JIMMA UNIVERSITY INSTITUTE OF HEALTH

SCHOOL OF GRADUATE STUDIES

PREVALENCE OF INTESTINAL PARASITE AND ASSOCIATED FACTORS AMONG FOOD HANDLERS WORKING IN MICRO ENTERPRISES OF JIMMA TOWN, SOUTHWEST ETHIOPIA.

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A RESEARCH REPORT TO BE SUBMITTED TO DEPARTMENT OF EPIDEMIOLOGY, PUBLIC HEALTH FACULTY, JIMMA UNIVERSITY IN PARTIALFULFILLMENT OF THE REQUIREMENTS FOR MASTERS OF PUBLIC HEALTH IN GENERAL PUBLIC HEALTH

DEC, 2018

JIMMA ETHIOPIA

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ABSTRACT

Background: High prevalence of intestinal parasitic infections and poly parasitism affect the health status of individuals mainly affecting physical and mental developments causing malnutrition, anemia, stunting, cognitive impairment, lowered educational achievement and interfering with productivity. However, the information on the prevalence of intestinal parasites and the associated factors especially in food handlers working in microenterprises in the study area is limited.

Objective: The objective of the study was to determine Prevalence of intestinal parasites and associated factors among food handlers working in micro enterprises of Jimma town.

Methods: A cross-sectional study design was conducted from March 1-26, 2018. Data were collected by face to face interviewer administered questionnaire. Fresh stool samples were collected from respondents and were examined microscopically for the presence of any of intestinal parasites using standard laboratory methods. Multivariable logistic regression model using Adjusted Odds Ratio (AOR) and 95% Confidence Interval (CI) was fitted to analyze the independent predictors of intestinal parasitic infections.

Result: - A total of 310 food handlers were participated in the study making the response rate 95%. From 310 study participants who participated in the study 118 were positive for one or more intestinal parasite/parasites making the prevalence 38.1%. G. lamblia was the most prevalent (11.9%) intestinal parasite followed by (9.4%) A.lumbricoides. among 118 positive food handlers, 7(2.3%) had mixed infections. Hand washing after using toilet with water only (AOR=3.67, 95% CI: 1.29-8.3), hand washing before food preparation with water only (AOR= 5.645, 95% CI: 1.902-16.749), and untrimmed finger nail (AOR= 4.68, 95 % CI: 2.157-10.165) were independent predictors of intestinal parasitic infection among the food handlers.

Conclusion:-This study revealed high prevalence of intestinal parasites among the study subjects**.** The study also identified factors such as habit of hand washing after toilet, hand washing before food preparation and untrimmed finger nail status that were associated with intestinal parasitic infection. Therefore health information on good hand washing technique, regular finger nail trimming are recommended to control the parasitic infection in food handlers.

Key Words: Intestinal parasite, Food handlers, microenterprises, Jimma town

Acknowledgment

First and foremost my deepest gratitude goes to God the Father, the Son and the Holy Spirit. Without GOD nothing happens.

My special thanks goes to Jimma University for their collaborative effort in facilitating MPH courses and support in availing all necessary materials and internet services to conduct this study.

My sincere and deepest gratitude goes to my advisors Abdulhalik Workicho and Mamo Nigatu for their unreserved assistance in giving me timely, constructive comments and relevant guidance during the development of this research thesis.

I would like to forward my thanks to Jimma town Health Bureau for provision of some materials necessary for this study and allowing me the laboratory during examination of my samples.

My deepest gratitude also goes to the urban food security and Job creation office of Jimma town for their cooperation and willingness to provide me valuable information and facilitating everything which I need during conducting this study.

I extend my deepest gratitude and appreciation to study participants, data collectors, and supervisor, my wife Bereket Getachew & my son Amen Afework for their patience & precious time they sacrificed, my friends and those whose names are not mentioned but contributed to the fulfillment of this study.

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ABBREVIATIONS AND ACRONYMS

AOR.....Adjusted Odds Ratio

BSc.....Bachelor of Science

CDC.....Centers for Disease control

CI ……Confidence Interval

COR…….Crude and Odds Ratio

DALYs…….Disability adjusted life years

FBD……...Food borne disease

GBD…….Global burden of diseases

gms.....Grams

IPI…….Intestinal parasitic infection

LMIC……Low and Middle Income Country

Neg.....Negative

NTDs.....Neglected Tropical Diseases

OR…… Odds Ratio

PI……Principal investigator

Pos. .....Positive

rpm..... Revolution per minute

SPSS ……..Statistical Products and Service Solutions

STH…….Soil transmitted helminthiasis

WHO ……World Health Organization

YLDs……Years lived with disability

CHAPTER ONE

1. INTRODUCTION

1.1 BACK GROUND

Intestinal parasite infections have been known to compromise the quality of human life since prehistoric times. Throughout the ages, human civilizations have fought against parasitism, including intestinal parasites (1).Intestinal parasitic infections caused by intestinal helminthes and protozoa are among the most common human infections endemic throughout the world especially in tropical and subtropical countries (2). Different species of intestinal parasites are responsible for majority of human infections resulting in considerable morbidity and mortality worldwide. Roughly, a quarter of the world's population is infected by one or other species of intestinal parasites (3).

Transmission of intestinal parasites affected directly or indirectly through objects contaminated with faeces. These include food, water, nails, and fingers, indicating the importance of faecal-oral human-to-human transmission (4). Although various modes of transmission of intestinal parasites are known to exist, the highest mode of transmission is through hand to mouth or the higher magnitudes of the parasites are transmitted through feco-oral(5) .

Parasites can be transmitted directly from one infected person to another, and is indirectly transferred through the exchange of tools. Another mode of transmission can be through the contamination of farmlands by human feces due to the use of raw sewage and plant feeding, especially of raw vegetables also the transmission through some insects such as flies and beetles (5,6)

Food handlers who are contaminated with parasites which have the potential to be directly transmitted from one person to another, they can transmit their faeces via their fingers, then to food processing, and finally healthy individuals(6,7).

Intestinal parasitic infections are widely distributed throughout the world, endangering public health. Infections with medically important parasites (intestinal helminthes and protozoa) are

closely linked with conditions of poverty, unsafe water, crowded living conditions, lack of sanitation and hygiene (8).

1.2 STATEMENT OF THE PROBLEM

High prevalence of intestinal parasitic infections and poly parasitism have a significant impact on health outcomes and morbidity in adults and children worldwide, causing malnutrition, anemia, stunting, cognitive impairment, lowered educational achievement ,interfering with productivity and increased susceptibility to other infections and acute complications are some of the consequent morbidities(4).

Globally some 3.5 billion people are affected with intestinal parasitic infections, with 450 million are symptomatic and more than 1.2 million deaths being reported annually. In developing countries, an estimated one-third of the population is affected by intestinal parasitic agents each year but the infections are more severe in the tropical regions of the world (9).

According to world health organization, approximately 500 million people worldwide suffer from amoebiasis, with an annual mortality between 40,000 and 110,000(10).Among intestinal helminthes, Ascaris lumbricoides,hookworm and Trichuri trichuria infect an estimated 1.2 billion,740 million and 795 million people worldwide,respectively,from which thousands of deaths were reported (11)

According to centers for Disease control (CDC) food borne diseases cause an estimated 76 million illnesses ,325,000 hospitalizations, and 5,000 deaths in the U.S. each year .The cost of the most common food borne illnesses in the United states is estimated at $6.5–$34.9 billion annually(12).

According to the 2001 GBD study, 58.1 million people suffered high intensity A. lumbricoides infection, 26.6 million with high intensity T. trichiura infection, and 59.9 million with high intensity hookworm infection. Only 3000 deaths were attributable to each species. Globally, A. lumbricoides was estimated to cause 1.817 million DALYs, T. trichiura 1.006 million DALYs, and hookworm 0.97 million DALYs. The majority of DALYs were lost in Southeast Asia (47%) and sub-Saharan Africa (23%)(13).

Intestinal parasites are widely distributed in Ethiopia. According to the Ethiopian Ministry of Health more than half a million annual visits of the outpatient services of the health institutions

are due to intestinal parasitic infections. It is estimated that one third of Ethiopians are infected with A. lumbricoides, one quarter is infected with T. trichiura and one in eight lives with hookworm. As a result, Ethiopia has the second highest burden of ascariasis, the third highest burden of hookworm, and the fourth highest burden of trichuriasis in Sub-Saharan Africa(14).

The most prevalent intestinal protozoan parasites in Ethiopia are Giardia lamblia and Entamoeba histolytica/ dispar. Helminthic infection includes Ascaris lumbricoides, Trichuris trichuria and Taenia saginata(15–17).

Several factors like climatic conditions, poor sanitation, unsafe drinking water, and lack of toilet facilities, low level of education, low socioeconomic status of the food handlers contributes to the high prevalence of intestinal parasites in the tropical and sub-tropical countries(14,18). In addition, intestinal parasitic agents increase in polluted environments such as refuse heaps, gutters and sewage units in and around human dwelling and living conditions of the people in crowded or unhealthy situations(5).

In Ethiopia, intestinal parasitic infections (IPIs) are usually related to so many factors that are associated with poverty, including poor socioeconomic condition, poor hygiene and sanitation practice, lack of safe and adequate water supply and climate change (19).

Hence, a better understanding of the above factors, as well as how social, cultural, behavioral and community awareness affect the epidemiology and control of intestinal parasites may help to design effective control strategies for these diseases(14).There is a need to undertake integrated control strategies which involve improved sanitation, health education and chemotherapy to effectively control intestinal parasitic infections in endemic African countries(20).As a result of this, the Federal Ministry of Health (FMoH) of Ethiopia has prioritized intestinal parasitic infection as one of the Neglected Tropical Diseases (NTDs) in the National Master Plan of NTDs, to address the public health problems due to NTDs(5).

Jimma Town is one of the towns found in, Oromia regional state of Ethiopia. In this Town, establishment of unregulated small scale microenterprises on food and drinking services for the matter of job creation become flourishing day by day and the food handlers are being appointed without being screened for hygiene related infections like intestinal parasites. Information on intestinal parasites and associated factors among food handlers in the study area concerning

microenterprises are limited. Therefore, this study was aimed to assess the prevalence of intestinal parasites and associated factors among food handlers working in microenterprises of Jimma town.

2. LITERATURE REVIEW

2.1 prevalence of intestinal parasite among food handlers

Several researches conducted around the world have emphasized the significance of food-handlers as threats in the transmission of parasite infections.

The results of the Meta analysis conducted in 2014 on the Prevalence of some Intestinal Parasites in Food Handlers of Asian and African Countries demonstrated that the prevalence of intestinal parasites was various and approximately low in the food-handlers in Asian and African countries, and *E. coli* was the most common parasitic infection among the food- based on random effect model. Moreover, the prevalence rate of parasitic infection with *A. lumbricoides* was 0.017. The prevalence of infection with *E. histolytica* was about 0.026% among the food-handlers. In this study, the prevalence of infection with *G. lamblia* was 0.033. (23)

A majority of studies conducted elsewhere in low income countries indicated the high prevalence of intestinal parasitosis (24). According to the study conducted on the prevalence of intestinal parasites and its associated socio-demographic factors among food handlers of Bagalkot city, Karnataka, India, showed that Out of 266 food handlers, 39 (14.7%) were tested positive for intestinal parasitic infections. Most common parasite isolated was A. Lumbricoides (5.3%) followed by E. Histolytica (1.5%), Giardia (1.5%), T. Solium (0.8%), T. Trichura (0.8%) and H. Nana (0.8%). Mixed infections constituted 4.1%(25).

In 2017 a study conducted in Gambia on high Prevalence of Intestinal Parasite Carriage among Food Handlers showed that 250 (46.3%) food handlers were intestinal parasite carriers. According to this study magnitude of each species of parasites are as follows ,Entamoeba histolytica/dispar 150 (46%) followed by Giardia lamblia 52 (16%), E. coli 40 (12.3%), E. harmana 20 (6.1%), Strongyloides 18 (5.5%), Ascaris lumbricoides 14 (4.3%), Iodoamoeba butschlii, 9 (2.8%), Taenia spp. 6 (1.8%), Diphyllobotrum latum 3 (0.9%), Hookworm 3 (0.9%), Fasiola hepatica 2 (0.6%), Hymenolepis dimunta 2 (0.6%), Trichuris Trichuira 1 (0.3%), Fasiola Buski 1 (0.3%), Hymenolepis nana 1 (0.3%) and V. nana 4 (1.2%) were the parasites identified from the studies(18).

A study done in 2018 on certified food handlers in Eldoret town, Uasin Gishu County in Kenya, showed that the overall prevalence of intestinal parasitic infection among the certified food

handlers was 30.4% (58/191). E. histolytica (32.8%; n=19) was the most prevalent intestinal parasite. histolytica (32.8%; n=19) was the most prevalent intestinal parasite found in the stools of the food handlers followed by hookworm spp (20.7%), A. lumbricoides (19.0%), T. trichiura (15.5%), and then G. intestinalis (12.0%) (26).

According to the study conducted on Prevalence of Gastrointestinal Parasitic Infections among Food Handlers in Eldoret Municipality, Kenya in 2014, from the 335 food handlers sampled in this study, 79 tested positive for the intestinal parasite species, which represented an overall prevalence of 23.7%. This comprised both intestinal protozoans and helminthes parasites(9).

A study conducted Lafia Metropolis of Nasarawa State, Nigeria showed that from a total of 204 participants selected for this study, the overall prevalence of parasitic infection was 21.6%, with helminthic (15.2%) predominating over protozoan (6.4%) infections. Seven different parasites were identified: Ascaris lumbricoides (5.0%), Strongyloides stercoralis (4.4%), Enterobius vermicularis (4.1%), Cryptosporidium parvum (2.5%), Giardia lamblia (2.0%), Ancylostoma duodenale (2.0%), and Entamoeba histolytica (2.0%)(27)

According to the study done in 2015 in Northern Iran, Stool samples were collected from 1041 male and female food handlers. Intestinal parasites were found in 161 (15.5%) of the studied samples. Seven species of protozoan or helminth infections were detected. Most of the participants were infected with Giardia lamblia (53.9%) followed by Blastocystis hominis (18%), Entamoeba coli (15.5%), Entamoeba histolytica/dispar (5.5%), Cryptosporidium sp. (3.1%), Iodamoeba butschlii (3.1%) and Hymenolepis nana (1.9%) as the only helminth infection (28).

A study done in Bandar Abbas, Southern Iran in 2015 showed a prevalence of parasitic organisms was 34.9% of participants were positive for stool parasites. The intestinal parasites were *Blastocystis hominis* 24.3%, *Entamoeba coli* 8%, *Giardia lamblia* 6.8% and *Dientamoeba fragilis* 4.3% respectively. Only two infections by *Hymenolepis nana* (0.3%) and one by *Enterobius vermicularis* (0.1%) were detected in this study (29).

In 2017 the overall prevalence of being infected with at least one intestinal parasite in Aksum Town, Northern Ethiopia, was 14.5%, 95% CI (11.3, 18.0) (19) .

A study done in 2010 showed that the prevalence of intestinal parasite among food handlers in Bahirdar town, Northwest Ethiopia, Was 158(41.1). Mixed Parasitic infections were detected in

9(2.3%) food handlers .The more prevalent Intestinal parasite species were E.histolytica /dispar, 49(12.76) and A.lumbricoides 45(11.7%) (30).

In 2014, the prevalence of intestinal parasitic infection among food handlers in Yebu Town, south west Ethiopia was 44.1 %(52/118). Lumbricoides (17.8%) was the predominant parasite identified from stool of the study participants followed by hookworm Spp (9.3%)(31).

A study done on the prevalence of intestinal parasites and associated risk factors among food-handlers working at cafeteria of Jimma University Specialized Hospital, Jimma, Ethiopia showed that a total of 94 food-handlers working at cafeteria of Jimma University Specialized Hospital were participated in the study. From the total samples stool and 54 fingernails contents examined, 31 (33%) were positive for one or more parasites. Over all eight types of intestinal parasites were identified. The most prevalent parasite identified was Ascaris lumbricoides (16%) followed by Entamoeba histolytica/dispar (4.3%), From 54 study participants who have untrimmed finger nail and from the sample the total of 54 samples of finger-nail contents examined, 10 (18.5%) were found to be positive for ova and cysts of different intestinal parasites. Among these positive subjects, 4 of them harbored ova of A. lumbricoides, 2 had ova of Trichuris trichiura, 2 had ova of Taenia spp. and 2 individuals each harbored 1 ova of hookworm species and 1 cyst of Giardia lamblia, respectively (16).

2.2 Factors Associated with intestinal parasite among food handlers

2.2. 1. Socio-demographic factors

The presence of intestinal parasites was significantly higher among female food handlers (31.4%) as compared to males (8.7%)(25),no formal education(19),Age(31)

2.2.2. Behavioral factors

Intestinal parasitic infections (IPIs) are usually related to so many factors that are associated with poverty, including poor socioeconomic condition, poor hygiene and sanitation practice, lack of safe and adequate water supply and climate change(32). Hand washing practices after toilet visit with water only, Hand washing before food handling, preparing food during suffering from infectious diseases and using common knife for cutting the flesh or vegetable were the most significantly associated factors for the occurrence of intestinal parasite infection(14,28)

As a result shown by the study done at Mekelle University, Northern Ethiopia, food handlers who were using soap when they washed their hands had a more likely protective effect(with 85%) from intestinal parasites infection than food handlers who did not use soap. The extent of intestinal parasites was less likely to occur (94% protective effect) among food handlers who washed their hands after toilet visit with water and detergent than food handlers who didn't wash their hand after toilet visit with water and detergent . Food handler's history of de-worming at least once in the last one year prior to this study had a more likely protective effect (with 75%) from intestinal parasitic infection compared to food handlers who didn't have the same history(35).

A study done at Arba Minch town, Southern Ethiopia, showed that, Compared to washed fruits and vegetables ,the odds of unwashed fruits and vegetables becoming contaminated with at least one parasite was 3.6 times higher (7).

A study conducted at the Arba Minch University student cafeteria on 345 food handlers, southern Ethiopia, showed that the finger nail status of the study participants had a significant association with the rate of intestinal parasitic infection. The odds of parasitic infection was 2 times higher for food handlers who had untrimmed finger nail as compared to those who trimmed (5), Similarly the study done at Yebu town and Jimma University Specialized Hospital showed that, food handlers who had no regular practice of washing their hands before meal were seven times more likely to be infected with intestinal parasites than those who wash their hands regularly .Which means practice of hand washing after using toilet was significantly associated with parasitic infection among the study participants and the untrimmed finger nail of the study participants had a significant association with the rate of intestinal parasitic infection. The odds of being infected with intestinal parasites were 14 times higher for individuals who had not trimmed their finger nails as compared to those trimmed (5,16,31).

2.2.3 Environmental factors

The transmission of some helminthes, protozoa and microsporidia to humans is via the fecal-oral route, through direct contact with infected persons, or by ingestion of contaminated food or water (36). The study done in 2011 North Gondar showed that water source for drinking, open field defecation/lack of latrine / had statistically significant association to any intestinal parasite infections(32)

2.3 Conceptual frame work

The conceptual frame work below shows multiple and interrelated predictors of prevalence of intestinal parasite infection reviewed from different literatures .For the purpose of this study the predictors were grouped into three parts; socio demographic characteristics(Sex,Age, Educational status, and Job responsibility) Behavioral risk factors (Hand washing before meal, hand washing after toilet visit, hand washing before food preparation, Using common knife for cutting raw flesh food and other food , Eating Raw/unwashed vegetables and fruits, Finger nail status) and Environmental related factors(water source and toilet availability). Each of the factors with their constructs are linked with intestinal parasite as well some of them are related with each other'

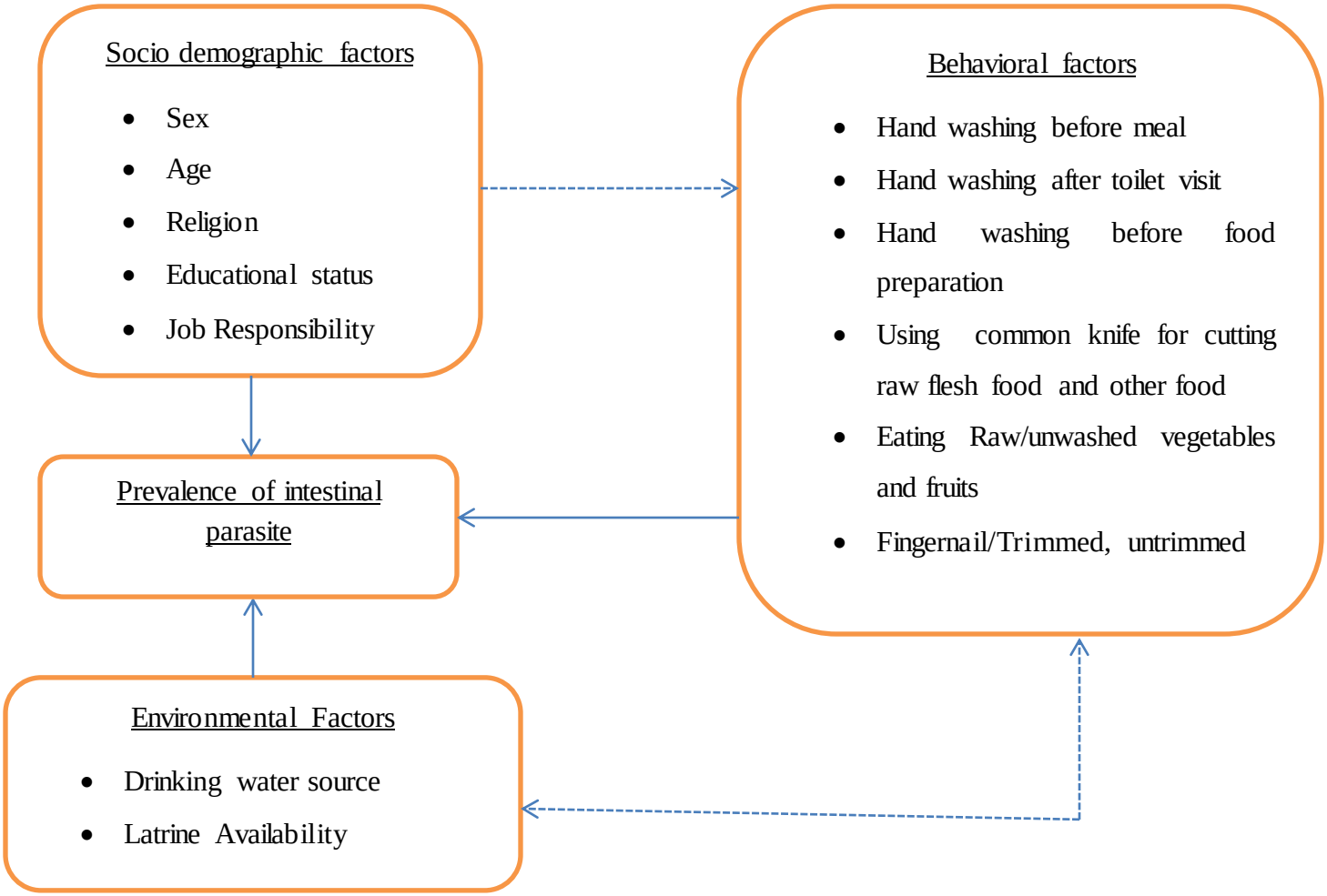

Figure 1 Conceptual frame work of Intestinal parasite and the associated factors among food handlers working in microenterprises after reviewing different literatures

2.5 SIGNIFICANCE OF THE STUDY

The finding of the study will facilitate the development of effective planning and strategies for evidence based interventions, creating awareness for the health professionals working in the study area and baseline information for further large scale study. This study can help different stakeholders including non-governmental organization to work against the common identified factors on the reduction of intestinal parasite. It will serve as source of information for other researchers and health policy makers to know more about the prevalence of intestinal parasite in the microenterprises.

CHAPTER THREE

3. OBJECTIVE

3.1 GENERAL OBJECTIVE

To assess prevalence of intestinal parasites and associated factors among food handlers working in microenterprises in Jimma town, Southwest Ethiopia, 2018.

3.2 SPECIFIC OBJECTIVE

To determine the prevalence of intestinal parasites among food handlers of microenterprises in Jimma town.

To identify factors associated with intestinal parasites among food handlers of microenterprises in Jimma town.

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted in the Jimma zone, which is located in Southwest part of Ethiopia, Oromia regional state and 354 km away from Addis Ababa. According to the data from the Jimma zone statistical department in 2016/17, the total populations were estimated 3,174484. The town is divided into 17 kebeles (smallest governmental administrative units). The geographical coordinates of the town are approximately 7°41′ N latitude and 36° 50′ E longitude. The town is located at average altitude of 1,780 meters above sea level. The town is generally characterized by warm climate with mean annual maximum temperature of 30°C and mean annual minimum temperature of 14°C. The annual rainfall ranges from 1138 to 1690 mm. According to Jimma food security and job creation office the town has a total of 451 micro enterprises. The town has currently four public health centers, two public hospitals and several private clinics. The study was conducted from March 1-26, 2018.

4.2 Study design

Cross-sectional study design was used.

4.3. Population

4.3.1 Source Population

All food handlers working in microenterprises of Jimma town who full fill inclusion and exclusion criteria.

4.3.2 Study population

All randomly selected food handlers working in microenterprises of Jimma town in the study period that met the inclusion criteria.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

Study participants were included in the study who fulfill the following criteria

- Food handlers who didn't take intestinal parasite treatment within past three months
- Are not too sick to be interviewed or able to communicate at the period of data collection

4.4.2 Exclusion criteria

Food handlers who were hired in microenterprises after developing sampling frame couldn't be included.

4.5 Sample size determination and Sampling techniques

4.5.1 Sample size determination

The sample size for the first specific objective was determined by employing single proportion population. It was calculated based on expected prevalence of intestinal parasites in food handlers from southwestern Ethiopia 44.1% (31).With a margin of error of 0.05 and a confidence level of 95%.

$$n = \frac{(Z\ a/2)^2\ P\ (1\text{-}P)}{d^2} = \frac{(1.96)^2\ 0.441\ (1\text{-}\ 0.441)}{(0.05)} = 379$$

Where:-

- $Z\alpha/2$ = 1.96 for the standard scale of 95% level of confidence
- P = Prevalence of intestinal parasite among food handlers in Yebu town. (44.1%) (31).
- d = Margin of error tolerated- 5% (0.05),
- α = Level of significance 5%,

Since the source population was less than 10,000 that was the total number of food handlers was (N=1353) finite population correction formula was used to calculate the final sample size. n, was calculated by applying finite population correction formula as follows,

$(nf = (n/(1+\frac{n}{N}) = 379/(1+\frac{379}{1353}) = 379/(1+0.280) = 296$

Where

- n_f = Finite sample size
- n=Sample size from the first objective.
- N=Total number of food handlers in the microenterprises of Jimma town.

Finally by adding the possible non-response rate of 10% the total sample size will be 326.

For the second objective, the sample size was calculated by using Open Epi info sample size calculator for cross-sectional studies by assuming two-sided confidence level of 95 and a Power of 80.

Table 1. Sample size determination for associated factors for intestinal parasite

No.	Variables	Proportion of the intestinal parasite among unexposed.	Odds Ratio(AOR)	Sample size obtained
1	Finger nail status (Trimmed, untrimmed)(5)	63.1	2.69	190
2	Hand wash before a meal regularly(water with detergent, with water only)(16)	11.5	4.2	114
3	Hand wash after using toilet regularly(water with detergent, with water only)(16)	7.6	9	58

Among the sample size calculated for the second objective /outcome variable /none of them was larger than the sample sizes calculated for the first objective. Therefore, the final sample size was taken as 326.

4.5.2 Sampling techniques

According to Jimma food security and job creation office there are 451 microenterprises in the town. From 451microenterprises all food handlers who working in each 451 microenterprises were listed by the name of microenterprises and tax identification number with their special location to obtain a list of food handlers (sampling frame) and as a result 1353 food handlers working within 451 microenterprises were registered. Simple random sampling method was employed. Study participants were selected by lottery method from the list of food handlers which was prepared before two day of data collection.

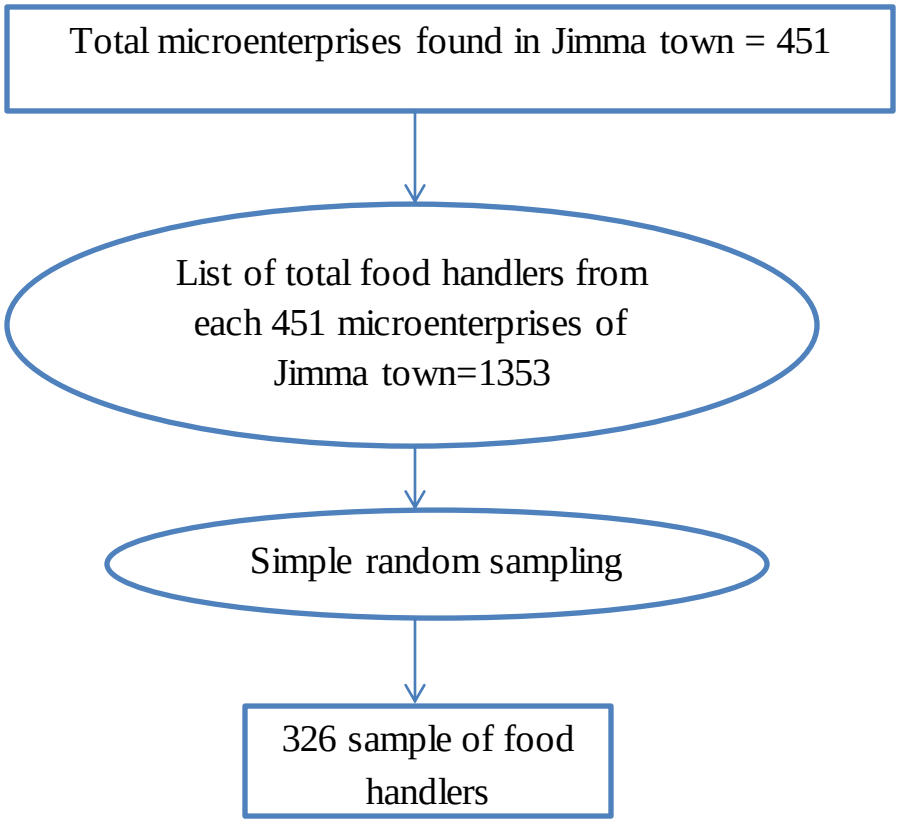

Figure 2 Schematic presentation of sampling procedure of food handlers of microenterprises in Jimma town Southwest Ethiopia, 2018.

4.6 Data collection tools and procedure

4.6.1 Data collection tools

Questionnaire:- The questionnaire was developed by the principal investigator after reviewing different literatures which has three parts. The first part was socio demographic factors; the second part was behavioral factors and the third part was Environmental factors.

Laboratory materials: - Suitable size, clean, dry and leak-proof stool cup which are not sterile but free of all traces of antiseptics and disinfectants together with applicator stick, ice-packs and cold box was used to collect stool specimen.

4.6.2 Data collection procedure

Data were collected by face to face interview using pre tested structured questionnaire which was translated to the local language which was Afan Oromo and information about socio-demographic characteristics, behavioral risk factors and environmental factors of food handlers were collected by two Medical laboratory technologists who were supervised by two Environmental health professionals.

The food handler after interview were given labeled (which was related with the questionnaire and the laboratory request format) clean ,dry and leak proof stool cup and pieces of applicator sticks to bring fresh stool after orientation on how to collect the stool specimen by a trained laboratory technician. Every food handlers was instructed to bring his/her own sufficient amount of (about 2gms) of stool. After collection .the samples were transported to Jimma health center laboratory within 1 hour by using icebox.

4.6.2.1 Microscopic Examination (Saline preparation)

It was carried out on the collected faecal sample by using wet preparation. A drop of fresh physiological saline was placed on a clean slide. Using an applicator stick , a small amount of stool specimen was emulsified in saline solution .the preparation was covered with cover slip and examined under the microscope for the presence or absence of intestinal parasite .The entire

saline preparation was systematically examined for larvae ,ciliates ,helminthes eggs, cysts and oocysts using 10_x objective with condenser iris closed sufficiently to give good contrast ,while 40_x objective was used to assist in the detection and identification of eggs ,cysts, and oocysts (Annex one)

4.6.2.2 Concentration technique (Formol-ether concentration)

An estimated 1g of stool sample or 2ml of watery stool was emulsified in about 4ml of 10% formol water contained in a screw-cap bottle. A further 3ml of 10% formol water was added and mixed well by shaking. The emulsified faeces were sieved through a coffee strainer and the sieved suspension transferred to a conical (centrifuge) tube made of strong glass, polypropylene. 3 ml of diethyl ether was added and the tube was stoppered mixed for 1 minute with a tissue wrapped around the top of the tube, the stopper was loosened. It was then centrifuged at 3000rpm for 1 minute. Using a stick, the layer of faeces debris from the side of the tube was loosened and the tube inverted to discard the ether. Faecal debris and formol water leaving behind the sediment. The tube was returned to its upright position and the fluid from the sides of the tube allowed draining to the bottom. The bottom of the tube was taped to re-suspend and mix the sediment .The sediment was transferred to a slide and covered with a cover glass and examined microscopically using the 10_x objective for focusing and 40_x objective for proper identification (Annex one)

4.7 Study variables

4.7.1 Dependent variables

- Intestinal parasite

4.7.2 Independent variables

Socio-demographic characteristics

- Sex, Age, Religion, Educational status, Job responsibility

Behavioral factors

- Hand washing after toilet Visit with water only, Hand washing before food preparation with water only and Untrimmed Finger nail.

Environmental factors

- Latrine availability, Source of water

4.8 Data quality control and assurance

The questionnaire was initially prepared in English and translated into the local language and Afan Oromo by language experts and translated back into English by another expert and pretested on 5% of sample among food handlers working in Serbo microenterprises, Southwestern Ethiopia to ensure its consistency. Data collectors and supervisors were trained for two days on method of data collection, specimen collection and examination techniques. The stool specimen examination was conducted by trained Medical laboratory technologists. The expiry date of normal saline, ether and formol was checked before stool sample preparation and examination. Microscopic slides, cover glasses were checked for cleanliness. Standard operating procedure (SOP) was used for every laboratory procedures during stool specimen collection, transportation, and storing. Closer supervision was undertaken during data collection and problems faced were discussed on a daily basis with data collectors and supervisor. Completion, accuracy and clarity of the collected data were checked every day.

4.9 Data processing and analysis

Collected data was edited, coded and entered in to Epi-Data version 4.1 and then exported to SPSS 21 for analysis. Frequencies and cross tabulations was used to summarize descriptive statistics. Bivariate logistic regression was done to identify candidate variable for multivariable regression. Multivariable logistic regression analysis was done by using backward elimination method. All explanatory variables that were associated with the outcome variable in bivariate analysis with P-Value of 0.25 or less were be included in the multivariable logistic regression analysis. The crude and adjusted odds ratio together with their corresponding 95% confidence intervals was computed. A P- Value < 0.05 was considered to declare a result as statistically significant in this study. Model fitness was cheeked by using Hosmer and Lemeshow test with

degree of freedom 8 and significance level of p-value 0.735. Multicollinearity was checked using VIF and the maximum value was 1.216.

4.10 Ethical consideration

Ethical clearance was obtained from Jimma University Institutional Review Board before its commencement. Letters of permission was secured from Jimma town Health bureau. Informed written consent was also obtained from each microenterprise and study participant after offering adequate information about the study (see Annex 2). Results of participants were kept confidentially and privacy of the respondents was maintained and those participants with parasitic infection were treated accordingly by an assigned Health officer freely at Health center.

4.11 Operational definitions

Microenterprises: - Microenterprises which are established and working exclusively on food and drinking services to users in the form of breakfast, lunch and dinner for public consumption.

Intestinal parasites: - are intestinal parasites, a group of protozoan and /helminthes that can be transmitted from food handler to consumers mainly through faecal oral transmission.

Positive for Intestinal parasite: - the presence of at least one intestinal parasite under investigation of microscopic examination of the stool specimen of the participant.

Negative for intestinal parasite: - absence of any pathogen of intestinal parasite under investigation of microscopic examination of the stool specimen of the study participant.

Mixed Infection: - are the simultaneous infections of a food handler/s by two more intestinal parasites.

Food Contamination: - the introduction of intestinal parasite in food or food environment.

Food contact surfaces**:** - Equipment/Utensils Surface that will come into contact with food in microenterprises

Food handlers: - Food handlers working in microenterprises and that have contact with food at the time of washing food contact surface, preparation or serving only.

Regular hand washing: - Washing hands always when after using latrine, before meal, before preparing food without missing.

Finger nail status: **-** Untrimmed finger nail of the study participants working in microenterprises during the study period.

4.12 Result dissemination plan

The result of this study will be disseminated to Jimma University Institute of Health, department of epidemiology. The copy of this thesis results will be submitted to, urban food security and Job creation office of the town. Furthermore a copy of this thesis results will be submitted to town health bureau and all attempts will be made to publish the result of the study on national or international journal.

CHAPTER FIVE

5 RESULTS

5.1 Socio-demographic characteristics

A total of 310 food handlers who had been working in microenterprises were enrolled in the study with the response rate of 95.09% %. From these food handlers, 218 (70.3%) were females and 92(29.7%) were males. Large proportion 132(42.6%) of food handlers were found above 35 years of age, regarding religion 118(38.1%) were Orthodox Christians. As to primary education 183(59.0%) accounts for higher proportion of the study participants. Regarding job occupation 239(77.1%) were cooker, 44(14.2%) were waiter, and 27(8.7%) were clean utensils (See Table 2).

Table 2 socio-demographic characteristics of food handlers in microenterprises of Jimma town, southwest Ethiopia, 2018

Socio-demographic characteristics	Frequency [n (%)]
Sex	
Female	218(70.3)
Male	92(29.7)
Age group	
<20 years	105(33.9)
20-35years	132(42.6)
>35years	73(23.5)
Religion	
Orthodox	118(38.1)
Muslim	94(30.3)
Protestant	98(31.6)
Educational status	
Non education	74(23.9)
Primary education	150(48.4)
Secondary and above	86(27.7)
Job responsibility	
Cooker	239(77.1)
Waiter	44(14.2)
Clean utensils	27(8.7)

5.2 Prevalence and types of intestinal parasite

Of 310 stool specimens, 118(38.1%) were found to be positive for one or more parasite species. Based on microscopic stool sample examinations, nine species of intestinal parasites were identified from the respondents. The most prevalent parasite identified was G. lamblia 37(11.9%), A. lumbricoides 29(9.4%) followed by E. histolytica /dispar 23(7.4%). Less frequent identified intestinal parasite spp. was Tania. Spps, S.mansoni, Hookworm species, T.Trichuria, S. stercoralis, H. nana (Table 3). Among 118 positive food handler's 7(2.3%) had mixed infections.

Table 3. Prevalence of intestinal parasites among food handlers of microenterprises of Jimma town, southwest Ethiopia

Variables	Frequency	Percent (%)
Stool exam for intestinal parasite (n=310)		
Positive	118	38.1%
Negative	192	61.9%
Intestinal parasite infection by number of species(n=118)		
Single	111	35.7
Mixed	7	2.3%
Parasite species of single infection		
Giardia lambia	37	11.9
A.lumbricoides	29	9.4
E. histolytica /dispar	23	7.4
Tania. Spp	8	2.6
S. Mansoni	6	1.9
Hookworm species	4	1.3
T.Trichuria	2	0.6
S. stercoralis	1	0.3
H. nana	1	0.3
Mixed	7	2.3

5.3 Behavioral factors

From 310 study participants 213(68.7%) food handlers had the habit of washing their hands only with water before preparing food, 207(66.8%) food-handlers washed their hands with water only after toilet visit, and 201(64.8%) untrimmed finger-nails. (See Table 5)

Table 4. Behavioral factors of food handlers working in microenterprises in Jimma town, southwest Ethiopia, 2018.

Individual behavioral characteristics	Frequency [n (%)]
Hand washing before meal regularly?	
Yes	100
Hand washing before meal regularly?	
With water & detergent	27(8.7)
With water only	283(91.3)
Hand washing after using toilet regularly	
Yes	288(92.9)
No	22(7.1)
Hand washing after using toilet regularly?	
With water & detergent	81(26.1)
With water only	207(66.8)
Hand washing before preparing food regularly?	
Yes	274(88.4)
No	36(11.6)
Hand washing before food preparation regularly?	
With water & detergent	61(19.7)
With water only	213(68.7)
Eating unwashed raw fruits/vegetables	
No	8(2.6)
Yes	302(97.4)
Using common knife for cutting raw flesh food & other food	
No	5(1.6)
Yes	305(98.4)
Finger nail status	
Trimmed	109(35.2)
Untrimmed	201(64.8)

5.4 Environmental factors

Regarding drinking water source almost all 308(99.4%) study participants were using pipe water, similarly the results of the study showed that 122(39.4%) study participants were using pit latrine (See Table 6).

Table 5. Environmental factors of food handlers working in microenterprises in Jimma town, southwest Ethiopia, 2018

Environmental related factors	Frequency [n (%)]
Water source for drinking	
Pipe	308(99.4)
Hand pump	2(0.6)
Access to latrine	
Yes	309(99.7)
No	1(0.3)
Type of latrine available	
Ventilated improved pit latrine	65(21.0)
Flush latrine	40(12.9)
Communal latrine Pit latrine	83(26.8)
Pit latrine	122(39.4)

5.5 Bivariate analysis of associated factors

Bivariable analysis was done in order to identify the candidate variables. Accordingly, nine variables (Age, Education, Job responsibility, Hand washing before meal with water only, Hand washing after toilet with water only, Hand washing before food preparation, Hand washing before food preparation with water only, untrimmed finger nail status and types of latrine) were candidate for multivariable logistic regression (Table 6).

Table 6. Bivariate analysis of different associated factors

Variables	Presence of parasite		COR,(95% CI)	P-value
	Yes n (%)	No n (%)		
Sex				
Female	87(39.9)	131(60.1)	1	
Male	31(33.7)	61(66.3)	0.765(0.459,1.275)	0.304
Age				
<20years	45(42.9)	60(57.1)	1	
20-34years	50(37.9)	82(62.1)	0.813(0.482,1.371)	0.437
>35years	23(31.5)	50(68.5)	0.613(0.328,1.148)	0.127
Educational level				
Non formal education	33(44.6%)	41(55.4%)	1	
Primary education	57(38.0%)	93(62.0%)	0.761 (0.433,1.339)	0.344
Secondary education &above	28(32.6%)	58(67.4%)	0.600(0.315, 1.141)	0.119
Job responsibility				
cooker	81(33.9)	158(66.1)	1	
waiter	26(59.1)	18(40.9)	2.818(1.459,5.440)	0.002
clean utensils	11(40.7)	16(59.3)	1.341(.595,3.024)	0.479
Hand washing before meal regularly?				
With water and detergent	5(18.5)	22(81.5)	1	
water only	113(39.9)	170(60.1)	2.925(1.076,7.948)	0.035
Hand washing after toilet visit regularly?				
With water and detergent	9(11.1)	72(88.9)	1	
water only	87(42.0)	120(58.0)	5.8(2.751,12.228)	0.001
Hands washing before preparing food regularly?				
yes	99(36.1)	175(63.9)	1	
No	19(52.8)	17(47.2)	1.976(0.982,3.975)	0.056
Hand washing before food preparation regularly				
With water and detergent	7(11.5)	54(88.5)	1	

water only	92(43.2)	121(56.8)	5.865(2.551,13.488)	0.001
Finger nail status				
trimmed	23(21.1)	86(78.9)	1	
untrimmed	95(47.3)	106(52.7)	3.351(1.959,5.733)	0.001
Types of latrine				
Ventilated improved pit latrine	16(24.6)	49(75.4)	1	
Flush latrine	8(20.0)	32(80.0)	0.766 (0.294,1.997)	0.585
Communal latrine	41(49.4)	42(50.6)	2.990 (1.470,6.079)	0.002
Pit latrine	53(43.4)	69(56.6)	2.352(1.206,4.589)	0.012

5.6 Factors associated with intestinal parasites among food handlers

Multivariable logistic regression was fitted to identify independent predictors of intestinal parasite among food handlers working in small scale enterprise in Jimma town. Accordingly, hand washing after toilet only with water, hand washing before food preparation only with water and untrimmed finger nail status were significantly associated with intestinal parasite (Table 7).

Food handlers who wash their hands only with water after toilet visit were three times more likely to develop intestinal parasite as compared to food handlers who wash their hands with water and other detergents (AOR=3.26, 95CI: 1.28-8.3).

Food handlers who wash their hands only with water before preparing food were almost six times more likely to acquire intestinal parasite as compared to food handlers who wash their hands with water and other detergents (AOR= 5.645,95% CI: 1.902-16.749).

The odds of parasitic infection was almost 5 times higher (AOR= 4.68, 95 % CI: 2.157- 10.165) for food handlers who had untrimmed finger nail as compared to those who trimmed.

Table 7. Factors independently associated with intestinal parasites among food handlers working in microenterprises of Jimma Town southwest, Ethiopia, 2018

Variables	Presence of parasite		COR,(95% CI)	AOR(95% C.I)
	Yes.no (%)	No. no (%)		
Hand washing after toilet visit regularly?				
With water and detergent	9(11.1)	72(88.9)	1	1
water only	87(42.0)	120(58.0)	5.8(2.751,12.228)	3.264(1.284,8.297)*
Hand washing before food preparation regularly?				
With water and detergent	7(11.5)	54(88.5)	1	1
water only	92(43.2)	121(56.8)	5.865(2.551,13.488)	5.645(1.902,16.749)*
Fingers nail status ?				
trimmed	23(21.1)	86(78.9)	1	1
untrimmed	95(47.3)	106(52.7)	3.351(1.959,5.733)	4.683(2.157,10.165)*

COR= Crude odds ratio, **AOR**= Adjusted odds ratio, ***** variable statistically significant at P< 0.05 **CI**= Confidence interval, 1 =reference category; The Hosmer-Lemeshow goodness-of-fit test statistic is greater than 0.05 for the Multivariable logistic regression.

CHAPTER SIX

6. DISCUSSION

The results of the present study revealed that the prevalence of intestinal parasites among the study participants was 38.1%,which was in consistent with the finding of 38.1 % in Nigeria(38) 38.2% in Paraná ,southern Brazil(39), 36% in Arba Minch University Student's Cafeteria, South Ethiopia (5). Higher prevalence rates have been reported, 49.4% in Mekelle ,Northern Ethiopia (35), 44.1% in Yebu, southwest Ethiopia(31),and 41.2% in Enugu State, Nigeria(40),and 83.1% in Swat,Khyber Pakhtunkhwa, Pakistan(34), while lower ones have been reported ,29.1% in Gondar Town, Northern Ethiopia (30), 34.9% in Bandar Abbas, Southern Iran(29), 33% in Jimma university specialized Hospital students' cafeteria ,southwest Ethiopia(16), 33.68% in Wolaita sodo town, south Ethiopia(41), 14.7% in Bagalkot city, India(25), 10.4% in Shiraz, Iran(42), 23.7% in Eldoret municipality, Kenya(9), 20.2% in Midwest Brazil(43), 15.5% in Sari ,Northern Iran (37).

The differences in reported prevalence in various studies may be due to socioeconomic status, climatic conditions, poverty, personal and community hygiene, different study population and the year in which these surveys were conducted (5,28,31). Moreover, it may depend as well on the distribution and prevalence of certain species of parasites especially those transmitted through faecal-oral ways(16).

The predominant parasite identified in the present study was G. lamblia with a prevalence of (11.9%) followed by A.lumbricoides (9.4%) and E. histolytica /dispar (7.4%). As indicated in the study conducted Sari, northern Iran high prevalence of G. lamblia is a good indicator of water and food contamination with the cysts of G. lamblia which remain viable for long periods of time in the environment, and can be directly transmitted to consumers if ingested via food or water that has been contaminated by infected food handlers (37). This might hold true with the present study as well.

As indicated by different studies high prevalence of ascariasis and entameobiasis is a good indicator of improper faecal disposal and use of poor water quality among the study participants(12,35,40). This might hold true with the present study as well.

This study identified protozoan and helminthic infection that can easily be transmitted via feco-oral route, either directly from person to person or indirectly by eating or drinking fecally contaminated food and water. Hence the independent predictors of intestinal parasites infection in food handlers identified from multivariable logistic regression model indicated that, hand washing after toilet with water only, hand washing before preparing food with water only and untrimmed finger nail status were identified as determinant factors for food handlers being infected by intestinal parasites.

In the current study, the odds of being positive for intestinal parasitic infection was 3 times higher among food handlers who were using water only when they washed their hands after toilet compared to food handlers who use water and detergents. This is to mean that food handlers who were washing hands with water only were higher chance of being infected by intestinal parasites compared to those who were washing their hands with water and detergents. This finding is supported by the study done in southern Ethiopia, food handlers who were using water only when they washed their hands after toilet had more likely risk of infection for intestinal parasites than food handlers who use water and soap(5).Similarly this finding was supported by the study conducted in Mekelle university students' cafeteria, Mekelle, Ethiopia; Food handlers who were using soap when they washed their hands had a 85% less likely to acquire intestinal parasitic infection than food handlers who did not use soap(35). Not washing hands after the use of the toilet might have been affected by the availability of sanitary materials, level of education and lack of personal hygiene training, which highlight the need for future sanitation interventions(44).

Food handlers those who had habit of washing their hands before preparing food with water only were more likely to acquire intestinal parasites than those who had habit of washing hands before preparing food with water and detergents. This finding is comparable with the study done in southern Ethiopia, The extent of intestinal parasitosis was more likely to occur (with 69 %) among food handlers who washed their hands before food handling with water only than food handlers who wash their hand with water and soap (5).

Food handlers who did not trim their finger nail were more likely to acquire intestinal parasitic infection as compared to those who trimmed their finger nail. This finding is comparable with

the study done in southern Ethiopia, in which finger nail status of the food handlers had a significant association with the rate of intestinal parasitic infection .The odds of parasitic infection was more likely for food handlers who had untrimmed finger nail as compared to those who trimmed(5).This finding is also supported by the study done in Yebu, southwestern Ethiopia, food handlers who did not trim their finger nail were more likely to acquire intestinal parasitic infection as compared to those who did(31). Untrimmed finger nails could serve as a vehicle for transport of organisms from the source to the food due to the area beneath a fingernail harbors most organisms and is difficult to clean(44).

Strength of the study:- The strength of the present study was concentration technique was used to increases the likelihood of finding ova, cysts and larvae of parasites.

Limitation of the study: - The present study was subjected to the following limitations. This study did not attempt to assess the parasite carriage of the finger nail contents and parasite intensity due to logistic reasons. Social desirability bias, which may cause weak association of hand washing habits with intestinal parasitic infections, is another concern.

CHAPTER SEVEN

7. CONCLUSIONS AND RECOMMENDATION

7.1 CONCLUSION

Prevalence of parasitic infection among food handlers observed in the current study is unacceptably high and a public health importance.

The study identified factors such as habit of hand washing after toilet use with water only, hand washing before food preparation with water only, and untrimmed finger nail status were significantly associated with intestinal parasitic infections.

This indicates that the food handlers could become a potential source of infection and therefore are responsible for parasite transmission in the study area and calls for immediate measures. Hence, these factors should be focused by policy makers and implementers to further bring the prevalence below the level of public health importance.

7.2 RECOMMENDATIONS

The study recommends to the following concerned bodies specifically

Jimma town health office:-

- In collaboration with other stakeholders should give health education about the transmission of intestinal parasitic infection and control methods for food handlers.
- In collaboration with other stakeholders should give health education on "Good hand washing technique "after toilet and before food preparation and on" regular finger nail trimming"
- Jimma town health office should implement regular medical check- up (screening) and treatment of food handlers.

Owners of microenterprises:-

- Owners of microenterprises should encourage and monitor for food handlers to practice good hand washing techniques regularly with water and detergent.

Food handlers:-

- Should have periodic physical examinations including stool test for intestinal parasites at least twice a year.
- They should strictly follow health information given by urban health extension workers on hand washing to prevent the health defects of the food handlers and avoid transmission of these parasites through contaminated foods.

Researchers:-

- Further studies should be conducted .which track this conditions over time .would be better suited for understanding and exploring the temporal nature of the relationship between intestinal parasite and associated factors among food handlers.

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ANNEXES

Annex 1.Standard Operating procedure

1.1 .Wet mount /direct examination of faecal Procedure

1. Place one drop of 0.85% Nacl on the slide
2. Take a small amount of faecal specimen and thoroughly emulsify the stool in saline
3. Place a 22 mm cover slip at angle into the edge of the emulsified faecal drop
4. Systematically scan the entire 22mm cover slip with the 10xobjective
5. Switch to high (40x objective) for more detailed study of any suspect eggs

1.2 . Formol –ether concentration technique

1. Using a stick, emulsify an estimated 1g of faeces in about 4ml of 10%formol water contained in a screw –cup bottle or tube.
2. Add further 3-4ml of 10% formol water, cap the bottle and mix well by shaking.
3. Sieve the emulsified faeces, collecting the sieved suspension in a beaker.
4. Transfer the suspension to a conical tube and add 3-4ml of diethyl ether.
5. Stopper the tube and mix for 1 minute.
6. With a piece of Wrapped around the top of the tube, loosen the stopper.
7. Centrifuge immediately at 3000rpm for 1 minute.
8. Using a stick .loosen the layer of faecal debris from the side of the tube and invert the tube to discard the ether, faecal debris and formol water.
9. Return the tube to its upright position and allow the fluid from the side of the tube to drain to the bottom. Tap the bottom of the tube to re-suspend and mix the sediment.
10. Transfer the sediment to the slide .and cover with cover glass.
11. Examine the preparation microscopically using the 10x objective with the condenser closed sufficiently to give good contrast .Use 40 x objectives to examine cysts.

Annex 2. CONSENT FORM

Verbal informed consent form before conducting interview

Dear Sir /Madam ; My name is _____ I am a post graduate student in Jimma University & working a research entitled prevalence of intestinal parasite and associated factor among food handlers in Microenterprises of Jimma town. We are requesting you to voluntarily participate in this study. The finding of this study will be used as a basis for better planning and best prevention strategy which is acceptable and effective I local settings. What we expect from you is to be examined for Intestinal parasitic infections as well as to answer a few questions regarding risk factors. The Laboratory examination involves collection of stool samples that should be collected using a sterile and disposable plastic container. Giving a stool doesn't have any harm to your health and any other aspects like your job rather you will be benefited. That is, if there is a positive findings or not in laboratory examination, you will be provided treatment for positive findings and health education. Any information that we collect about you during this research will be kept in secret. Information about you Identity will be put away after re-coding your file ;and kept in a secure place .we assure you that the reports will not bear any information of your personality like name and identity.

Since participation in this study is entirely voluntary, you can refuse to participate in this study at any time .your refusal to participate will not affect any of your benefits.

Are you willing to participate?

1. If Yes ,proceed to the next page
2. If No, pass to the next participant.

Name of the Interviewer_____Signature_____

Date of Interview_____time started _____time finished _____

Supervisors name _____ Signature_____

ANNEX 3. QUESRIONNAIRE

JIMMA UNIVERSITY INSTITUTE OF HEALTH DEPARTMENT OF EPIDEMIOLOGY

English version questionnaire on assessment of intestinal parasites and associated factors among food handlers working in Microenterprises of Jimma Town south West Ethiopia, 2018

INSTRUCTIONS

The questionnaire have interview questions types which were pre-coded response ,only read (ask)as it is written and record the response of the respondents exactly.

Date _____/_____/2018 Label Number_____			
Socio-demographic characteristics			
S.no	Questions	Response	
1	Sex	Female ……1 Male……2	
2	How old are you?	<20years ……1 20-34years ……..2 >35years ……..3	
3	What is your Religion?	Orthodox ……..1 Muslim……...2 Protestant……..3 Others (specify) …….. 4	
4	What is your educational status?	No education ……...1 Primary education……2 Secondary Education & above.....4	
5	What is your job responsibility?	cooker……...1 waiter……2 Clean utensil's……..3	
Individual behavioral factors			
6	Do you wash your hands before a meal regularly?	Yes……1 No……2	If No go to Q8

7	If Yes for Q6, with what?	Water & detergent……....1 Water only……2	
8	Do you wash your hands after using toilet regularly?	Yes……1 No……2	If No go to Q10
9	If yes for Q8, with what?	Water & detergent……1 Water only……2	
10	Do you wash your hands before preparing food regularly?	Yes……1 No……2	If No go to Q12
11	If Yes for Q10, with what?	Water & detergent……1 Water only……2	
12	Eating Raw/unwashed vegetables?	Yes ……...1 No ……2	
13	Using common knife for cutting raw flesh food and other food?	Yes ……...1 No ……2	
14	What is finger nail status?	Trimmed ……....1 Untrimmed……...2	
Environmental factors			
15	What is your water source for drinking?	Pipe……..1 Hand pumping…….....2 River…….....3 Others (specify)……..4	
16	Is there latrine facility?	Yes……1 No……2	
17	If yes what type of latrine do you have?	Ventilated improved pit latrine….1 Flush latrine……...2 Communal latrine……..3 Pit latrine……4	

LABORATORY DATA			
18	Parasite Isolated from stool	Positive _____	Negative____
		A.lumbricoides ……1	
		T.Trichuria……2	
		S. stercoralis ……3	
		S. Mansoni.……4	
		H. nana……..5	
		Tania. Spp…….6	
		Giardia lambia……..7	
		Hookworm species …….8	
		E. histolytica /dispar ……..9	
		Other species ……10	
		Mixed……,……..&……11	

Thank you for your time and concern

ANNEX 4. LABORATORY REPORT FORMAT

<table>
<tr><td colspan="3">JIMMA UBNIVERSITY INSTITUTE OF HEALTH DEPARTMENT OF EPIDEMIOLOGY</td></tr>
<tr><td colspan="3">A descriptive study of the carrier status of intestinal parasites among food handlers working in Micro enterprises of Jimma town south west Ethiopia ,2018</td></tr>
<tr><td colspan="3">Laboratory report form</td></tr>
<tr><td>Label Number_____</td><td></td><td rowspan="2">Time of Sample collection
--------/-------/</td></tr>
<tr><td>Age</td><td></td></tr>
<tr><td>Sex F ▭ M ▭</td><td></td><td>Date of sample collection
--------/------/-----</td></tr>
<tr><td>Laboratory Result/s</td><td colspan="2">Identified Intestinal parasites (Write Name/s)</td></tr>
<tr><td rowspan="4">Microscopic Examination</td><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td rowspan="4">Concentration technique</td><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="3">Name of Laboratory Personnel _____ Signature _____</td></tr>
</table>

ANNEX 5.AFAN OROMO VERSION OF CONSENT FORM AND QUESTIONNAIRE

Mirkaneessa fedhii hirmaannaa

Akkam jirtu, ani maqaan Koo _____ jedhama. Yuunivarsiitii Jimmaatti barataa digrii lammaffaa yommuun ta'u waa'ee hanga rakkoo raammoo mari'immaanii fi sababoota isaan wal qabatan hojjattoota mana nyaataa interpiraayizii xixiqqaa magaalaa Jimmaa keessatti hojjatan irrattin qo'annoo gaggeessaa jira. Qo'annoo kana irratti fedhiidhaan akka hirmaattan gaafatamtu. Firiin qo'annoo kanaa haalawwan ittisaa fi to'annoo rakkoo kanaa irratti karoorsuu fi furmaata kaa'uuf murteessaa dha. Yoo qo'annoo kana irratti hirmaattan qorannoo raammoo mar'immanii akka gootanii fi gaaffiilee afaanii muraasa akka deebiftaniif gaafatamtu. Qorannoo laaboraatoorii gochuuf boolii guddaan kan fuudhamu ta'ee boolii guddaa kennuun fayyaa fi hojii keessan irratti miidhaa kan fidu osoo hin taane kan isin fayyadu dha. Yoo firiin qorannoo laaboraatorii rakkoon jiraachuu agarsiisa ta'e yaalii fi barumsi fayyaa barbaachisaa ta'e kan isiniif kennamu ta'a. Odeeffannoon isin irraa fudhatamu icciitiidhaan kan eegamu fi firiin yaalii keessanii kan galmaa'u maqaa keessaniin osoo hin taane koodiin kan kennamuuf ta'a.

Hirmaannaa keessan fedhii irratti kan hundaa'e yommuu ta'u yeroo kamittiyyuu qo'annaa kana addan kutuu ni dandeessu. Hirmaachuudhaaf fedhii qabduu?

1. Eeyyee, (gara fuula itti aanutti darbi)
2. Lakkii, (gara hirmaataa kan birootti darbi)

Maqaa Gaafataa _____ Mallattoo _____

Guyyaa Af-gaaffii _____ Yeroo itti jalqabe _____ Yeroo itti xumurame_____

Maqaa to'ataa _____ Mallattoo_____

YUUNIVARSIITII JIMMAA, INSTITIYUUTII FAYYAA, KUTAA BARNOOTAA IPPIDIMOOLOJII

Af-gaaffii hanga rakkoo raammoo mari'ammaanii fi sababoota isaan wal qabatan hojjattoota mana nyaataa interpiraayizii xixiqqaa magaalaa Jimmaa keessatti hojjatanii qo'achuuf qophaa'e.

Qajeelfama: Gaaffiileen armaan gadii gaaffii afaanii yommuu ta'an deebiin isanii dursee kan murtaa'e /daangeffame dha. Gaaffilee akkuma jirutti dubbisuun/gaafachuun deebii isaanii filadhu.

Guyyaa _____/_____/2018 Lakkoofsa Addaa_____			
Haala Hawaasummaa			
Lakk.	**Gaaffiilee**	**Deebii**	
1	Saala	Dhalaa ……1 Dhiira……2	
2	Umuriin kee meeqa?	<20……1 20-34…….....2 >35…….....3	
3	Amantaan ati hordoftu maali?	Ortoodoksii ……1 Musliima……..2 Protestaantii...……..3 Kan biroo (caqasi) …….4	
4	Haalli barnootaa kee maali?	Kan hin baranne……..1 Sadarkaa tokkoffaa……..2 Sadarkaa 2^{ffaa} fi isaa oli.....4	
5	Gaheen hojii kee maali?	Bilcheessuu……1 Keessummeessuu…….…..2 Meeshaa dhiquu……3	
Haalawwan amala dhuunfaa			
6	Nyaataa dura yeroo hunda harka	Eeyyee……..1	Yoo lakki ta'e

	kee ni dhiqattaa?	Lakki……....2	gara G8 darbi.
7	Yoo deebiin G6 eeyyee ta'e maaliin dhiqatta?	Bishaanii fi samunaa…….1 Bishaan qofa……..2	
8	Mana fincaanii booda yeroo hunda harka kee ni dhiqattaa?	Eeyyee……...1 Lakki……2	Yoo lakki ta'e gara G10 darbi.
9	Yoo deebiin G8 eeyyee ta'e maaliin dhiqatta?	Bishaanii fi samunaa……1 Bishaan qofa…….2	
10	Otoo nyaata hin qophessin dura yeroo hunda harka kee ni dhiqattaa?	Eeyyee……...1 Lakki……2	Yoo lakki ta'e gara G12 darbi.
11	Yoo deebiin G10 eeyyee ta'e maaliin dhiqatta?	Bishaanii fi samunaa…….1 Bishaan qofa……....2	
12	Kuduraalee dheedhiin ykn otoo hin dhiqamin ni nyaattaa?	Eeyyee…….....1 Lakki……2	
13	Nyaata dheedhii fi kan biro muruuf albee/ haaduu tokko fayyadamtaa?	Eeyyee……...1 Lakki……2	
14	Haalli qeensa harka keetii maal fakkaata?	Qoramaa …….....1 Kan hin qoramne……..2	
Haalawwan naannoo			
15	Dhugaatiidhaaf madda bishaanii kamiin fayyadamtu?	Boombaa……...1 Boombaa kan harkaan harkifamu.2 Laga…….....3 Kan biroo (caqasi)…….4	
16	Mana fincaanii qabduu?	Eeyyee……...1 Lakki……2	
17	Yoo G16 eeyyee ta'e gosti mana fincaanii keessanii maali?	Mana fincaanii fooyya'aa……1 Kan bishaaniin hojjatu……..2	

		Kan uummataa……..3 Boolla qofa……..4	
Ragaa Laaboraatoorii			
18	Maxantuu boolii guddaa keessatti argame	Poozatiivii _____	Nagaatiivii __
		A.lumbricoides ……1	
		T.Trichuria……2	
		S. stercoralis ……3	
		S. Mansoni.……4	
		H. nana……..5	
		Tania. Spp……6	
		Giardia lambia……..7	
		Hookworm species ……..8	
		E. histolytica /dispar ……...9	
		Other species ……...10	
		Mixed……,…….……11	

Yeroo keessan kennitanii waan hirmaattaniif guddaa galatoomaa!