* 14 (4.7%), *E.vermicularis* 12 (4.0%) and *H.nana* 6 (2.0%)(33).

Another study conducted in Sanliurfa, Turkey, on environmental Pollution with STHs, 78 stool, 46 water, 90 soil and 100 vegetables samples were examined for the presence of STH eggs, 88.5 % of the stool samples, 60.8% of the water samples, 84.4 % of the soil samples and 14 % of the vegetables samples were found positive for STH eggs. *Ascaris* eggs were detected in 92% of soil samples in which garden soils were found more polluted and followed by yard and bank soil(34).

Another study conducted on STH eggs present in soil at multiple locations within HHs in rural Kenya, the overall prevalence was 15.5%. *A.lumbricoides* was the most prevalent in all samples (11.6%), *T.trichuira* (4.7%) and hookworm species (0.8%). The prevalence of STH soil contamination in at least one location within a HH was 26.8%, and *A.lumbricoides* was the most commonly detected at HHs (19.4%). Prevalence of any STH egg in soil was slightly higher at the house entrance (19.4%) than the latrine entrance (11.3%). STH eggs also detected at bathing and food preparation areas in the three houses revisited for additional spatial sampling, indicating STH exposure can occur at multiple sites within a HH plot, not just near the latrine. The highest concentration of eggs in one house occurred in the child's play area(35).

The study conducted within Ibadan metropolis in Oyo State, south western Nigeria to determine the prevalence of intestinal parasite in soil samples within the city. A total of 102 soil samples were collected from different sources from five local government areas ranging

from refuse dumps, vegetable farms, school play grounds, abattoir, Hospital, vicinity of house, gutter and road side. Two different methods of concentrating parasites were used to analyze the samples-the zinc sulphate floatation technique and concentrated glucose solution method. 57 (55.9%) soil samples were positive for one or more parasites, includes; hookworm (37.3%), *S.stercoralis* (20%), *E.histolytica* (18.7%), *A.lumbricoides* (17.3%), *T.trichiura* (6.7%) respectively(36)

A study conducted for identification of Parasites in Soil Samples of Vegetable Field of Bhaktapur District, Nepal, out of 102 soil samples examined, 50 samples were found to be positive for intestinal parasites. Overall the prevalence of parasites in the fields was 49.01%, *A.lumbricoides* was the highest followed by *S. stercoralis* (37).

Another survey conducted on Soil Contamination Rate, Prevalence, Intensity of Infection of geohelminths and associated risk factors among residents in Bazou (West Cameroon), Out of the 400 soil and 182 stool samples examined, 13(3.3%) and 9(4.95%) were positive respectively. Soil contamination rates were 2%, 1% and 3% for *A.lumbricoides, T.trichuira* and hookworm eggs respectively. Specimens were collected respectively from four sites and from inhabitants aged 1 to 40 years and above in 12 HHs. Soils around houses were more contaminated 6(12%) as compared to those collected from markets 5(10%) and roads 2(4%)(38)

In developing prevention and control strategies and for the empirical treatment of STH, knowledge of the most likely causative agents, the possible risk factors and status of soil contamination are essential. However, to our knowledge, particularly in Jimma zone, no published research report was available on the prevalence & intensity of STHs infection with KAPs assessment comparing model & non-model HHs where the socio-economic status & other associated factors may vary. On top of this, the geographical difference in the status of contaminated source was also not well studied. A study conducted among government & private school in Jimma town of a total of 80 soil samples, soil contamination rate was 11.25%. The majority of STHs identified were from government schools (77.8%) & the rest (22.2%) were from private school compounds. Egg of *A. lumbricoides & T. trichiura* parasites were found with the infection rate of 77.8% & 22.2% respectively(39).

2.3. Knowledge, Attitude and Practice

For health education activities to be effective, they will also need the identification of the target audience and the formulation of clear messages, which take into account local perceptions and attitudes to bring about behaviour change. If the members of the community are aware of the negative effects of intestinal helminths, they will be more likely to support and sustain uptake of MDA intervention measures. Nevertheless, there are risk factors which community members are able to control without much effort, like washing hands before eating and after defecation, drinking boiled or treated water, wearing shoes and eating well cooked food. Recent studies support that both individual and community perceptions and attitudes of parasitic worm infections and their prevention and treatment are important factors. Although it is recognized that the control and prevention of parasitic diseases depend upon adequate knowledge of human behaviour, the literature on this subject is limited and few studies have considered people's perceptions and attitudes toward worm infection, treatment and control(40).

Assessment conducted on knowledge of the Abaye Deneba community about parasitic diseases such as schistosomiasis, amoebiasis, ascariasis and taeniasis was very low. However, 59.3% members correctly responded that the cause of giardiasis is related to contaminated water and 51.2% knew how to prevent it. In some cases, respondents did correctly identify causes, symptoms of intestinal parasite infection and ways to prevent it, but they did not accurately link it to the appropriate disease caused by the different intestinal parasite species. 50.2% were showed infection with at least one intestinal parasite. *S.mansoni* was the most prevalent 41.3% followed by *T.trichiura* 9.4%, *A.lumbricoides* 8.4%, *T.saginata* 2.4%, *E.vermicularis* 2.0% and hookworm 0.4%(41).

Knowledge, attitude & practice survey carried out in two rural communities of Côte d'Ivoire subjected to school-based & community-based research and control activities, there was some knowledge of parasitic worm infections in both villages. The most commonly perceived diseases in both villages was malaria, intestinal worms, dysentery, schistosomiasis, and scabies 87%, 52%, 50%, 29% and 22%, respectively. The most frequently mentioned signs and symptoms in both villages were headache (73%), abdominal pain (72%), fever (72%), backache (71%), and diarrhoea (59%). In both villages, it was commonly believed that

consumption of meat and sweetened foods were the main sources of infection. Majority of participants ranked medical treatment as the most effective approach and 84% of the HH claimed to have taken anthelmintic drugs, among which 58% had taken medicine sold on local street markets and 49% traditional medicine(42).

A total of 215 Orang Asli in rural Malaysia HHs were interviewed face-to-face to fill in the questionnaire on their KAP towards intestinal helminths infections. It was found that 132 (61.4%) participants had heard about the intestinal worms. 20.3% indicated that the main source of their information was the clinic, while 63.1% could not remember. About the types of intestinal helminths, only 7.6% mentioned pinworm and 5.3% roundworms. Only 29.3% of the respondents were able to mention at least one symptom of intestinal helminth infections indicated that there was a lack of knowledge. Of those, 36.5% and 39.7% mentioned one & two symptoms, respectively as abdominal pain and abdominal distension followed by diarrhoea, loss of appetite, and vomiting(9)

A study conducted on KAPs of geo-helminths infection in coastal region, Kenya, participants in the focus discussions have heard about STHs before, during schooling. The level of awareness was high in identifying types of worms like hookworms, round worms & tapeworms. Awareness on mode of transmission, the disease was caused by walking bare footed, drinking untreated water, eating soil, open defecation etc. Majority of them had knowledge on signs & symptoms like abdominal pain, diarrhoea, vomiting, lack of appetite & craving for soil. Majority of them indicated that washing hands, wearing protective clothing while farming, drinking treated water, proper human waste disposal, treatment with drugs, general personal hygiene, wearing shoes, building &using latrines would help in combating the infection and the treatment was acceptable to the community and the infection could be controlled with proper medication. Practices in latrine use, ownership & personal hygiene, few participants admitted to own & utilize pit latrines despite having knowledge that open defecation was closely linked to worm infection and reported that good hygiene practices like hand washing before eating and proper human waste disposal would reduce worm infection(42).

The Federal Ministry of Health (FMOH) of Ethiopia launched the HEP in 2003 and it became operational with the 2004-2005 graduation of 7136 HEWs, trained to work mainly in disease

prevention and health promotion in rural villages.The program was expected to help accelerate the country's progress in meeting Millennium Development Goals . Now it is the country's major health program: by 2010, there were 30,578 HEWs serving almost all villages in rural areas. It has enabled Ethiopia to increase primary health care coverage from 76.9% in 2005 to 90% in 2010.HEP has improved sanitation and increased access to safe and clean drinking water from 35.9% in 2004-2005 to 66.2% in 2009-2010 nationally, when access to safe excreta disposal reached 60%(43).

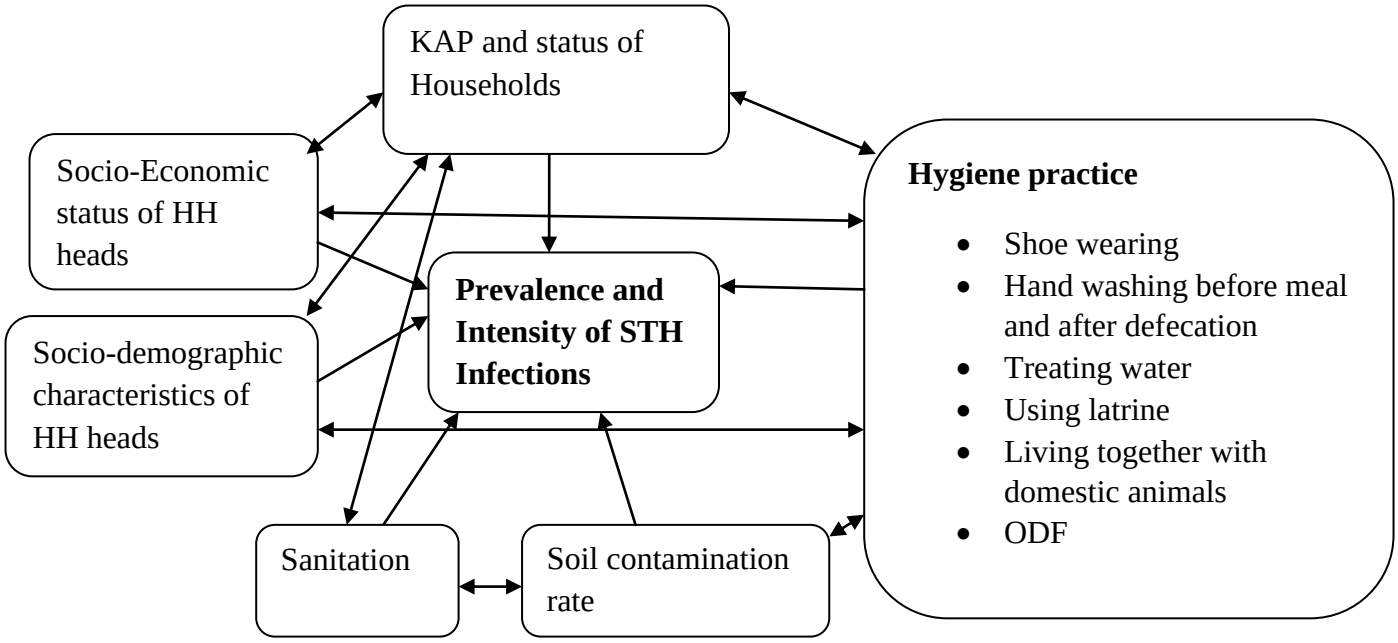


Figure 1:-Conceptual framework used to assess the risk factors for STHs infection

CHAPTER THREE

3. OBJECTIVE

3.1. General Objective

To assess Soil-transmitted helminths infections among health Extension program model and non- model households of selected kebeles of Seka Chekorsa woreda, Jimma zone, southwest Ethiopia.

3.2. Specific Objectives

- ✓ To determine the prevalence of STH infections among Health extension program model & non-model HH members of selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.
- ✓ To determine the intensity of STH infections among Health extension program model & non-model HH members of selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.
- ✓ To identify the predictors of STHs infection among Health extension program model & non-model HH members in selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.
- ✓ To assess the Knowledge, attitude and practice among Health extension program model & non-model households of selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.
- ✓ To assess the soil contamination rate among Health extension program model and non-model villages of selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. Study area

Seka Chekorsa woreda is one of the woreda's found in Jimma zone of Oromia regional state of south west Ethiopia. It is 366 km away from the capital city Addis Ababa and 20 km away from Jimma town. It is bounded by Gomma and Manna woreda in the north, Gera woreda in the south, Dedo woreda and Jimma Town in the East and Shabe Sombo woreda in the west. Currently, the woreda covers an estimated area of 455km^2 and has 36 kebeles (34 rural and 02 urban) 29 models and 07 non-models, 01 Hospital, 09 Health centers, 35 Health posts and 84 HEWs, around 90% of the residents are farmers. The altitude of this woreda ranges from 1580 to 2560 meters above sea level and rainfall ranging from 1,200 to 2,800 mm. The minimum and maximum daily temperatures of the area are 12.6°C and 29.1°C respectively. Perennial rivers include the Abono, Anja, Gulufa and Meti. A survey of the land in this woreda shows that 45.3% is arable or cultivable (44.9% was under annual crops), 6.1% pasture, 25.8% forest, and the remaining 22.8% is considered swampy, degraded or otherwise unusable. Khat, peppers, fruits and teff are important cash crops.Coffee is another important cash crop for this woreda; over 50 km^2 are planted with this crop(44).

The 2007 national census reported a total population for this woreda is 208,096, of whom 104,758 were men and 103,338 were women; 7,029 (3.38%) of its population were urban dwellers.

Figure 2-Location map of Seka Chekorsa woreda.

4.2. Study period

The study was conducted from April to June 2018.

4.3. Study design

Community based comparative cross-sectional study was conducted.

4.4. Population

4.4.1. Source population

All household members of Seka Chekorsa woreda were the source of population.

4.4.2. Study population

All household members of selected model and non-model HHs of Seka Chekorsa woreda that fulfill the inclusion criteria were included in the study.

4.5. Sample size and sampling technique

4.5.1. Sample size

The total sample size needed for the study was calculated using Epi-Info 7 version statistical software (Stat calc) using the double population proportion formula with the aim of detecting difference between model and non- model HHs of 26.05% and 52.1%(29), respectively with a power of 80%,1:1 ratio, OR of 2 or with an assumption 50% reduction and confidence level of 95%. Then the possible non-response of 10% and design effect of 2 was added and the final sample size was 612 (306 model and 306 non-model HH members).

In assumption of 50% reduction /OR of 2 and 1:1 ratio, a total of 153 soil samples of 10- 50 g of dry soil from the top 0–5 cm layer of the soil of different sources from villages (6 model and 6 non- model) of the selected areas of five sites was collected.

$$n = \frac{(Z\alpha/2)^2 P (1-P)}{d^2}$$

P=11.25% - soil contamination rate among government & private school in Jimma town(39).

$$n = \frac{(1.96)^2 0.1125 (1-0.1125)}{(0.05)^2}$$

$$n = \frac{(3.8416) (0.1125) (0.8875)}{0.0025}$$

$$n = \frac{153}{}$$

4.5.2. Sampling technique

A multistage sampling technique was applied; sampling was done at the kebeles, villages and HHs levels. In the first stage, out of 36 kebeles, 04 kebeles were randomly selected (2/29 model- Buyo Kechema and Kusaro and 2/7 non-model- Andode Alaga and Meti). Under these kebeles, there are 22,752 total populations and 4,315 total HHs, i.e.2085 models and 2230 non-models and the mean family size of Jimma zone is 5.1±1.8. In these 04 kebeles, there are 12 (06models and 06 non models) villages (locally referred to as "zones").Then, from selected kebeles, the calculated sample size /average family size =120HHs (60 model and 60 non-model) was selected.

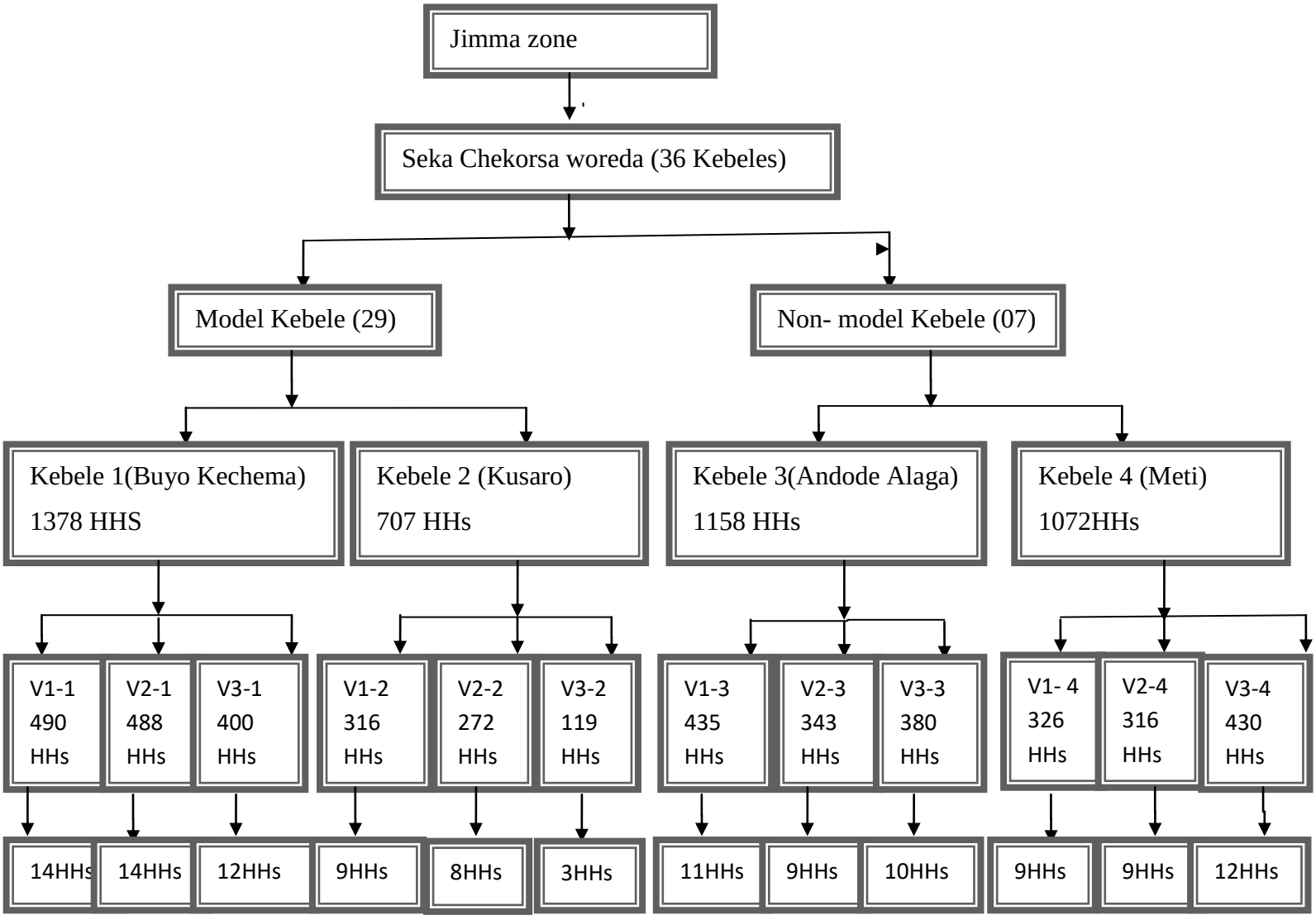


Figure 3:-Diagrammatic Representation of the study Woreda, their respective Kebeles, Villages and HHS.

153 soil samples of 10- 50 g of dry soil from the top 0–5 cm layer of the soil of different sources (refuse dumps, vegetable farms, Children play grounds, vicinity of house and latrine, and road side) from model and non- model villages of the selected areas of five sites were collected. Model and non- model HHs and villages were identified through a house to house enumeration prior to the actual data collection. The simple random sampling technique was used to select a random start.

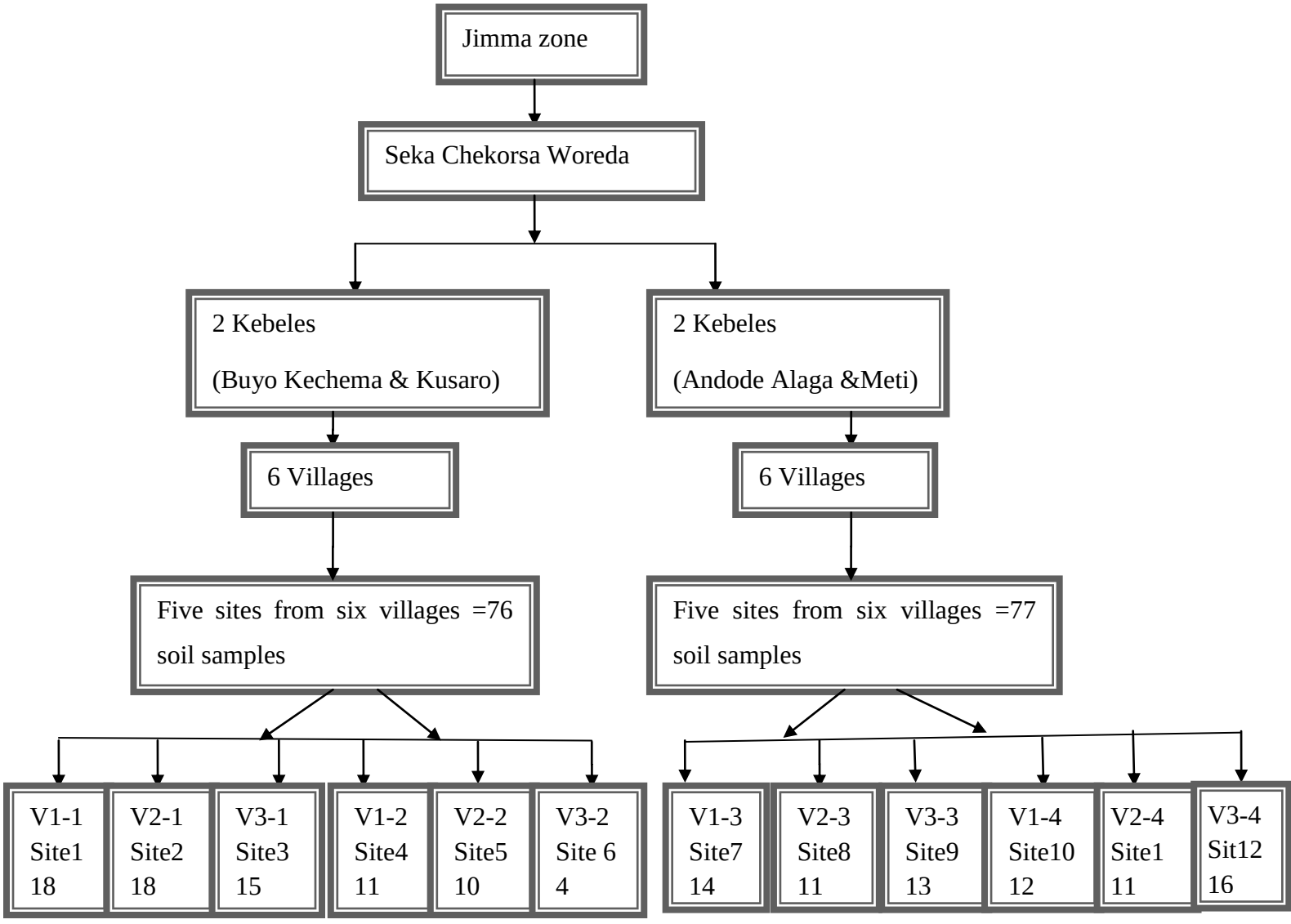


Figure 4:-Diagrammatic Representation of the study Woreda, their respective Kebeles, Villages &sites of soil sample collection

4.6. Eligibility Criteria

4.6. 1. Inclusion Criteria

Permanent residents living at least for 6 months in the study area with greater than two years' age group of both sexes, who were voluntary to provide written consent to participate in the survey, could provide stool sample and did not take anti-helminthic treatment 28 days prior to data collection were included in the study.

4.6. 2. Exclusion Criteria

Individuals who provided diarrheic stool and who have a history of being clinically ill were not included in the study.

4.7. Study Variables

4.7.1. Dependent variables

Prevalence and Intensity of STH infection

4.7.2. Independent variables

-Socio-demographic characteristics -Source of water -Sanitation

-Socio-economic status -KAPs of HH heads -HHs status

-Availability of latrine -Soil contamination rate

4.8. Data Collection and Processing

4.8.1. Socio demographic data

Socio demographic and KAPs data on the risk factors were collected by trained data collectors using pre-tested questionnaire (Annex III)

4.8.2. Stool sample collection and processing

The individuals were supplied with labeled plastic containers and instructed to bring proper stool samples. All collected specimens were checked for their label, quantity and procedure of collection. Portion of each specimen was examined by direct wet mount preparation for intestinal protozoa at nearby Health institution. All specimens were transported to the diagnostic Medical Parasitology Laboratory of School of Medical laboratory sciences, Jimma University and examined microscopically using of Kato Katz method (Annex I).

Based on fecal egg count, individuals were categorized under any of the WHO proposed thresholds for the classes of intensity for each helminth. The result was expressed as eggs per gram of faeces (EPG) and infection intensities of STH were categorized as: *A. lumbricoides* (Light infection 1–4,999 EPG, Moderate infection 5,000-49,999 EPG and heavy infection ≥50,000EPG), *T.trichiura* (Light infection 1-999 EPG, Moderate infection 1,000-9,999 EPG, and heavy infection ≥10,000EPG) and hookworm (Light infection 1-1,999EPG, Moderate infection 2,000-3,999 EPG, and heavy infection ≥4,000EPG)(45)

4.8.3. Soil sample collection and processing

One hundred fifty three (153) soil samples of 10-50 g of dry soil mostly the top 0-5 cm layer of the soil of different sources not exposed to direct sunlight from model and non- model villages of the selected areas ranging from refuse dumps, vegetable farms, Children play grounds, vicinity of house and latrine, and road side was collected and stored in airtight plastic bags labeled with numbers and transported to the same diagnostic area as stool samples. In the laboratory samples were dried overnight at room temperature in a shaded place if it was wet. Microscopic examination was performed for eggs of the helminths using Zinc Sulphate floatation technique (Annex II).

4.9. Data analysis and Interpretation

After checking the data for completeness and coding of the questionnaires, KAPs of household heads were assessed by using questionnaire and associated risk factors by logistic regression. The data was entered in to the computer, processed and analysed using SPPS version 20.0.Variables which are significant below 0.25 in the bivariate analysis was a candidate for multiple logistic regression in order to control the confounding effect or to know independently associated factors so variables with a p-value < 0.05 was considered as statistically significant in the model. Finally the data was presented in tables, graphs and words.

4.10. Data quality assurance

Training was given to the data collectors on the objective of the study and each item on the questionnaire. The questionnaire was checked during data collection and at the end of the day for completeness and consistency. Standard Operating Procedure (SOP) was followed during specimen collection, transportation and processing. Medical Laboratory technologists who are

experienced in Kato-Katz and Zinc Sulphate floatation technique processed and examined the samples, and 10% of the samples (stool and soil) were randomly selected and rechecked blindly to ensure quality control.

4.11. Ethical consideration

Ethical clearance and letter of permission was obtained from the Institutional Review Board (IRB) of Jimma University and Official permission was sought from Jimma Zone and Seka Chekorsa Woreda Health office. Before data collection, all individuals were invited to participate and asked to provide written consent. Confidentiality of individual's information was maintained during data collection, analysis and interpretation. Under the supervision of health officer,the HEWs of the representative kebeles provided appropriate drugs for individuals who become positive for any of intestinal parasites, single dose of 400 mg of Albendazole and 500mg of Metronidazole for adults and 250mg of Metronidazole syrup for children(for 5-7 days) according to the Ethiopian drug administration guideline(46).

4.12. Plan for dissemination

The final report will be submitted to School of Medical Laboratory Sciences, Jimma University and the finding will be conveyed to the academic staff of Jimma University on a formal presentation. The reports will also submit to zonal and woreda health office. Moreover, the paper will be submitted for publication on either national or international journal to communicate to the scientific community.

4.13. Operational term definition

Model households: -Households heads (members) attended at least 75% of trainings on HSEPs, implemented at least 75% of the packages, and eventually certified for fulfilling these requirements.

Non-model households: -HHs which didn't attend at least 75% of the training on HSEPs, didn't implement at least 75% of the packages, and eventually not certified.

Soil contamination: -the pollution of soil by human excreta that cause harmful effect on human health.

Prevalence: - is the number of positive for STHs examined during the study period in selected Kebeles.

Risk factor: - a condition that predisposes, or influences the spread or transmission of a disease.

Soil-transmitted helminths (**STHs**):-are parasites like *A. lumbricoides, T. trichiura* and hook worm species which their eggs and larvae must develop in soil before infectious.

Knowledge: -the understanding of the communities can have about the STHs infection.

Attitude: -the way that the communities think and feel about STHs infection.

Practice: -the actions taken by the communities from knowledge and attitude know about the STHs.

Households: -all members of the people live together in the same house.

CHAPTER FIVE

5. RESULTS

5.1. Socio-demographic and economic characteristics

A total of 120 HHs were visited, yielding a total sample size of 612 individuals. The response rate was 100%. From the total HH heads interviewed, 86 (71.7%) were males and 34(28.3%) were females. The majority (66.7%) of the HH heads were in the age group of ≥ 35 years, followed by 25-34 (24.2%) and 15-24 years (9.2%), with a mean age of 39.55 ±11.74 years. The family size ranged from 2-14 people per HH with mean family size of 5.18 ±1.89. The vast majority (93.3%) of HHs were living in mud plastered houses with earthen floor. The majority, 85 (70.8%) of the HH heads were literate (at least read and write), whereas the remaining 35 (29.2%) were illiterate (could not read and write). There were no significant differences between model and non-model HHs in terms of the socio-demographic and socio-economic characteristics of the HH heads ($p > 0.05$) (Table 1).

Of the 612 individual study participants, 306 were from model and 306 were from non-model households. About half, 308 (50.3%) of the study participants were males and 304 (49.7%) were females. The majority (54.7%) of the study participants were in the age group of >15 years, followed by 5-15 years (34.3%) and <5 years (10.9%), with a mean age of 22.34 ±16.71 years. There were no significant differences between model and non-model HHs in terms of gender ($\chi^2 = 0.65$, $p = 0.419$) and age ($\chi^2 = 2.56$, $p = 0.278$) of the household members (individual pariticpants).

Table1: Socio-demographic and socio-economic characteristics of model and non-model households, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia

Variables		**Model (n=60)**	**Non-model (n = 60)**	χ^2	**p value**
		No. (%)	**No. (%)**		
Gender	Male	45 (75.0)	41 (68.3)	0.657	0.418
	Female	15 (25.0)	19 (31.7)		
Age	15-24	4 (6.7)	7 (11.7)	1.053	0.591
	25-34	14 (23.3)	15 (25.0)		
	≥35	42 (70.0)	38 (63.3)		
Family size	<5	24 (40.0)	24 (40.0)	0.00	1.00
	≥5	36 (60.0)	36 (60.0)		
Education	Illiterate	16 (26.7)	19 (31.7)	0.363	0.547
	Literate	44 (73.3)	41 (68.3)		
Occupation	Farmer	44 (73.3)	37 (61.7)	4.076	0.253
	Housewife	15 (25.0)	19 (31.7)		
	Merchant	0 (0.0)	3 (5.0)		
	Daily laborer	1 (1.7)	1 (1.7)		
Family income	<1000	8 (13.3)	12 (20.0)	1.80	0.407
	1000-3000	42 (70.0)	42 (70.0)		
	>3000	10 (16.7)	6 (10.0)		
House type	Mud plastered	54 (90.0)	58 (96.7)	2.143	0.143
	Stone walls	6 (10.0)	2 (3.3)		
Floor type	Earthen	54 (90.0)	58 (96.7)	2.143	0.143
	Cement	6 (10.0)	2 (3.3)		

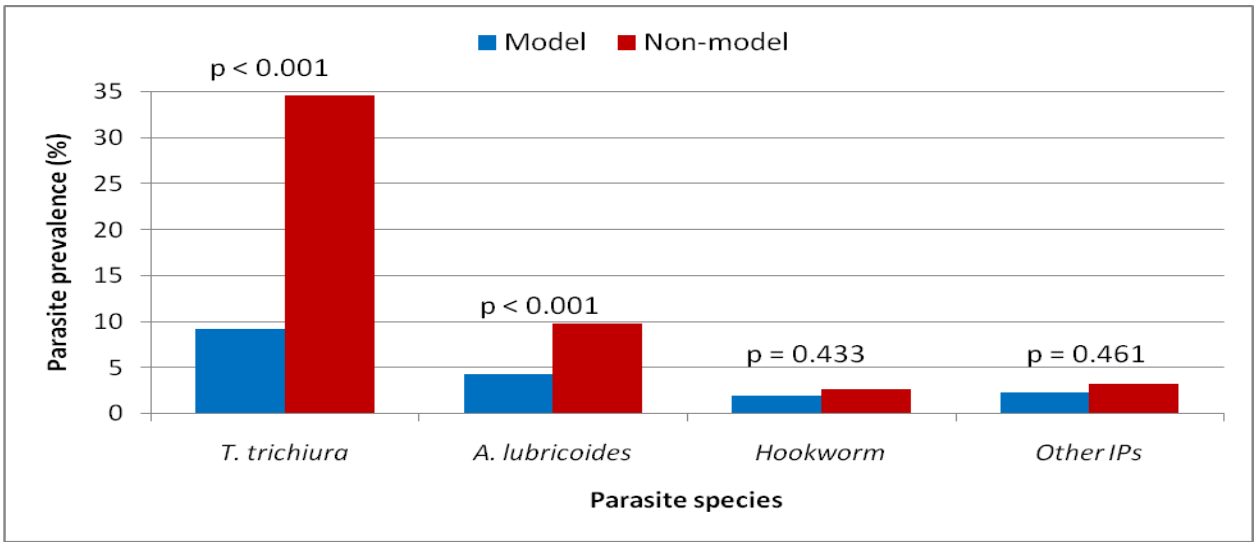
Key: n-sample size, No. - Number, %- percent, χ^2-chi-square

5.2. Prevalence of Soil-transmitted Helminths

The overall prevalence of all parasitic infection and STHs among study participants who provided a stool sample for examination was 210(34.3%) and 197(32.2%), respectively. A total of six intestinal parasites were identified, namely *T. trichiura* (21.6%), *A.lumbricoides* (6.4%), hookworm (2.1%), *E.vermicularis* (1.1%), *Taenia species* (0.3%) and trophozoite of *E.histolytica / E.dispar* (0.7%) with significant difference in prevalence of *A.lumbricoides* and *T.triciura* between model and non-model HH members (P<0.001) (Figure 5).

All model and non-model HH members were tested for prevalence of STHs, 44(14.4%) model and 153(50.0%) non-model were positive for atleast one species of STHs with significant difference between model and non-model HHs (OR=5.96, 95% CI; 3.74-9.52, P<0.001).

Slight difference were observed among males and females infection prevalence, 95(48.2%) and 102 (51.8%) respectively (P>0.05) no significant differences was observed.



Key: IPs-other intestinal parsites (*E. vermicularis, E. histolytica* /dispar and *Taenia* species)

Figure 5: Prevalence of STH species and other IPs among individuals of model and non-model households, Seka Chekorsa woreda, Southwest Ethiopia

The highest intestinal parasites prevalence was reported among the age group >15 years, 335(54.7%) and 106(31.6%) were infected with STHs, followed by 5-15 years, 210(34.3%), and 85(40.5%) were infected with atleast one species of STHs with no statiastical difference between them (P>0.05).

Household members trained by HEWs on HSEP were 359(58.7%), and (22.8%) were infected while from untrained (52.6%) were infected with STHs with significant difference (P<0.001). Regarding infection status majority 196(32.0%) of the study participants were infected by single species of STHs, 13(2.1%) were double infections and 1(0.2%) were triple infections.

5.3. Intensity of Soil-Transmitted Helminths (STHs)

The quantity of eggs per gram (EPG) of stool samples of individuals who had participated in the study was done using the Kato-Katz thick smear method. Intensity of infections for STHs was categorized according to the WHO classification thresholds. The results showed an average intensity of infection 223 EPG (ranging from 48 - 11,104) for *T.trichiura.* It was high in age group of >15 years followed by age group of 5-15 years with no significant difference between model and non-model HHs (P>0.05). This study also revealed that the average intensity infection of *A. lumbricoides* was 3,410 EPG (ranging from 48 - 60,432). It was high in age group of 5-15 years followed by >15 years with no significant association (P>0.05).The average EPG for hookworm was 96 (ranging from 48 – 864). There were no significant association in intensity infection of STHs among model and non-model HH members.

Table 2: Soil transmitted helminths intensity infection thresholds with HH status of selected Kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.

STHs Species	HH status	Intensity class	Age groups			X^2	P-Value
			<5	5-15	>15		
Trichuris trichiura	Model	Light	0(0.0)	12(8.5)	16(11.4)	12.701	0.391
	Non-model	Light	13(9.2)	36(25.6)	58(41.1)		
	Non-model	Moderate	0(0.0)	02(1.4)	04(2.8)		
*Ascaris lumbricoide*s	Model	Light	0(0.0)	09(18.0)	03(6.0)	14.426	0.071
	Non-model	Light	05(10.0)	16(32.0)	13(26.0)		
	Model	Moderate	0(0.0)	01(2.0)	0(0.0)		
	Non-model	Moderate	0(0.0)	0(0.0)	01(2.0)		
	Non-model	Heavy	0(0.0)	0(0.0)	02(4.0)		
Hookworms	Model	Light	0(0.0)	0(0.0)	06(40.0)	12.917	0.115
	Non-model	Light	0(0.0)	05(33.3)	04(26.7)		

5.4. Hygiene Related Habits and Environmental Conditions of the Households

Table 3 shows hygiene related habits and environmental conditions of model and non-model HHs. Most (97.5%) of the HHs had a latrine. There were no a significant difference between model and non-model HHs in terms of latrine ownership ($\chi^2 = 0.34$, $p = 0.559$). On the other hand, there were significant differences between model and non-model HHs with regard to availability of latrine lid ($\chi^2 = 21.1$, $p < 0.001$), availability of hand washing facilities around latrine ($\chi^2 = 21.1$, $p < 0.001$), source of drinking water ($\chi^2 = 12.11$, $p = 0.001$) and waste disposal system ($\chi^2 = 16.15$, $p < 0.001$). About 85% of latrines owned by model HHs had lid, with handwashing facilities around the latrines, while this was only 45% for non-model HHs. About one fifth (18.3%) and 81.7% of model HHs were using pipe and spring water, respectively, whereas all of the non-model HHs were using spring water for drinking. About (70.0%) of model HHs were practiced dry and liquid waste disposal in the pit and (5.9%) were in open fields, while (33.3%) and (66.7%) of non-model HHs practiced in pit and open fields, respectively.

Table 3: Hygiene related habits and environmental conditions of model and non-model households, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia

Variables		**Model**	**Non-model**	χ^2	**p value**
		No. (%)	**No. (%)**		
Own latrine	Yes	58 (96.7)	59 (98.3)	0.342	0.559
	No	2 (3.3)	1 (1.7)		
Latrine lid	Yes	51 (85.0)	27 (45.0)	21.099	<0.001*
	No	9 (15.0)	33 (55.0)		
Hand washing facility	Yes	51 (85.0)	27 (45.0)	21.099	<0.001*
	No	9 (15.0)	33 (55.0)		
Water source	Pipe	11 (18.3)	0(0.0)	12.11	0.001*
	Spring	49 (81.7)	60 (100.0)		
Waste disposal	Pit	42 (70.0)	20 (33.3)	16.151	<0.001*
	Open field	18 (30.0)	40 (66.7)		

Key: n-sample size, No. - Number, %- percent, χ^2 -chi-square, ODF- Open defecation free

5.5. Hygiene Related Habits of Individual Study Participants

Hygiene related habits of the study participants are shown in Table 4. Of the 612 individuals, 562 (91.8%) were ODF while the remaining 50 (8.2%) were non-ODF. There were significant difference between model and non-model HH members in terms of implementing ODF (χ^2 = 17.08, p < 0.001). Similarly, there were significant differences between model and non-model HH members with regard to hand washing habit (χ^2 = 13.73, p < 0.001), shoe wearing habit (χ^2 = 9.78, p = 0.002) and nail hygiene (χ^2 = 4.34, p < 0.037). About ninety five percent of the model HH members had habit of hand washing after using latrine, while 86.9% of the non-model HH members had hand washing habit. Similarly, the proportion of HH members who had shoe wearing habit was higher in the model than non-model HHs. The proportion of study participants with clean nails was also higher for model (97.7%) than non-model HH members (94.4%).

Table 4: Hygiene related habits of model and non-model Household members, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia

Variables		**Model**	**Non-model**	χ^2	**p value**
		No. (%)	**No. (%)**		
ODF	Yes	295(96.4)	267(87.3)	17.075	<0.001*
	No	11 (3.6)	39(12.7)		
Hand washing habit	Yes	292 (95.4)	266(86.9)	13.730	<0.001*
	No	14 (4.6)	40(13.1)		
Shoe wearing habit	Yes	292 (95.4)	271 (88.6)	9.783	0.002*
	No	14 (4.6)	735(11.4)		
Nail hygiene	Yes	299 (97.7)	289(94.4)	4.337	0.037*
	No	07 (2.3)	17 (5.6)		

Key: n-sample size, No. - Number, %- percent, χ^2 -chi-square, ODF- Open defecation free

5.6. Risk factors for Soil-Transmitted Helminths(STHs)

Table 5 shows bivariate and multivariate logistic regression results for assessment of risk factors for STHs among model and non-model HH members. The strength of potential risk factors of independent variables with the outcome variable was determined. Independent variables in Binary logistic regression analysis at P≤0.25 were selected as potential candidates for multiple logistic regression analysis and p-value <0.05 were considered as risk factors associated with the STHs infection. In binary logistic regression analysis: household status, ODF, availability of latrine lid, hand washing habit, nail hygiene and waste dispasal systems of HHs were screened potential candidates for multiple logistic regression analysis.

After adjusting for confounding variables, the present study reported that the distribution of STH infections varies between model and non-model HHs. The finding showed that non-model HHs (AOR: 5.96, 95%CI; 3.74-9.52, p<0.001) were six times more likely infected with STHs than those of model HHs.

Regarding to STHs infection with nail hygiene, indicated that those HH members not keeping their finger nail clean (AOR: 0.29, 95%CI; 0.12-0.84, p=0.021) were less likely infected with STHs than those of HH members keeping their finger nail clean with significant differnces.
Concerning STHs infection with relation to gender, this finding showed that females were more likely infected than males, however there was no observed statistical significant difference between them (AOR: 1.23; 95%CI; 0.85-1.78, P=0.280).

Those study participants practiced open defecation were more likely infected with STHs than those of ODFs (AOR: 1.01; 95%CI; 0.15- 6.79, P=0.995), with no significant differences.

Those study participants had no hand washing habit (AOR: 0.88; 95%CI; 0.14-5.66, P=0.890) have showed that the risk of infection by STHs was less likely than those have the habits, and no shoe wearing habit (AOR: 3.89; 95%CI; 0.42-36.41, P=0.234) have showed the risk of infection by STHs was more likely than those have the habits, with no significant difference.

Those HH members had a practice of waste disposal on open field than those disposed in pit (AOR: 0.98, 95%CI; 0.63-1.52, P=0.916) were less likely infected by STHs and HH members using drinking water from spring than pipe (AOR: 2.41, 95% CI; 0.61-9.53, P=0.208) were more likely infected by STHs, however statistical significance was not indicated.

Table 5: Bivariate and multivariate logistic regression of risk factors for STH among model and non-model HHs, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.

Parameter	**No. tested**	**STH +ve (%)**	**COR (95% CI)**	**p-value**	**AOR (95% CI)**	**p-value**
HH status						
Model†	306	44(14.4)	1		1	
Non-model	306	153(50.0)	5.96 (4.03-8.80)	<0.001•	5.96(3.74-9.52)	<0.001*
Gender						
Male†	308	95(30.8)	1		1	
Female	304	102(33.5)	1.13(0.81-1.59)	0.473	1.23(0.85-1.78)	0.280
ODF						
Yes†	562	173(30.8)	1		1	
No	50	24(48.0)	2.08 (1.16-3.72)	0.014•	1.01(0.15-6.79)	0.995
Own Latrine						
Yes†	604	192(31.8)	1			
No	08	05(62.5)	3.58 (0.85-15.12)	0.083	3.16(0.29- 33.60)	0.340
Latrine lid						
Yes †	562	173(30.8)	1			
No	50	24(48.0)	2.08 (1.16-3.72)	0.014•		
Water source						
Pipe†	11	03(27.3)	1		1	
Spring	601	194(32.3)	1.27 (0.33-4.84)	0.725	2.41(0.61-9.53)	0.208
Hand washing						
Yes†	558	172(30.8)	1		1	
No	54	25(46.3)	1.94(1.10-3.40)	0.022•	0.88(0.14-5.66)	0.890
Shoe wearing						
Yes†	563	175(31.1)	1		1	
No	49	22(44.9)	1.81(1.00- 3.26)	0.050	3.89(0.42-36.41)	0.234
Nail hygiene						
No	24	15(62.5)	3.72(1.59-8.65)	0.002•	0.29(0.12 -0.84)	0.021*
Clean†	588	182(31.0)	1		1	
Waste disposal						
Open field	208	96(46.2)	2.57(1.81-3.66)	<0.001•	0.98(0.63-1.52)	0.916
Pit†	404	101(25.0)	1		1	

Key -† Reference category, • potential candidates for multivariate analysis,* P<0.05 - considered as significantly associated with the outcome variable

5.7. Knowledge, Attitude and Practice (KAP) Assessments

Table 6 shows KAP of HH heads about STH infections. Of the total 120 HH heads interviewed, 56 (93.3%) of model and 23 (38.3%) of non-model HH heads heard and knew about STHs locally named as 'Raammoo garaa', the difference being statistically significant between the two groups ($\chi^2 = 40.35$, $p < 0.001$). They got information about STHs from five sources: health extension workers, health institution, mass media, school and other peoples with significant difference between them.

There was a statistical significant difference between model and non-model HHs interms of HH heads' knowledge about signs and symptoms of STH infections ($\chi^2 = 43.26$, $p < 0.001$). The majority (93.3%) of model and (38.3%) of non-model HH heads said that the signs and symptoms of STHs were abdominal pain, diarrhea, vomiting and loss of appetite. Similarly, there were a significant difference between model and non-model HHs in terms of HH heads' knowledge about mode of transmission of STHs ($\chi^2 = 41.03$, $p < 0.001$). Most (93.3%) of model and (38.3%) non-model HH heads said that STHs could be transmitted by contaminated hands, eating contaminated foods,walking barefooted and drinking untreated water,while (6.7%) and (38.3%), respectively did not know the mode of transmission of STHs. There was significant difference observed interms of possible prevention of STHs, effect of STHs on people's health and faeces could be the cause of infection between model and non-model HH members ($p< 0.001$). About (83.3%) of model and (35.0%) of non-model HHs had practices to prevent STHs by hand washing before eating and after defecation, boiling drinking water, wearing shoes with significant association between them ($\chi2= 41.61$, $P<0.001$).

Table 6: KAP of Household heads about STHs in model and non-model HHs, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia, 2019

Variables		Model (n=60)	Non-model (n = 60)	χ^2	p value
		No. (%)	No. (%)		
Know about STHs	Yes	56 (93.3)	23 (38.3)	40.346	<0.001*
	No	4 (6.7)	37 (61.7)		
Sign & symptoms	Abdominal pain	28(23.3)	8(13.3)	43.263	<0.001*
	Diarrhea	23(38.3)	12(20.0)		
	Nausea & vomiting	1 (1.7)	2 (3.3)		
	Loss of appetite	4 (6.7)	1 (1.7)		
Transmission	Contaminated hands	41 (68.3)	19 (31.7)	41.028	<0.001*
	Contaminated food	8 (13.3)	2 (3.3)		
	Untreated water	4 (6.7)	1 (1.7)		
	Barefoot walking	3 (5.0)	1 (1.7)		
Prevention	De-worming	43 (71.7)	7 (11.7)	53.542	<0.001*
	Hand washing	9 (15.0)	13 (21.7)		
	Wearing shoes	2 (3.3)	2 (3.3)		
	Boiling water	2 (3.3)	1 (1.7)		
Effect of STH	Harmful to health	56 (93.3)	23 (38.3)	40.346	<0.001*
	Do not know	4 (6.7)	37 (61.7)		
Faeces cause STH infections	Yes	56 (93.3)	23 (38.3)	40.346	<0.001*
	No	4 (6.7)	37 (61.7)		
Practices	Hand washing	50(41.7%)	21(17.5%)	41.606	<0.001*
	Boiling drinking water	3(2.5%)	2(1.7%)		
	Wearing shoes	3(2.5%)	37(30.8%)		

Key: n-sample size, No. - Number, %- percent, χ^2 -chi-square, STH- Soil-transmitted helminthes

5.8. Soil Contamination Rate

From a total of one hundred fifty three soil samples collected from model and non-model villages, the overall soil contamination rate was 12.4% and the identified parasites were larvae of *S.stercoralis*, hooworm species, ova of *A.lumbricoides,* and ova of *T.trichiura* species. There were a statistical significant difference between model and non-model villages (χ^2 = 11.77, P=0.038).

Table 7. Prevalence of STHs and other parasites in soil samples taken from five different sites in model and non-model villages, Seka Chekorsa, Jimma zone, Southwest Ethiopia (N=153)

Species	**Model, n (%)**	**Non-model n (%)**	**Total n (%)**
Hookworm	2 (2.6)	5 (6.5)	7 (4.6)
A. lumbricoides	0(0.0)	2 (2.6)	2 (1.3)
T. trichiura	0(0.0)	2 (2.6)	2 (1.3)
S. stercoralis	1 (1.3)	7 (9.1)	8 (5.2)
Total	3 (3.9)	16 (20.8)	19 (12.4)

Key: n-number positive, %-percent, N-number of soil samples (76 from model &77 from non-model villages)

The more contaminated sites in the selected areas were vicinity of house and latrine 7(4.6%), from model 01(1.3%) and non-model 6(7.8%), infected with species of *A.lumbricoides, T.trichiura*, hookworm and *S.stercoralis* followed by refuse dumps 5(3.3%), from model 2(2.6%) and non-model 3(3.9%), infected with hookworm as displayed in figure 6.

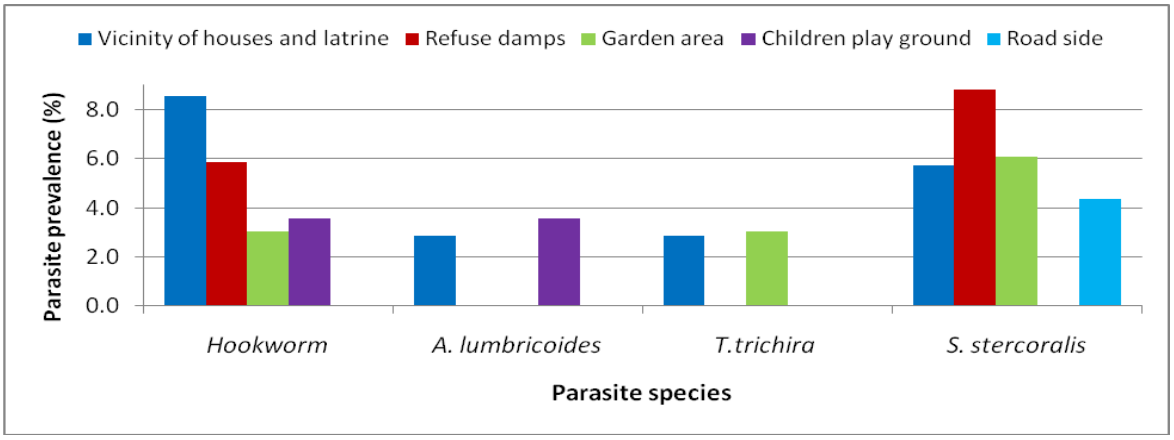


Figure 6: Prevalence of STHs and other Intestinal Parasitess in dfferent types of soil samples, Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia

CHAPTER SIX

6. DISCUSSION

6.1. Prevalence of STHs

This study is the first to provide information on the assessment of prevalence and intensity of STHs infection with knowledge, attitude and practice and soil contamination rate among model and non-model HHs in selected four kebeles of Seka Chekorsa woreda, Jimma zone, southwest Ethiopia.

Regardless of the intensive efforts to control, the STHs overall prevalence in the study area before and after implementation of the health extension program was unknown. The overall parasitic infection among model and non-model HHs in this rural community was found to be 34.3%in the age group 2 to70 years old, probably due to the endemicity of the parasites, the effect of HSEP and the predisposing factors in this study area. Slight difference was observed among male and female's infection prevalence.This indicates a similar exposure risk of both sexs to infection by these helminths. For STHs, the over all prevalence among both statuses of HH members were (32.2%) and male and females infection prevalence was also shows slight difference, (47.2%) and (52.8%) respectively. The more affected age groups by STHs among model and non-model HH heads in the study areas were >15 years followed by age groups of 5-15 years, this may be due to their exposure of contact with soil during farming.

Several studies conducted in different countries found different result of overall prevalence from the present study. InShuar communities in the Ecuadorian Amazon (65%), in Amazonian southern border of Ecuador, analysed at HHs level, (72.9%) and at individual levels (46.9 %), among residents of Era-Awori village located in a Lagos suburb, South West Nigeria (83.3%), in Cameroon, (32.5%), in Bushullo village, southern Ethiopia, (67.3%), around Gilgel Gibe Dam, Southwest Ethiopia; (52.1%) had shown overall higher prevalence than the present study (19-27). This is due to the effect of training on packages, predisposing factors and endemicity of parasites in the study areas.

Regarding species specific, report of different studies in comparison with the present study, lower prevalence of *T.trichiura (*21.6%), *A.lumbricoides* (6.4%), hookworm (2.1%), than a study conducted among geographically and economically distinct Shuar communities in the

Ecuadorian Amazon, *A.lumbricoides (*48 %) and *T. trichiura (*38%), were observed. In two indigenous communities of the Amazonian southern border of Ecuador, higher prevalence of *A.lumbricoides,* (19.5%) and hookworms (7.6%) but relatively lower prevalence of *T.trichiura* (18.9%) and with higher an overall STH prevalence (32.5%) across the four regions of Littoral, North-West, South and South-West Cameroon were observed.

Higher prevalence also observed in a Lagos suburb, South West Nigeria, an overall prevalence (83.3%), *A.lumbricoides* (67.7%), hookworm (45.0%), *T. trichiura (*31.3%) and *S.stercoralis (*18.0%), in 19 States and the FCT, Nigeria, higher hookworm (47%) and *A. lumbricoides (*42%) and lower *T. trichiura (*11%), and also in the eleven communities in Nsukka zone, Enugu state, Nigeria, higher hookworm (52.8%) and *A.lumbricoides* (74.3%), and in Ethiopia in Bushullo village, southern Ethiopia, higher overall infection rates of *T. trichiura* (41.5%), *A.lumbricoides* (37.2%) and hookworm infection (28.4%) than the present study(19-25).

The above all variation in distribution of the STHs in different studies localities might be due to environmental, socio-demographic and socio-economic factors that favor the transmission cycle of the parasites and the amount of sample size taken,egg output variation, the method applied, training on packages, KAPs of communities on STHs and study population involved.

The presence of multiple parasites in the same host is slightly widespread in the study area which is not exceptional in many tropical and sub-tropical regions of the world in which polyparasitism are still common, even though varying in parasite species composition.The maximum number of parasite species found in the same host in the present study was three, (0.2%). The polyparasitism in the present study area and previously conducted in different areas showed that, the difference might be due to the interconnection of immunological level and exposure practice of an individual.

6.2. Intensity of STHs

The present study implied that the intensity level of STHs as it is related to morbidity, *T.trichiura* infection was highly prevalent in the study population with intensity ranging from light to moderate among model and non-model household members. *A. lumbricoides* showed light to heavy intensity infection from model and non-model household members. Intensity

infection of hookworm species revealed only for light intensity infection from model and from non-model HHs.

Among geographically and economically distinct shuar communities in the Ecuadorian Amazon, most of the individuals infected with *A. lumbricoides* had moderate intensity (51%) higher than the present study, and 4.0% had heavy intensity infections the same to the present study. Similarly, most of the individuals infected with *T. trichiura* had light-intensity (91.0%), a few had moderate intensity infection, and (9.0%) had lower intensity infection than the present study (19).

The intensity level difference may be due to frequent exposure practice to the source of infection, difference in treatment seeking behavior, difference in KAPs of study participants, risk groups with age and immunological difference.

6.3. KAP Assessments

In the present study the KAPs of HH heads were assessed to wards STHs transmission, signs and symptoms, effects on people's health, cause of infection, prevention and consequences. It was found that majority of the HH heads (65.8%) knew about STHs from the information sources of health extension workers, health institution, school, mass media and other people.

In the present study the KAPs of the HHs heads were higher when compared to participants of Orang Asli in rural Malaysia, (61.4%) of HHs know about the intestinal worms, their main source of information was the clinic, and majority of them could not remember the source of information.The main signs and symptoms were abdominal pain and abdominal distension followed by diarrhoea, loss of appetite, and vomiting.The difference with the present study may be due to the level of the KAPs of HH heads respondent involved in the study.

The level of awareness among parents of pre-school age children of coastal region, Kenya, majority of them could identify the various types of worms like H.worms, round worms and tapeworms and minority of the participants had never heard about STHs at all than the present study.

Awareness on mode of transmission, most of the participants reported that the disease was caused by walking bare footed, drinking untreated water, eating soil, open defecation, in the present study the perceived cause of symptoms were consumption of under cooked meal, drinking untreated water, walking barefooted, consumption of spoilt meal, lack of hygiene.

Majority of them had knowledge on signs and symptoms like weight loss, abdominal pain, diarrhoea, vomiting, lack of appetite and craving for soil, but in the present study, HH heads KAPs on signs and symptoms of STHs were abdominal pain, diarrhea, vomiting and nausea, and loss of appetite.

With regard to ways of preventing infection with STHs, majority of them indicated that washing hands, wearing protective clothing while farming, drinking boiled or treated water, proper human waste disposal, treatment with drugs, general personal hygiene, wearing shoes, health education, building and using latrines would help in combating the infection as in the present study de-worming, washing hands before eating & after defecation, wearing shoes, and boiling drinking water were the main preventing way.The slight differces may be the effect of health extension workers and the level of KAPs of communities on STHs.

The main aims of the health extension program is to increase public access to basic health services mainly by producing model HHs through providing training on the 16 packages and strengthen through home visiting by HEWs. Out of 16 packages, the seven sub-packages are under hygiene and environmental sanitation: excreta disposal, solid and liquid waste disposal, water supply and safety measures, healthy home environment, control of insects and rodents, food hygiene and safety measures and personal hygiene. All these are essential in prevention and control of STH infection among the community if the community effectively apply in their health care activities.

The prevalence of STHs among model and non-model HHs positive for STHs showed statistical significant association. This implied that the implementation of health extension packages and the effect of HEWs among communities were very crucial to improve the health status of the communities. Visiting of HHs by HEWs positive association was demonstrated in the study conducted on the utilization of the HEP and concluded that continuous home visits and follow up of HHs strengthen the information and the implementation of the health extension program.

6.4. Soil Contamination Rate

Several studies conducted on contamination of soils in different countries found different result of overall and species specific prevalence of STHs in soil sample from the present study.The overall STHs among model and non-model villages in this rural community was found that 12.4% from five different sites. In non-model villages, the soil contamination rate was higher 16 (10.4%) as compared to model villages 03(2.0%). All areas of soil samples collected were contaminated with different species of STHs with different contamination rates were observed.

Contamination of soil with STH eggs in Kathmandu Valley and outside of Valley in Nepal was 36.5%, in urban and periurban areas of Ebonyi State in Nigeria was 30.7% with different species of parasites, hookworms (6.3%), *A.lumbricoides* (8.0%), *S. stercoralis* (5.7%), *T.trichiura* (4.7%)(30), in Sanliurfa, Turkey environmental pollution with STHs was 84.4%, *Ascaris* eggs were more dominant in which garden soils were found more polluted, within HHs in rural Kenya,the prevalence was 15.5%, *A.lumbricoides* was the most prevalent in all samples (11.6%), followed by *T.trichiura* (4.7%) and H.worm species (0.8%)(32) , 55.9% within Ibadan metropolis in Oyo State, south western Nigeria, H.worm (37.3%), *S. stercoralis* (20%), *A. lumbricoides* (17.3%), *T. trichiura* (6.7%) were identified, 49.01% in soil Samples of Vegetable Field of Bhaktapur District, Nepal, *A. lumbricoides* was found in the highest number followed by *S.stercoralis*, had over all higher prevalence than the present study(28-34).

A study conducted on soil contamination among government and private school in Jimma town, was 11.25% has less contamination rate than the present study (29). These differences might be due to the season of soil samples collected, improvement in the living standards, use of toilet, proper disposal of human excreta instead of using as fertilizer, awareness creation, impact of health extension workers on health information, and waste disposal system of the study area.

Strength and Limitation of the study

Strength of the study

This study is the first of its kind in this locality focused on the communities in rural area; encouraged government currently introduced health extension packages, identified the health status of model and non-model HHs and includes all age groups of both sexes of the selected study area.

Limitation of the study

The study was limited to single sample collection per study participants (single wet mount & Kato-Katz examination). This may lead to underestimation of infection prevalence and intensities.

The other weakness is since this study was done only in four Kebeles from total of 36; this may be lack of representativeness to the whole Seka Chekorsa Woreda communities. Therefore, it must be necessary for the continuation of the study to obtain an accurate data reflecting the whole community in the Woreda to understand the KAPs of HHs, prevalence, intensity and predisposing factors of the STHs infection and the rate of contamination of soils. There was lack of baseline information about prevalence and intensity of STHs infections before the implementation of the HEP, and we could therefore not measure the actual contribution of the HEP to STHs infection from the base line.

CONCLUSION AND RECOMMENDATION

Conclusion

This study implies that STHs infection is a health problem deserves a serious concern and shows endemic situation of the study area. The prevalence of these STHs infection reported in this study revealed the difference in training on HSEPs among model and non-model HHs, poor personal related hygiene and environmental contamination as a public health problem.

The STHs prevalence in the age groups >15 years in the study area is an indication that younger study subjects are more exposed since they usually have a close contact with soils.

The overall intensity of this study revealed that light to heavy infection of helminths, Light intensity infection may favour the spread of infection as individual usually have no symptoms and put the community continues to have persistently high levels helminthic infection and also a moderate intensity of infection may result in delayed physical growth and impaired cognitive development.

Model HHs are early adopters of the health extension program than non-model HHs, in the present study there is significant association between them in related to STHs infection and the impact of HSEPs implemented by model HH villages clearly showed the difference among them.

Concerning the soil contamination rate, of non-model HH villages their soil were more contaminated with different species of STHs and also there is enormous KAP level difference about STHs among them.

The associated risk factors (predictors) of STHs infection identified in this study area were the status of HHs and their villages, their KAPs about STHs, personal and environmental sanitation, training given on HSEPs, etc contributes for the prevalence and spread of STHs and also for the contamination of soil. So the application of health extension programs in communities must be enforced by a health education program and it should be intensively continued.

The data obtained from this study provides information on epidemiological status of the STHs infection, associateed risk factors, and the rate of contamination of soil by STHs and the level of the KAPs of HHs in relation to STHs.

Recommendation

Proper intervention methods that should include community based deworming, health education, personal and environmental hygiene, health extension package programs are recommended with the relevant health agencies stakeholders, Jimma Zone health Bureau and Seka Chekorsa woreda health Bureau to come to the support in control of the STHs infection among these rural communities whom depend on farming as a main source of income.

Providing proper guidelines on improving the KAP of the community should be recommended for the health extension workers towards STHs prevention and control. Health extension workers services provision in related to STHs and regular scheduled intensive follow up in visiting households to look over practical application of the package in related to environmental sanitation and hygiene. And also the predictive spread of the STHs infection in the areas observed in this study will assist in planning targeted control and intervention programmes.

Considering the soil contamination rate with parasitic helminth eggs, measures in improving the basic environmental and sanitary conditions through a comprehensive community oriented health education program together with a periodic deworming is indicated. A standard method for enumerating STH in soil will allow comparison of the prevalence and risk factors of soil contamination with STH across different settings, e.g. household sanitation practices (presence and type of latrine, management of child feces), community-level practices (presence of open drains, locations where fecal sludge is disposed), and environmental effects. Soil contamination measurements can also be an effective tool for evaluating interventions aimed at reducing STH transmission.

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ANNEXES

Annex I: -Kato-Katz technique

Kato Katz technique is used for qualitative and semi-quantitative diagnosis of intestinal helminthiasis caused by *A. lumbricoides*, *T. trichiura*, H.Worm and Schistosoma species.WHO has recommended Kato Katz technique in areas with moderate to high transmission rates of STH (i.e. where the proportion of infected individuals is >20– >50%) or intestinal schistosomiasis (>10–50%).

Materials-Kato-set (Template with hole, screen, nylon or plastic, plastic spatula), Newspaper or glazed tile, Microscope slides, Cellophane as cover slip soaked in Glycerol-malachite green or glycerol methylene blue solution, Fresh stool, Gloves

Procedure

1. Households randomly selected in each village were interviewed.
2. The inclusion and exclusion criteria were looked over intensively.
3. If he/she fulfilled the criteria, instructed clearly how to collect the specimen.
4. Sufficient amount of stool specimen was collected from each participant using a leak proof, tightly corked plastic container and also protected from direct sun light & moisture.
5. A glass slide was labeled with the sample number and a plastic template was placed.
6. A small amount of the faecal sample was placed on a newspaper &a piece of nylon screen was pressedon top. Using a spatula, the sieved faecal material was scraped.
7. Some of the sieved faeces were scraped up to fill the hole in the template, avoiding air bubbles and levelling the faeces off to remove any excess.
9. One piece of the cellophane was placed, which has been soaked overnight in Glycerol-malachite green solution, over the faecal sample.
10. A clean slide was placed over the top and pressed evenly downwards to spread the faeces in a circle.The slide was carefully removed by gently sliding it sideways to avoid separating the cellophane strip. The slide was placed with the cellophane upwards. The slide was read within 30–60 minutes to check for the presence of hookworms.
11. The slide was placed under a microscope and the whole area was examined.
12. The number and type of each egg of each species on a recording form were recorded.
13. Finally, the number of eggs were multiplied by the appropriate number to give the number of EPG – the standard measurement to assess the intensity of infection(47)

Annex II: - Methods of detecting STHs in Soil sample

Most methods used for the detection and quantification of STHs in environmental samples (wastewater, sludge, compost, soil, vegetables etc.) involve the recovery of STHs eggs from the sample matrix and quantification of STHs eggs or larvae using microscopy.

ZincSulphate flotation technique procedure

About 1gram of soil was thoroughly mixed in 10 ml distilled water. The coarse particles are removed by straining through gauze. The filtrate is poured into 15ml conical centrifuge tube and centrifuged at 2500 r.p.m. for 1 minute. The supernatant fluid is poured off and distilled water is added to the sediment. It is shaken well, centrifuged and the process is repeated 2 or 3 times till the supernatant fluid is clear. The clear supernatant is poured off and 3-4 ml of zinc sulphate (specific gravity 1.18) is added to the sediment and more zinc sulphate solution is added to fill the tube up to the top and centrifuged again at 2500 r p m for 1 minute. With a platinum wire loop sample is taken from the surface, on to a clean glass slide, a coverslip is put on and examined under the microscope(5).

Materials -Zinc sulphate, distilled water, gauze, 15ml conical tube, centrifuge, wire loop, glass slide andcoverslip.

Annex III: -Questionnaire (English Version)

Jimma University, Institute of Health, Faculty of Health Sciences, School of Medical Laboratory Sciences.

Questionnaires to assess associated risk factors for STH infection with KAPs among model and non-model households in selected kebeles of Seka Chekorsa woreda, Jimma zone, southwest Ethiopia, 2018.

Introduction

Hello? I am ----------from Jimma University, I am here with my colleagues to study about soil transmitted helminths.

The main objective of this study is to determine the epidemiology of STH infection with KAPs among model and non- model householdsof Seka Chekorsa woreda, Jimma zone, Oromia region, southwest Ethiopia. If you agree, I would like to obtain stool specimens in plastic sheet from you, which would be used only to detect the presence of intestinal helminths. Youwill not get any risk if you participate in the study. When you will found to be positive for intestinal helminths, you will receive standard drugs free of charge. The information in your records is strictly confidential. Your participation in this study is completely voluntary and you can refuse to participate or free to withdraw yourself from the study at any time. Refusal to participate will not result in loss of medical care provided or any other benefits.

Do you understand what has been said to you? If you have question, you have the right to get proper explanation. We thank you in participation in the study.

Are you willing to participate in the study? 1. Yes 2. No

Name of participant_____

Name of the interviewer_____

Name of Supervisor _____

Model or non- model HHs code_____

Date_____

An interviewer guided questionnaire for risk factor assessment to STH infection with KAPs among model and non- model households in Seka Chekorsa woreda, Jimma zone, south west Ethiopia,2018.

Questionnaire part I: -Socio-demographic characteristics of the households.

S. No	Questions	Responses	Remark
101	Age		
102	Sex	1. Male 2. Female	
103	Marital status	1. Single 2. Married 3. Widowed 4. Divorced	
104	Family size	1. ≤5 2. >5	
105	Educational status	1. Cannot read & write 2. Read&write only 3.1st cycle 4.2nd cycle 5. Secondary and above	
106	Occupational status	1. Housewife 2. Governmental 3. Dailylaborer 4. Merchant 5. Farmer 6. Student 7. Others, specify	
107	Address	1. BuyoKechema 2. Kusaro 3.AndodeAlaga 4. Meti	
108	Did you trained on packages?	1. Yes 2. No	

Questionnaire part II: -Socio-economic conditions of the households.

201	Family income		
202	Do you have the following items?	1. Radio 2. Television 3. Cell phone 4. Tape recorder 5. Others, specify	
203	Type of house	1. Mudplasterd 2. Stone walls 3. Break walls 4.Others	
204	House floor type	1. Earthen 2. Cement 3. Breaks 4. Others, specify	
205	Household crowded	1. Yes 2. No	

Questionnaire part III: Questionnaire used to assess some associated factors related to STH.

301	Do you have latrine?	1. Yes 2. No	
302	Latrine usage pattern	1. Always 2. Sometimes 3. Never	
303	Distance of Latrine from house		
304	Availability of latrine lid	1. Yes 2. No	
305	If no, for Q 301, where do you use?	1. Open field 2. Communal	
306	Hand washing facility around latrine?	1. Yes 2. No	
307	Open Defecation Free (ODF)	1. Yes 2. No	
308	Human excreta used as a fertilizer?	1. Yes 2. No	
309	Source of drinking water	1. Pipe 2. River 3. Spring 4. Others, specify	
310	How do you use drinking water?	1. Direct 2. Boiling 3. Filtering 4. Chlorine treated	
311	Hand washing habit	1. Yes 2. No	
312	Shoe wearing habit	1. Yes 2. No	
313	Presence of dirt in finger nail	1. Yes 2. No	
314	Improved sanitation	1. Yes 2. No	
315	Dry waste disposal system	1. Pit 2. Open field 3. Others, specify	
316	Liquid waste disposal system	1. Pit 2. Open field 3.Toilet 4. Others	
317	Kitchen site	1. Inside home 2. Separate 3. Others, specify	
318	Is there separated room for animals?	1. Yes 2. No	
319	If yes for Q 319, which animals?	1. Dog 2. Cat 3. Ruminants 4. Non-Ruminants 5. Others, specify	
320	Travel history to other villages?	1. Yes 2. No	
321	If yes for Q 324, when?	1. Within this month 2.1-3 months 3. Before 3 months	

Questionnaire part IV: Questionnaire intended to analyse KAPs related to STHs.

401	Do you know about STHs?	1. Yes 2. No	
402	If yes for Q401, where did you get the information?	1. Health Institution 2. HEWs 3. Mass media 4. School 5. Other people 6. Do not remember	
403	What do you think the signs & symptoms of STH?	1. Abdominal pain 2. Abdominal distension 3. Diarrhoea 4. Vomiting 5. Nausea 6. Loss of appetite 7. Body weakness 8. Worms in Stool 9. Do not know	
404	How could STH be transmitted?	1. Eating contaminated food 2. Dirty hands 3. Walking barefooted 4. Drinking untreated water 5. Playing with soil 6. Eating soil (geophagy) 7. Do not know	
405	What is the possible prevention for the STH?	1. De-worming 2. Washing of hands before eating and after defecation 3. Wearing of shoes when outside of home 4. Boiling of drinking water 5. Do not know	
	Attitude & perceived practices towards STH		
406	What do you think of Effects of STH?	1. Harmful to peoples' health 2. Beneficial to peoples' health 3. Do not know	
407	Could faeces be a source of infections?	1. Yes 2. No 3. Do not know	
408	Perceived cause of symptoms?	1. Consumption of under cooked meal 2. Drinking of untreated water 3. Walking bare footed outside the house 4. Consumption of spoilt meal 5. Lack of hygiene 6. Do not know	
409	Practices	1. Hand washing before eating 2. Hand washing after defecation 3. Boiling of drinking water 4. Wearing shoes outside the house 5. Cutting fingernails regularly 6.Washing vegetables & fruits before eating 7. Seeking Rx for diarrhoea & abdominal pain 8. Others (specify)	
410	Place of treatment	1. Health institution 2. Traditional healers 3. Door-to-door sellers 4. Family 5. Others(specify)	
411	Type of treatment	1. Pharmaceutical medicine 2. Drugs sold on street markets 3. Traditional medicine 4. Others(specify)	

Annex IV: Consent Form

Name of the participant----------Code number----------
Age----------Sex----------Kebele----------Model/Non-model HHs----------
Investigators Name----------Date----------

I am _____ a post graduate student from Jimma University, Institute of Health, Faculty of Health Sciences and School of Medical Laboratory Sciences.

I am here to study the prevalence and intensity of STHs infectionwith KAPs among model and non-model HHs of selected kebeles of Seka Chekorsa woreda, Jimma zone.

This study is going to determine the prevalence and intensity of STH infection with KAPs and associated risk factors among model and non-model HHs of selected kebeles of Seka Chekorsa woreda, Jimma zone, Southwest Ethiopia.

The study findings would also be used to design and implement control strategiesin this woreda in the future by concerned body or by any volunteer. The research results willbe disseminated through publication and in a thesis for academic purpose.

Please note that your participation in this study is entirely voluntary and you have a right torefuse to participate. If you agree to take part, you have the right to withdraw from study atany time if you wish to do so, without giving a reason. Your decision to withdraw will not affect anything on the relationship between you and me or any other person who is involved inthis study.

If you agree to participate in this study there may be direct and indirect benefit to you. These areif you will be found either infected with any of the STH or other intestinal parasite; you will get the appropriate treatment free of charges. Also participating in the study assists in thedetermination of the level of infection in this community, this information will help indeveloping appropriate control measures for the parasites in the district.There are no physical risks associated with this study.All information collected from this study will be kept confidential and no one will be told onwhat you have said your identity and laboratory findings of the sample taken from you.

If you have questions about this study, you have the right to ask and get clarification.

Do you agree?

My questions have been answered. I agree to participate in this study.

Signature of participant.....Date.....

Signature of Investigator.....Date.....

Annex V: Questionnaire (Amharic Version)

ጅማ ዩኒቨርሲቲ የጤና ኢንስቲትዩት ጤና ሳይንስ ፋካልቲ የህክምና ላቦራቶሪ ሳይንስ ት/ቤት

በሰቃ ጨቆርሳ ወረዳ፣ ጅማዞን፣ደቡብምዕራብ ኢትዮጵያ በተመረጡ ቀበሌዎች መካከል የሚገኘውን በአፈር አማካኝነት ወደ ሰው የሚተላለፉ ትላትሎችና ለስርጭታቸው አስተዋጽኦ የሚያደረጉትን ለማጥናት የተዘጋጀ መጠይቅ፡፡

<u>መግቢያ</u>

አኔ_____ከጓደኞቼ ጋር በአፈር አማካኝነት ወደ ሰው የሚተላለፉ ትላትሎችን ለማጥናት ከጅማ ዩኒቨርሲቲ መጥተናል፡፡

የጥናቱ ዋና ዓላማ በሰቃ ጨቆርሳ ወረዳ፣ጅማዞን፣ኦሮሚያ ክልል ደቡብ ምዕራብ ኢትዮጵያ በአፈር አማካኝነት ወደሰውየሚተላለፉትላትሎችስርጭታቸውንለመወሰንነው፡፡

ይህ መጠይቅ ለስርጭታቸው አጋላጭ ምክንያቶችን ለመወሰን ይረዳል፡፡

ከተስማሙ የሰገራ ናሙና በዚህ ዕቃ ከእርሶ ወስጄ የአንጀት ጥገኛ ትላትሎች መኖራቸውን እመረምራለሁ፡፡በዚህ ተሳትፎ ምንም ጉዳት አያገኞትም፡፡እነዚህ ትላትሎች ከተገኘቦት መድሐኒት በነፃ ያገኛሉ የሚሰጡን መረጃ በሚስጥር ይያዝሎታል፡፡ በዚህ ጥናት ላይ ተስትፎ በፍቃደኝነት ስለሆነ እምቢ ማለት ወይም በፊለጉ ጊዜ ማቋረጥ ይችላሉ ፡፡ የእርሶ ከተሳትፎ ማቋረጥ የተዘጋጀውን ህክምና ወይም የተለያዩ ጥቅሞችን አያሳጣም፡፡ያልኩትን በሙሉ ተረዱ? ጥያቄ ካሎት ትክክለኛ ገለፃ ማግኘት መብት አለዎት፡፡ስለተሳትፎዎ እናመሰግናለን፡፡

በጥናቱ ላይ ለመሳተፍ ፍቃደኛ ነዎት? 1. አዎ 2. አይደለም

የተጠያቂውስም_____
የጠያቄውስም፡_____
የተቆጣጣሪውስም፡_____
የቤተሰቡመለያቁጥር፡_____
ቀን:_____

መጠይቅ ክፍል አንድ፡ማህበራዊና ሥነ-ህዝባዊ መረጃዎች

ተ.ቁ	ጥያቄ	መልስ	ምርመራ
101	ዕድሜ		
102	ፆታ	1.ወንድ 2. ሴት	
103	የጋብቻሁኔታ	1. ያላገባ (ች) 2. ያገባ (ች) 3. ባልየሞተባት/ሚስትየሞተችበት 4. የተፋቱ	
104	የቤተሰብቁጥር	1.Error! Reference source not found. 2.Error! Reference source not found.	
105	የትምህርትሁኔታ	1.ማንበብናመፃፍየማይችሉ 2. ማንበብናመፃፍብቻየሚችሉ 3. 1ኛደረጃ 4. 2ኛደረጃ 5. ከፍተኛ	
106	የሥራሁኔታ	1.የቤትእመቤት 2. የመንግስትሰራተኛ 3. የቀንሰራተኛ 4. ነጋዴ 5. ገበሬ 6. ተማሪ 7. ሌሎች (ይገለጽ)	
107	አድራሻ	1.ቡዩቀጨማ 2. ኩሳሮ 3. አንዶዬአላጋ 4. ሜጢ	
108	በፓኬጁላይስልጠናወስደዋል?	1.አዎ 2. አይደለም	

መጠይቅ ክፍል ሁለት: ማህበራዊና ምጣኔ ሀብታዊ መረጃዎች

201	የቤተሰብ ገቢ		
202	የሚከተሉትነገሮችአለዎት?	1.ሬድዮ 2. ቴሌቪዥን 3. ተንቀሳቃሽስልክ 4. ቴፕ 5. ሌሎች	
203	የቤቱ አይነት	1.በሞቃየተመረገ 2. ከድንጋይየተሰራ 3. ከጡብየተሰራ 4. ሌሎች(ይገለጽ)	
204	የቤቱ ወለል አይነት	1.አፈር 2. ሴሚንቶ 3. ጡብ 4. ሌሎች (ይገለጽ)	

መጠይቅ ክፍል ሦስት፡በአፈር አማካኝነት ለሚተላለፉ ትላትሎች አጋላጭ ምክንያቶችን የሚዳስስ

301	መፀዳጃ ቤት አለዎት?	1.አዎ 2.አይደለም	
302	የመፀዳጃ ቤት አጠቃቀም ልማድ አለዎት?	1.ሁልጊዜ 2.አልፎአልፎ 3.በፍፁምአልጠቀምም	
303	የመፀዳጃ ቤት ከመኖሪያቤት ርቀት		
304	መፀዳጃ ቤቱ ክዳን አለው?	1.አዎ 2. አይደለም	
305	ለጥያቄ ቁ.301 አይደለም ከሆነ የት ይጠቀማሉ?	1.ሜዳላይ 2. በህዝብሽንትቤት	
306	መፀዳጃ ቤቱ አካባቢ የእጅ መታጠቢያ አለ?	1.አዎ 2. አይደለም	
307	ሜዳ ላይ ከመፀዳዳት ነፃ ነዎት?	1.አዎ 2. አይደለም	
308	ከሰው የሚወጣውን እዳሪ ለመዳበሪያነት ይጠቀማሉ?	1.አዎ 2. አይደለም	
309	የመጠጥ ውሀ ምንጭ	1.ቧንቧ 2. ወንዝ 3.ምንጭ 4. ሌሎች(ይገለጽ)	
310	የመጠጥ ውሀን እንዴት ይጠቀማሉ?	1.በቀጥታ 2. በማፍላት 3. በማጣራት 4.መድሐኒትበመጨመር	
311	እጅ የመታጠብ ልምድ አለዎት?	1.አዎ 2. አይደለም	
312	ጫማ የማድረግ ልማድ አለዎት?	1.አዎ 2. አይደለም	
313	በእጅ ጣት ጥፍር ውስጥ ቆሻሻ አለ?	1.አዎ 2. አይደለም	
314	አጠቃላይንጽህና	1.አዎ 2. አይደለም	
315	የደረቅ ቆሻሻ አወጋገድ ዘዴ	1.ጉድጓድውስጥ 2.ሜዳላይ 3. ሌሎች (ይገለጽ)	
316	የፍሳሽ ቆሻሻ አወጋገድ ዘዴ	1.ጉድጓድውስጥ 2.ሜዳላይ 3.ሽንትቤትውስጥ 4.ሌሎች (ይገለጽ)	
317	የማዕድ ቤት ቦታ	1.ቤትውስጥ 2. ለብቻ 3. ሌሎች (ይገለጽ)	
318	ለእንስሳት የተለየ ቤት አለ?	1.አዎ 2. አይደለም	
319	ለጥያቄ ቁ.319 አዎ ከሆነ ለየትኞቹ?	1.ውሻ 2.ድመት 3. ለሚያመነጭኩ 4.ለማያመነጭኩ	
320	ወደሌላ ስፍራ ሄደው ያውቃሉ?	1.አዎ 2. አይደለም	
321	ለጥያቄ ቁ.320 አዎ ከሆነ መቼ?	1.በዚህ ወር ውስጥ 2. ከ1-3 በለው ወራት ውስጥ 3. ከ3 ወር በፊት	

መጠይቅ ክፍል አራት: በአፈር አማካኝነት ለሚተላለፉ ትላትሎች የሰዎች እውቀት፣ ሃሳብና ሙከራን የሚዳስስ መጠይቅ

401	በአፈር አማካኝነት የሚተላለፉ ትላትሎችን ያውቃሉ?	1. አዎ 2. አይደለም	
402	ለጥያቄ ቁ. 401 አዎ ከሆነ መረጃውን ከየት አገኙ?	1. ከጤና ተቋማት 2. ከጤና ኤክቴንሽን ሠራተኞች 3. ከመገናኛ ብዙሃን 4. ከት/ቤት 5. ከሌሎች ሰዎች 6. አያውቁትም	
403	በአፈር አማካኝነት ስለሚተላለፉ ትላትሎች ስለምልክታቸው ምን ያስባሉ;	1. የሆድ ህመም 2. የሆድ መንፋት 3. ተቅማጥ 4. ማስታወክ 5. ማቅለሽለሽ 6. የምግብ ፍላጎት ማጣት 7. ድካም 8. በሰገራ ውስጥ ትላትል ማግኘት 9. አያውቁትም	
404	እነዚህ ትላትሎች እንዴት ይተላለፋሉ;	1. የተበከለ ምግብ 2. በቆሻሻ እጆች 3. ባዶ እግር 4. ንፅህናው ያልተጠበቀ ውሃ 5.በአፈር በመጫወት 6. አፈር በመብላት	
405	መከላከያዎች ምንድናቸው;	1. መድኃኒት በመውሰድ 2. ከምግብ በፊትና ከመፀዳጃ መልስ እጅ በመታጠብ 3. ከቤት ውጭ ጫማ በማድረግ 4. የመጠጥ ውሃን በማፍላት 5. አያውቁትም	
406	የእነዚህ ትላትሎች ውጤት ምን ይመስልዎታል	1. ለሰዎች ጤና ጎጂ ናቸው 2. ለሰዎች ጤና ጠቃሚ ናቸው 3. አያውቁትም	
407	ሰገራ ለዚህ በሽታ መንስኤ ይሆናል	1. አዎ 2. አይደለም	
408	ስለምልክቶቹ መንስኤ ያለዎት ግንዛቤ	1. በደንብ ያልበሰለ ምግብ መመገብ 2. ንጽህናው ያልጠበቀ ውሃ መጠጣት 3. ከቤት ውጪ ባዶ እግር መሄድ 4. የተበከለ ምግብ መመገብ 5.ንጽህና ማጣት 6. አያውቁትም	
409	ልምምዶች	1. ከመመገብ በፊት እጅ መታጠብ 2. ከመጸዳጃ በኃላ እጅ መታጠብ 3. የመጠጥ ውሃ ማፍላት 4. ከቤት ውጭ ጫማ ማድረግ 5. ሁል ግዚ የእጅ ጥፍር መቁረጥ 6. አትክልቶችንና ፍራፍሬዎች አጥቦ መመገብ 7. ለተቅማጥና ለሆድ ህመም መድኃኒት መውሰድ 8.ሌሎች	
410	ሕክምና ከየት ያገኛሉ	1. ከጤና ተቋማት 2. ከባህላዊ 3. ከአዟሪዎች 4. ከቤተሰብ 5. ሌሎች (ይገለፅ)	
411	የሕክምናው ዓይነት	1.ከፋርማሲ የሚገዙ 2. ከመንገድ ላይ የሚገዙ 3. ባህላዊ 4. ሌሎች (ይገለፅ) 5. አያውቁትም	

Annex VI: የስምምነትቅጽ

የተሳታፊውስም_____መለያቁጥር_____ዕድሜ__

_____ፆታ_____ቀበሌ_____ሞዴል/ሞዴልያልሆነ_____

የመርማሪውስም_____ቀን_____

አኔ_____ከጅማ ዩኒቨርሲቲ ጤና ኢንስቲትዩት ጤና ሳይንስ ፋካልቲ የህክምና ላቦራቶሪ ሳይንስ ት/ቤት የድህረ-ምረቃ ተማሪ ነኝ፡፡

በሰቃ ጨቆርሳ ወረዳ ጅማ ዞን በተመረጡ ቀበሌዎች መካከል በአፈር አማካኝነት ወደ ሰው የሚተላለፉ ትላትሎች ስርጭት እና መጠን ለማጥናት እዚህ እገኛለሁ፡፡ይህ ጥናት በዚህ ወረዳ ውስጥ ለበሽታው ስርጭትና መጠን አጋላጭ ምክንያቶች የሆኑትን ለመወሰን የሚረዳ ነው፡፡ወደፊትም ባለድርሻ አካላትና ፍቃደኛ በሆኑት በዚህ ወረዳ ውስጥ የበሽታውን የመካላከ ያስልቶችን ለመቅረጽና ስራ ላይ ለማዋል ይረዳል፡፡የጥናቱውጤትምታትሞለትምህርታዊዓላማየሚሰረጭይሆናል፡በዚህ ጥናት ላይ የእርስዎ ተሳትፎ በፍላጎት ስለሆነ እምቢ ለማለት መብት አለዎት ፡፡ ለመሳተፍ ፍቃደኛ ሆነውም ያለምንም ምክንያት በፈለጉ ጊዜ ማቋረጥ ይችላሉ፡፡ ለማቋረጥ የእርሶ ውሳኔ በግንኙነታችን ላይ ምንም ተጽእኖ አያመጠም፡፡ለመሳተፍ ፍቃደኛ ከሆኑ በቀጥታም ሆነ በተዘዋዋሪ ይጠቀማሉ፡፡ እሱም እነዚህ ትላትሎች ከተገኘቦት በነፃ ህክምና ያገኛሉ፡፡ ሌላም የእርሶ ተሳትፎ በዚህ ህብረተሰብ ውስጥ የበሽታውን መጠን ለመገመት እና ትክክለኛ የመከላከያ እርምጃዎችን ለመቅረጽ ያገለግላል፡፡ ከዚህ ጥናት ጋር ተያይዞ በእርሶ ላይ የሚያመጣ ተጽእኖ የለም፡፡ከእርሶ የሚገኘው መረጃ በሙሉ በሚስጥር የሚጠበቅ እና የምርመራ ውጤቶን ማንም ለሌላ የማይገልጽ ይሆናል፡፡ስለዚህ ጥናት ጥያቄ ካሎት መጠየቅ እና ገለፃ ለማግኘት መብት አለዎት፡፡ተስማማን?

ጥያቄዎች ስለተመለሱልኝ ለመሳተፍ ተስማምቻለሁ፡፡

የተሳታፊው ፊርማ_____ቀን_____

የመርማሪው ፊርማ_____ቀን_____

Annex VII: Questionnaire (Afan Oromo version)

Yunversiitii Jimmaa, Instiitiyutii Fayyaa, Faakaalitii Saayinsii Fayyaa, Mana Barumsaa Saayinsii Laaboraatorii Meedikaalaa.

Gaafannoo qo'annoo jirattota mana moodela fi moodela kan hintaane aanaa Saqqaa cokorsaa, zoonii Jimmaa, kibba-lixa Itiyoophiyaa, gandoota filataman giddutti waa'ee sababoota fafacaa'ina raamolee biyyoodhan daddarban fi yaada namootaa kan bara 2010 A.L.H tti.

Seensa

Haloo, ani…….Yunversiitii Jimmaa irraa, michootakoo waliin waa'ee raamolee biyyoodhan namatti daddarban qorachuf asitti argamna.

Kaayyoon inni guddaa qoranichaa waa'ee raamolee biyyoodhan daddarban fi yaada namoota jiraattota moodela fi moodela Kan hintaane giddutti aanaa Saqqaa cokorsaa, zoonii Jimmaa, naannoo Oromiyaa, kibba-Lixa Itiyoopiyaa giddutti murteesuf. Kanaafu gaafileen Kun sababoota raamolee Kun ittin fafacaa'an sakata'uufi.Yoo fedhii keessan ta'ee boolii guddaa xiqqoo isin irraa fudhadhee waa'ee raamolee kanaa sakata'a. Sababa hirmaattanif rakkoon kamille isin hinquunnamu.Yoo rammoon Kun isin irratti argamee kaffalti malee qoricha argattu. Odeeffannon Kun hunduu dhoksaadha eegama. Hirmaannan keessan fedhiidhan waan ta'eef diduu yookin yeroo barbaaddanitti addan kutuu ni dandeessu.Hirmaachu dhiisuun yaali kennamu ykn faayidaa adda addaa dhabuu miti.

Waanan isinitti hime hubattanii? Gaaffii yoo kabaattan, ibsa ga'aa argachuuf mirga qabdu. Hirmmanaakeessanif isin galateeffanna.

Qorannicha irratti hirmaachuf feetanii? 1. Eeyyee 2. Lakkii

Maqaa hirmaataa/ttuu_____

Maqaa qorataa_____

Maqaa to'ataa_____

Koodii moodela yookin moodela miti manichaa_____

Guyyaa_____

Gaafannoo sababoota fafacaa'ina raamolee biyyoodhan namatti daddarban mana moodela fi moodela miti giddutti aanaa Saqqaa Cokorsaa, zoonii Jimmaa, Kibba-Lixa Itiyoophiyaa, bara 2010A.L.H.tti to'achuf kan gargaaru.

Gaafannoo kutta I: Haala hawasa-dinagdee deebi kennaa

Lak.	Gaaffii	Deebi	Yaala
101	Umurii		
102	Saala	1. Dhiira 2. Dhalaa	
103	Haala gaa'elaa	1. Kan hinfuudhin/hineerumin 2. Kan fuudhe/eerumte 3. Kan duraa du'e/duute 4. Kan hike/hikte	
104	Baay'na maatii	1. ≤5 2. >5	
105	Haala Barumsaa	1. Dubbisuu/barressu kan hidandeenye 2. Dubbisuu fi barreesuu qofa 3. Sad. 1ffaa 4. Sad. 2ffaa 5. Sad. ol'aana	
106	Haala hojii	1. Haadha manaa 2. Kan mootummaa 3. Hojjetee bulaa 4. Daldalaa 5. Qotee bulaa 6. Barataa 7. Kan biraa(ibsa	
107	Teessoo	1. Buuyyoo qacamaa 2. Kusaaroo 3. Andoodee Allaggaa 4. Meexii	
108	Paakijiicha irratti leenjii fudhattaniittu?	1. Eeyyee 2. Lakkii	

Gaafannoo kutaa II: Dinag-hawaaslee deebi kennaa

201	Galii maatii		
202	Kanneen armaan gadii qabduu?	1. Raadiyoo 2. Televizyinii 3. Mobaayilii 4. Teepii 5. Kan biraa(ibsaa)	
203	Gosa mana jireenyaa	1. Dhoqeen kan dupaame 2. Mana dhagaa 3. Bilooketin kan ijaarame 4. Kan biraa (ibsaa)	
204	Gosa lafamanichaa	1. Biyyoo 2. Simmintoo 3. Xuubii 4. Kanbiraa(ibsaa)	
205	Baay'inan mana keessa jiraatuu?	1. Eeyyee 2. Lakkii	

Gaafannoo kutaa III: Gaaffilee sababoota raamolee biyyoodhan daddarban qo'atu.

301	Mana fincaanii qabduu?	1. Eeyyee 2. Lakkii	
302	Haala mana fincaanitti fayyadaman	1. Yeroo hundaa 2. Darbee darbee 3. Lakkii	
303	Fageenya mana fincaani mana irraa		
304	Manni fincaanichaa qadaada qabaa?	1. Eeyyee 2. Lakkii	
305	Gaaffii 301 yoo miti ta'e, eessati fayadamtu?	1. Bakkee 2. Kan gamtaa	
306	Mana fincaani biraa baka harka dhiqanna qabduu?	1. Eeyyee 2. Lakkii	
307	Bakkeetti boola'uu irraa bilisaa?	1. Eeyyee 2. Lakkii	
308	Boolii guddaa Xaa'oodhaf ni fayyadamtuu?	1. Eeyyee 2. Lakkii	
309	Bakka bishaan dhugaatii argattan	1. Qolka 2. Laga 3. Burqituu 4.Kanbiraa(ibsaa)	
310	Bishaan dhugaatii akkamiti fayyadamtu?	1. Akasumati 2. Danfisu 3. Calaluun 4. Kilooriinii itti naquun	
311	Barmata harka dhiqachu qabduu	1. Eeyyee 2. Lakkii	
312	Barmata kophee keeyachuu qabduu	1. Eeyyee 2. Lakkii	
313	Qeensa harkaa keesaa xuriin jiraa	1. Eeyyee 2. Lakkii	
314	Qulqulina(walii gala) qabduu	1. Eeyyee 2. Lakkii	
315	Haala kosii gogaa itti gatan	1. Boolla keesatti 2. Bakkeeti 3. Kan biraa(ibsaa)	
316	Haala kosii dhangaalaa itti gatan	1. Boolla keesatti 2. Bakkeeti 3. Mana fincaani keesatti 4. Kan biraa(ibsaa)	
317	Baka nyaata itti qopha'u	1. Mana keesa 2. Qophaatti 3. Kan biraa(ibsaa)	
318	Manni horii qophaatti jiraa?	1. Eeyyee 2. Lakkii	
319	Gaaffii 319fi yoo Eeyyee ta'e, horii warra kamiif?	1. Saree 2. Adurree 3. Warra alala guuran 4. Warra alala hinguurre 5. Kan biraa(ibsaa)	
320	Iddoo biraa deemtee turtee?	1. Eeyyee 2. Lakkii	
321	Gaaffii 324 fi yoo Eeyyee ta'e, yoom?	1. Ji'a kana keesa 2. Ji'a 1-3 giddutti 3. Ji'a sadii dura	

Gaafannoo IV: Gaaffilee raammocharatti beekumsa, yaada fi shaakala namootaa qo'atu.

401	Raamolee biyyoodhan daddarban ni beektuu?	1. Eeyyee 2. Lakkii	
402	Gaaffii 401fi yoo Eeyyee ta'e odeeffannoo eessaa argattan?	1.Dhaabbata Fayyaa 2.Hojjetoota exteenshiinii Fayyaa3.Midiyaa biyyaalesaa 4.Mana Barumsaa 5.Namoota biraa 6.Hinbeekan	
403	Waa'ee Mallattoo dhukubichaa maal yaadu?	1. Garaa dhukubbii 2.Garaa bokoksaa 3.Garaa kaasaa 4.Ol-deebisaa 5.Locaa 6.Fedhii nyaata dhabuu 7.Dadhabina qaamaa 8. Boolii keessatti rammoon argamu	
404	Raamoleen kun akkamiti daddarbu?	1. Nyaata faalame nyaachuu 2. Harka xurii 3.Miilla duwwaa deemuu 4. Bishaan hinqulqulaa'n 5.Biyyoodha taphachuu 6.Biyyoo nyaachuu	
405	Eeggannoon danda'aman malfa'i?	1. Daawwaa fudhachuu 2.Nyaata dura harka dhiqachu 3. Kophee keeyachuu 4.Bishaan danfisuu	
406	Bu'an dhukuba kana maali?	1. Fayyaa namootaatti miidha fida 2.Fayyaa namootaatif gargaraadha 3.Hinbeekan	
407	Booliin burkaa dhukuba kanati?	1.Eeyyee 2.Lakkii 3.Hinbeekan	
408	Sababni Mallattoo dhukubichaa maali?	1. Nyaata siritti hinbilchanne nyaachuu 2.Bishaan hinqulqulai'n dhuguu 3.Miilla duwwaa deemuu 4.Nyaata tortoraa nyaachuu 5.Qulqulina dhabuu 6. Hinbeekan	
409	Shaakala	1. Nyaata dura harka dhiqachu 2.Boolii booda harka dhiqachu 3.Kophee keeyachuu 4.Qeensa yeroo hundaa qorachuu 5.Kuduraafi fuduraa nyaachuu dura miicuu 6. Garaa dhukubbii fi garaa kaasaa fi yaalamuu	
410	Bakka wal'ansaa	1.Dhaabbata Fayyaa 2.Fayitootab aadaa 3.Bakkeeti warra gurguran bira 4.Maatii	
411	Gosa wal'ansichaa	1. Mana qoricha 2. Karaa irratti warra gurguran biraa 3.Qoricha aadaa 4.Kan biraa 5. Hinbeekan	

Annex VIII: Uunkaa Waliigaltee

Maqaa Hirmaataa/ttuu_____Lak.Koodii_____

Umurii____Saala_____Ganda_____Mana moodela/moodela miti_____

Maqaa qorataa_____Guyyaa_____

Ani_____barataa digirii lammaaffaa Jimmaa Yunversiitii, Instiitiyutii Fayyaa, Faakaalitii Saayinsii Fayyaa, Mana Barumsaa Saayinsii Laaboraatorii Meedikaalaa ti.

Waa'ee fafacaa'ina fi ulfaatina raamolee biyyoodhan namatti daddarban gandoota filataman aanaa Saqqaa Cokorsaa, zoonii Jimmaa keessa jiraattota mana moodela fi moodela miti ta'an giddutti qorachuf as jiraa.

Qorannoon Kun waa'ee fafacaa'ina fi ulfaatina raamolee biyyoodhan namatti daddarban fi sababootasaanii gandoota filataman aanaa Saqqaa Cokorsaa, zoonii Jimmaa keessa jiraattota mana moodela fi moodela miti ta'an giddutti murteessuf.

Argannon qorannoo kanaa aanaa kana keessatti tarsiimoo to'achuu saxaxu fi hojii irra olchuuf qaama ilaalatufi fedhii kan qaban hundaaf gargaara. Bu'an qorannoo kanaas karaa maxansaa fi qorannoo kaayyoo Barumsaa tiif Kan tamsaa'u ta'a.

Qorannoo kana irratti hirmaachuun keessan fedhiidhan wan ta'eef hirmaachuu dhiisuu ni dandeessu.Yoo barbaaddanimmoo yeroo fetanitti Sababa tokko malee addaan kutuuf mirga qabdu. Murteen addaan kutuu keessanii walitti dhufeenya nu gidduu jiru miidhuu hidada'u.

Qorannoo kana irratti hirmaachuu yoofeetan bu'aa kallattii fi kallattii kan hintaane argattu. Kunis yoo Raamoleen yookin maxantootin marrummanii isin irratti argamee, kaffalti malee qoricha argattu.Akkasumas sadarkaa dhukuba kanaa hawaasatti argamu murteesuuf gargaara, Odeeffannon kunis aanaa kana keessatti tarkaanfi to'anna gaarii uumuuf ni gargaara.

Qorannoo kanaan Kan walqabatee qaama keessan irratti homtuu hindhufu. Odeeffannon hundumitti asirra sasaabamu dhoksaatti ni eegama namni tokkollee isa isin jettan fi fakkisa bu'aa Laaboraatorii in himu. Gaaffii waa'ee qorannoo kanaa yoo kabaattan gaafattanii ibsa argachuuf mirga qabdu. Waligallee?

Gaaffiinkoo naaf deebi'eera. Qorannicha irratti hirmaachuf waliigaleera.

Mallattoo hirmaataa/ttuu_____Guyyaa_____

Mallattoo Qorataa_____Guyyaa_____

Annex IX: -Stool SampleLaboratory Result Reporting Format

Kebele----------Model/Non-model----------

Code	EPG, *A. lumbricoides*	EPG,*T. trichiura*	EPG, Hookworm species	Other IPs

Annex X: Soil sample Laboratory Result Reporting Format

Kebele----------Model/Non-model village----------

Code	Site	Type of soil	Time of collection	Parasitological finding

DEDICATION

I dedicated this thesis to my beloved families for their support and passionate partnerships in the successful completion of this academic undertaking.

DECLARATION

I, the undersigned, declare that this thesis is my original work and that all sources of materials used for this thesis have been duly acknowledged.This thesis has been submitted in partial fulfillment of the requirements for MSc degree at Jimma University and is deposited at the university library to be made available to borrowers under rules of the library. I solemnly declare that this thesis has not been presented within the same organization or in other universities, colleges or other institstution for the award of any academic degree, diploma, or certificate.

I agree to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and condition of the Institute of health in effect at the time of grant is forwarded as the result of this application.

Name of student	Sgnature	Date
Getachew Teshome	_____	_____

Approval of the Internal Examiner

This thesis has been submitted with my approval as University examiner

1. Mr. Tariku Belay (MSc, Assistant Professor)

Signature_____Date_____