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PREVALENCE AND FACTORS ASSOCIATED WITH INTESTINAL PARASITIC INFECTION AMONG FOOD HANDLERS OF FOOD AND DRINKING ESTABLISHMENTS IN SATELLITE TOWNS OF BAHIRDAR CITY ADMINSTRATION, NORTHWEST, ETHIOPIA

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A THESIS RESEARCH SUBMITTED TO DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH IN EPIDEMIOLOGY

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THESIS TITLE	PREVALENCE AND FACTORS ASSOCIATED WITH INTESTINAL PARASITES AMONG FOOD HANDLERS OF FOOD AND DRINKING ESTABLISHMENTS IN SATELLITE TOWNS OF BAHIRDAR, NORTHWEST, ETHIOPIA

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ABSTRACT

BACKGROUND: - Intestinal parasitic infections are among the major public health and socioeconomic problems in developing countries. Globally more than 2 billion people are chronically infected with intestinal parasites and result more than 200,000 deaths every year. Food handlers with poor personal hygiene could be a potential source of infections to humans. There is limited information regards on intestinal parasites and factors in the study area.
OBJECTIVE: - To assess the prevalence and factors associated with intestinal parasitic infections among food handlers in the satellite towns of Bahir Dar, Northwest Ethiopia.
METHODS: - A community-based cross-sectional study was conducted among 314 food handlers working in food and drinking establishments in satellite towns of Bahir Dar from September 20 to October 10, 2019. A stratified sampling technique was used. Interviewer administered questionnaires, physical observation and laboratory diagnostic tests (stool-specimen microscopic examinations) were used to collect the data. Data were entered using EPI-DATA version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics (frequency, median and inter-quartile range) were used. Also, binary logistic sregressions were used. Independent variables with P-values less than 0.05 were taken as statistically significant.
RESULTS: - The overall prevalence of intestinal parasitic infection in the current study was 37.9% [95% CI (32.5%, 43.29%)]. The predominant intestinal parasite species was Entamoeba histolytica 62 (52.1%). Lack of regular hand washing before meal [AOR = 2.168, 95% CI (1.293, 3.634], lack of regular hand washing after visiting toilets [AOR = 3.863, 95% CI (2.288, 6.522)], untrimmed fingernails [AOR = 3.152, 95%CI (1.854, 5.357)] and non-deworming [AOR = 5.151, 95% CI (1.451, 18.286)] were predictors of intestinal parasitic infection.
CONCLUSION: - The prevalence of intestinal parasitic infection in this study among food handlers was high. Lack of regular hand washing before meals, lack of hand washing after visiting toilets, having untrimmed fingernails and had never been deworming for intestinal parasites were statistically significant predictors for intestinal parasitic infection among food handlers. Hand washing practice at critical times before meal and after visiting toilets, clipping fingernails regularly and the regular deworming program is recommended to control intestinal parasites in food handlers.

Keywords: - prevalence, factors, intestinal parasite, food handlers, satellite towns of Bahir Dar

ACRONYMS AND ABBREVIATIONS

AOR	**A**djusted **O**dds **R**atio
CDC	**C**enter for **D**isease **C**ontrol and **P**revention
COR	**C**rude **O**dds **R**atio
CI	**C**onfidence **I**nterval
FMOH	**F**ederal **M**inistry of **H**ealth
IPIs	**I**ntestinal **p**arasitic **I**nfections
NGO	**N**on**g**overnmental **O**rganizations
NTD	**N**eglected **T**ropical **D**isease
SPSS	**S**tatistical **P**ackage for **S**ocial **S**cience
WHO	**W**orld Health **O**rganizations

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1. INTRODUCTION

1.1. Background

Intestinal parasitic infections (IPIs) are caused by intestinal protozoa, helminthes or both and remain major public health problems, particularly in low-income countries due to difficulties in securing optimal hygienic food handling practices (1, 2). According to world health organization (WHO) estimates nearly one-third of the population in developed countries are affected by intestinal parasitic infections, whereas in developing countries the estimate is around five times higher (3). According to the global disease, burden report showed that globally approximately 800 million people had Trichuriasis, and one billion had Ascariasis and Hookworm infections, 500 million people are infected with Entamoeba histolytica and 2.8 million people are infected with Giardia lamblia (4).

Intestinal parasitic Infections are wildly distributed in tropical sub-tropical areas with the greatest numbers occurring in sub-Saharan Africa, the Americans, China and East Asia (5). A study in Pakistan showed that the overall prevalence of intestinal parasite is 83.1% (6).

In low-income countries, where there is a poor regulatory system for food hygiene, food handlers are appointed in food and drinking establishment centers without investigating their health status for the common intestinal parasitic infections (7). Ethiopia is a developing country where intestinal parasitic infections are major health problems. Intestinal parasitic infections account for the second most predominant cause of outpatient morbidity in the country (8). From Sub-Saharan Africa, Ethiopia has the second highest burden of Ascariasis, the third highest burden of hookworm, and the fourth highest burden of Trichuriasis (9). A recent study in Woldia revealed that the overall prevalence of intestinal parasitic infection is 16.8% (10).

Food handlers without symptoms of parasitic infections can be considered as dangerous to society because such food handlers routinely practice their jobs without giving attention to the transmissions of infections. Due to this intestinal parasites can be transmitted to consumers directly or indirectly through food, water, nails, and fingers from food handlers (11).

Food handlers with poor personal hygiene could be a potential source of infections of mainly intestinal helminthes, protozoa and pathogenic bacteria (12).

The commonest mode of transmission of parasites is faeco-oral by ingestion of food or water contaminated and feces contaminated soil with the infective stage of one or more species of the parasites (13). The customers may be able to satisfy their taste and nutrition needs but give little attention to hygiene and food safety (14).

1.2 Statement of the problem

Intestinal parasitic infections are major public health problems in developing countries. The world health organization (WHO) estimated that in developing countries up to 30% of the population suffers from foodborne diseases each year (15). Globally, 3.5 billion people are infected with intestinal parasites. Of this 450 million had manifest clinical symptoms, more than 2 billion people are chronically infected and more than 200,000 deaths occur due to intestinal parasite infections every year (16). In developed countries, up to 10% of the population might suffer from food borne diseases. Each year millions of people become sick and thousands die after eating contaminated or mishandled foods. Four percent (4%) of foodborne disease is caused by intestinal parasites (17). Ethiopia is one of the developing countries where intestinal parasite infections are more prevalent. Previous studies carried out in Ethiopia showed that 14.5 to 61.9 % of food handlers suffer from intestinal parasite infection (18-20).

Poor socio-economic conditions, lack of personal and environmental sanitation, poor hygiene and sanitation practices, lack of safe and adequate water supply were major factors for intestinal parasite infections of food handlers (21, 22). Intestinal parasitic infections result in compromised physical and mental developments, malnutrition, anemia, cognitive impairment, lowered educational achievement, interfering with productivity, low birth weight, increase health care costs and death (23).

Even though, Federal Ministry of Health (FMOH) attempts to improve the situation through pregnant and school deworming, still the problem is present and the program didn't incorporate food handlers that are a potential source of intestinal parasitic infections (IPIs) to the community (24).

Intestinal parasitic infection is one of the ten top diseases in the town health centers or the study area. As far as the researcher's knowledge and searching effort, there was no recent study conducted in the study area about intestinal parasites. Furthermore, most of the previous studies identified factors associated with intestinal parasites. But factors such as licensed establishment, working duration, consume remaining foods and medical checkups during employment were not documented and included in the study. Therefore, this study was aimed to give reliable current data on the prevalence of intestinal parasitic infection and associated risk factors among food handlers in satellite towns of Bahir Dar.

1.3 Significance of the study

This study will help to provide information on the level of the current situation of intestinal parasites prevalence and its factors in satellite towns of Bahir Dar for health offices.

This study was primarily important for the food handlers by treating the cases and prevent intestinal parasite transmissions to the community or humans.

The information generated from this study can be used as an input for Bahir Dar zonal health departments to take measures that mitigate the transmission of intestinal parasites from food handlers.

It may also be used as a baseline for planning and intervention purpose for NGOs those who are interested in working food safety program in satellite towns. In addition, Students and researchers will be used as a reference for their work for the future.

2. LITERATURE REVIEW

2.1 Magnitude of the problem

A study conducted in Southern Brazil showed that parasitic infections were observed in 28% of street food vendors. Among protozoa, Entamoeba coli were the most frequent species occurring in 15.3%, while the prevalence of protozoa pathogenic was low (Giardia lamblia 2.7% and Entamoeba histolytica 0.7%). Among helminthes, Strongyloides stercoralis was the most observed occurring in 5.3% (25).

The results of the study in Western Iran showed 19 (9%) stool specimens were positive for different intestinal parasites. These intestinal parasites included Giardia lamblia 2.9%, Entamoeba coli 4.3%, Blastocystis sp. 1.4% and Hymenolepis nana 0.5% (26).

In Northwest Iran, the prevalence of parasitic infection was observed in 172 cases (3.73%) of 4612 samples. A total of 156 positive samples (90.69%) were related to protozoa and 16 (9.3%) were related to helminths. Most of the parasitic infections were related to Giardia and Entamoeba coli and the lowest infection was related to H.nana (27).

The prevalence of the intestinal parasite in the study conducted in South Iran was 34.9% with Blastocytis hominis 24.3%, Entamoeba coli 8%, Giardia lamblia 6.8%, Dientameoba fragilis 4.3%, Hymenolepis nana 0.3%, and Enterobius vermicularies 0.1% (28).

The overall prevalence of parasitic infection in a study conducted in Philippines was 90% with helminthic predominating protozoan infections. Eight different intestinal parasites were identified: Entamoeba histolytica/Entamoeba dispar (15.6%), Balantidium coli (8.4%), Giardia lamblia (4.2%), Ascaris lumbricoides (30%), Trichuris trichiura (14.9%), Ancylostoma duodenal/ Necator americanus (2.3%). Taenia spp. (2.4%) and Enterobius vermicularis (2.9%). Other amoeba-like protozoans (19.2%) were also observed suggestive of exposure to fecal materials (29).

A study conducted in Dubai which is the second-largest city of United Arab Emirates showed that, 2% overall prevalence of intestinal parasites among food handlers belonging to different nationalities. The prevalence of Giardia lamblia and Ascaris lumbricoid in this study was 1.6% and 0.2% respectively (30).

Results in Gambia showed that the prevalence rate of intestinal parasites were 250 (46.3%). The most prevalent parasite is Entameoba histolytica/dispar 150 (46%) followed by Giadia lamblia. Most of the food handlers were certified for handling food 483 (89.4%) and 492 (91.2%) know the principle of food safety (31) .

The study recorded in Jos, North Central Nigeria 55.9% of intestinal parasites. Intestinal parasites identified were Entamoeba histolytica (34.7%), Giardia lamblia (21.2%), and Ascaris lumbricoides (26.3%) Trichuris trichiura (25.4%) Hookworm (17.8%) Schistosoma mansoni (13.6%) Hymenolepis nana (6.8%) (32).

A study done in metropolitan care tertiary hospitals showed that intestinal parasites were detected in 31/200 (15.5%), 11 (35.5%) were seen by direct saline technique and an additional 20 (64.5%) by formol-ether concentration technique. The parasites found in descending order of frequency among the food handlers were: fertilized eggs of Ascaris lumbricoides 8.5% (17/200), cyst of Giardia (3.5%), cyst of Entamoeba histolytica 2% (4/200), eggs of Taenia spp. 1% (2/200) and eggs of Trichuris trichiura 0.5% (33).

A study finding in Nekemte town showed that the overall prevalence of intestinal parasites in this study was 52.1%. Entamoeba histolytica/dispar was the most predominant parasite (56.8%), followed by Ascaris lumbricoides (26.4%), Taenia saginata (16%), and hookworm (16.8%) (34).

The overall prevalence of intestinal parasitic infections in the study conducted in Yebu town among the study subjects was 44.1% (52/118). Ascaris lumbricoides and hookworm spp. were the predominant parasites identified from the stool of study participants (35).

A study in the Woliata Sodo stool examination of food handlers revealed that 97(33.68%) had one or more intestinal parasites and 12(12.4%) food handlers have been diagnosed with mixed intestinal parasites. Ascaris lumbricoides was the most prevalent parasites 18(6.25%), followed by hookworm 17(5.9%) (36).

Evidence from Addis Ababa university students cafeterias indicated that 78 (45.3%) of food handlers were found to be positive for different intestinal parasites with the most abundant parasite of Entamoeba histolytica/dispar 68 (70.8%) followed by Giardia lamblia 18 (18.8%), Taenia species 5(5.2%), Ascaris lumbricoides 2 (2.1%), hookworm 2 (2.1%) and Trichuris trichiura 1 (1.1%) (37).

A study in Mekelle University cafeterias showed that out of 307 food handlers enrolled in the study 161 (52.4%) stool specimens were positive for different intestinal parasites. Entamoeba histoletica /dispar was the most prevalent parasite (32.3%), followed by Giardia Lamblia (4.9%) and Schistosoma mansoni (2.6%) in which 4 (1.3%) stool specimens were positive for mixed parasites (38).

A study in Haramaya university cafeterias revealed that the overall prevalence of intestinal parasitic infections was 25.2% (95% CI: 18.3, 29.6). Entamoeba histolytica/ dispar (46.7%) and A. lumbricoides (14.3%) were the most frequent isolates (39).

A study finding from cafeterias of Jimma University specialized hospital showed that From the total 148 samples (94 stool and 54 finger nails content) examined, 31 (33%) were positive for one or more parasites. Overall eight types of intestinal parasites were identified. The most prevalent parasite identified was Ascaris lumbricoides (16%) followed by Entamoeba histolytica/dispar (4.3%) (40).

2.2 Factors associated with intestinal parasitic infections

I. Socio-Demographic factors

A study in Shariz Iran indicated that the majority of participants were male (57%), however, data analysis showed significant statistical difference in the rate of infection between females 11.9% and males 9% (P=0.024). There was no significant statistical difference in the rate of infection among different educational and occupation groups (41).

Results of the study in Sudan revealed that residence and occupation were found to have a significant association with the result of the direct wet examination of IPs. The OR indicated that those respondents who workings in restaurants were 2.25 times more likely to have positive tests compared with others. The occupation was found to have a significant association with the result of formal ether and the OR indicated that those respondents who working in restaurants were 4.23 times more likely to have positive tests compared with others. Intestinal parasites were more prevalent among males 73 (25.1%) over female food handlers 10 (16.9%) (42).

A study in Jimma university hospital showed that it did not show a significant association between job position, education, sex and age of the food-handlers and parasitic infection (40).

Study results in Wollo University cafeterias revealed that there was no statistically significant association between the intestinal parasitic infection and age, sex and service year (43).

II. **Behavioral and hygienic related factors**

A study in Bogota Colombia showed that a higher prevalence of infections by any intestinal parasite was found in participants who had never been dewormed ($p = 0.01$). Higher but not statistically significant associations were found between any parasite and women living with a partner, and intestinal polyparasitism and being from a minority group and not having a water sink (44).

Study results in Chagni town showed that lack of regular hand washing before the meal, lack of regular hand washing after visiting toilets, untrimmed finger-nails, and frequent medical check-ups for intestinal parasites were significantly associated with the infection of intestinal parasites. Out of 400 food handlers, 383 (95.75%) were taking shower more than two times per week of which 56 (14.62%) were positive for intestinal parasitic infections and 17 (4.25%) were taking shower less than two times per week of which 3 (17.65%) were positive for intestinal parasitic infections (45).

A study result in Arbaminch University revealed that independent predictors of intestinal parasitic infection among the food handlers were fingernail status, hand washing practice after toilet, hand washing practice before food handling, preparing food when suffering from diseases, and using a common knife for cutting raw flesh food and other food (46).

A study in Yebu town showed that no regular practice of washing hands before a meal (AOR: 7.8, 95% CI: 2.8, 24.8), and untrimmed fingernail (AOR: 14.7, 95% CI: 2.8, 75.4) were independent predictors of intestinal parasitic infection among the food handlers (35).

A study in Aksum town revealed that trimmed finger-nails, hand washing by water and soap after visiting the toilet and before the meal were not significantly associated with intestinal parasitic infection (18).

Study from Harmaya university cafeteria showed that having no formal education [AOR: 2.13, 95% CI: 1.24, 3.67], monthly income of less than 45.7 USD [AOR: 3.86, 95% CI: 1.62, 9.20], lack of hand washing after the use of the toilet with soap [AOR: 2.43, 95% CI: 1.22, 4.86] and

untrimmed fingernails [AOR: 3.31, 95% CI: 1.99, 5.49] have significant association with intestinal parasitic infections (39).

A study in Jimma University specialized hospital showed that there was a significant association between parasitic infection and finger-nail status, hand washing after defecation and before serving food as determinants of intestinal parasitic infection. Out of the total food-handlers interviewed, 58.5% (55/94) identified as not having the habit of hand washing before serving food for the customers of whom 23 (41.8%) were tested positive for one or more parasites. As far as hand washing habits after toilet use is concerned, 48 (51.1%) of the food-handlers were not washing their hands and among them, 24 (50.0%) were tested positive for some kinds of parasites. This study did not show a significant association between wearing hair-cap, training, medical checkup, use of gown/apron of the food-handlers and parasitic infection. Of the 94 food handlers, only 40 (42.6%) trimmed finger-nails, of whom 2 (5.0%) were positive for one or more species parasites. Of the 54 (57.4%) with untrimmed finger-nails, 24 (44.4%) were positive (40).

Study results in West and East gojjam prison cafeterias showed that the most significant associated factors of intestinal parasitic infections were finger-nail status, information about food contamination related to intestinal parasitic infection and hand washing before having contact with food and after toilet with water (20).

A Study results in East Wollega indicated that regular consumption of raw and/or unwashed fruit [AOR, 95% CI 3.30 (1.2, 6.3), P = 0.011] was significant predictors of intestinal helminthic infection but handwashing after latrine and before the meal was not statistically significant (47).

A study in Ethiopia showed that interventions of hand washing with soap and weekly nail clipping for children with no intestinal parasites at baseline demonstrated a significant reduction in intestinal parasite re-infection rates at 6 months. Children who received handwashing with soap at critical times were 68% less likely to be re-infected by intestinal parasites than children left to continue with existing habits and practices. Similarly, children whose nails were cut on a weekly basis were 49% less likely to be re-infected by intestinal parasites than children not receiving the nail clipping intervention (48).

Study results in Wollo University cafeterias revealed that there was no statistically significant association between the intestinal parasitic infection and handwashing habit with soap after

toilet, handwashing with soap before food preparation and food safety training. But Fingernail trimming ($p = 0.002$, AOR: 4.35, 95% CI 1.71–11.04) and medical checkup ($p = 0.012$, AOR: 4.01, 95% CI 1.37–12.25) were independent predictors of intestinal parasitic infection among the food handlers (43).

III. Environmental related factors

A study in Aksum revealed that the majority, 342 (85.5%) were users of private tap water, 373 (93.3%) had a shower facility and all of the respondents had a toilet facility in their establishments. Of the establishments which had toilet facility, 364 (91%) had a water flush type of toilet. Among the respondents with IPs, 35 (60%) were from restaurants, 10 (17%) from hotels and 13 (22.4%) from café and juice houses (18).

A study conducted in West Gojjam shows that poor environmental sanitation and having irrigation practices were significantly associated with intestinal parasitic infection (49).

3. CONCEPTUAL FRAMEWORK

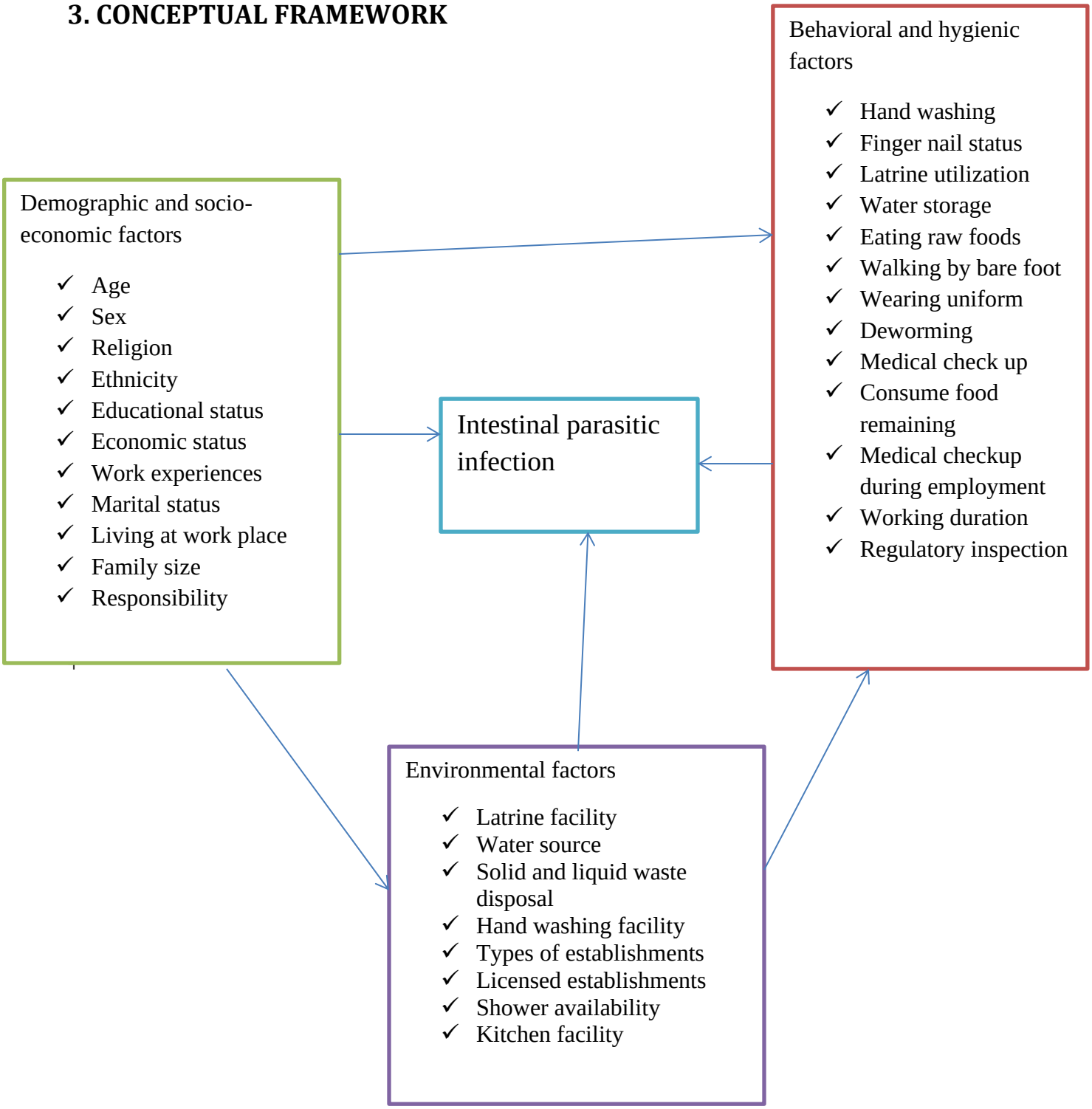

Figure 1: Conceptual framework for an intestinal parasite. This was adopted from the WHO food checklist and preparation manual 2014 and different literatures (18, 43).

4. OBJECTIVES

4.1. General objectives

- To assess the prevalence and factors associated with intestinal parasitic infection among food handlers working in satellite towns of Bahir Dar, Northwest Ethiopia, 2019

4.2. Specific objectives

- To determine the prevalence of intestinal parasitic infection among food handlers in satellite towns of Bahir Dar, Northwest Ethiopia.
- To identify factors associated with intestinal parasitic infection among food handlers in satellite towns of Bahir Dar, Northwest Ethiopia.

5. METHODS

5.1 Study design

A community-based cross-sectional study was conducted among food handlers working in the food and drinking establishments in satellite towns of Bahir Dar, Northwest Ethiopia from September, 20 to October 10, 2019.

5.2 Study area and population

The study was conducted in Satellite towns of Bahir Dar. Bahir Dar is the capital city of Amhara National Regional State which is located 560 Kilometers Northwest of Addis Ababa, the capital city of Ethiopia, at an elevation of 1800 above sea level. Administratively the city is structured into 6 sub-cities, five satellite towns (Tiss Abay, Meshentie, Zegie, Sebatamit, and Zenzelma) and 10 rural kebeles. The city currently has 10 governmental health centers, 10 health posts, 3 governmental and 4 private hospitals and more than 30 private clinics. In satellite towns, there are 4 health centers, 7 health posts, and 8 private clinics. The total population of the city is 339,683, of which, 79,065 lives in satellite towns. There were a total of 225 food and drinking establishments (58 in Tiss Abay, 51 in Zenzelma, 43 in Meshenti, 48 in Sebatamit and 25 in Zegie). There were 526 food handlers working in these places (140, 129, 91, 67 and 99 food handlers working in Tiss Abay, Zenzelma, Meshenti, Zegie, and Sebatamite respectively) (Bahir Dar city Administration health department report of 2019).

5.3 Source population and study participants

The source populations were all food handlers working in food and drinking establishments of Satellite towns of Bahir Dar and the study participants were all randomly selected food handlers working in food and drinking establishments of Satellite towns.

5.4 Eligibility criteria

5.4.1 Inclusion criteria

Food handlers who were working at food and drink establishments during the study period were included in the study.

5.4.2 Exclusion criteria

Food handlers who were ill during the data collection period and unable to give information, street food vendors and food handlers who had taken anti-parasitic drugs within the past three weeks prior to the study were excluded.

5.5 Variables

5.5.1 Dependent variable

Intestinal parasitic infection (yes=1, no=0)

5.5.2 Independent variables

Socio-demographic factors

Age, sex, religion, ethnicity, educational status, income, marital status, living area, work experience, family size, and responsibility.

Behavioral and hygienic related factors

Food safety training, hand washing after toilet, before a meal and during food handling and preparing, medical checkup, nail trimming, latrine utilization, sharing knife and other equipment used for food preparation, eating raw or uncooked food, shoe wearing, work duration, consume food remaining and medical checkup during employment.

Environmental related factors

Latrine facility, hand washing facility, water source, solid and liquid waste disposal facility, kitchen facility, types of establishments, licensed establishments and shower availability.

5.6 Operational definitions

Food handlers with IPIs: Intestinal parasites confirmed by microscopic stool examinations.

Food handlers: a person who is working in food and drinking establishments and engaged in the process of food preparing, serving and cleaning.

Food and drinking establishments are establishments where food and drinks are prepared for public consumptions including restaurants, cafeterias, snacks, bakery, butchers and teji houses.

Functional latrine: It is a latrine usable at the time of data collection.

Hand washing practice: washing hands after toilet use, before meal and handling and preparing food with water and soap.

Latrine utilization: food and drinking establishments having functional latrines, no observable faeces in the compound and show at least one sign of use (footpath to the latrine, not covered by grass, the latrine is smelly, presence of anal cleansing material, fresh faeces in the squatting hole, and the slab is wet).

Satellite towns- are smaller municipalities that are adjacent to a major city which is the core for a metropolitan area. Therefore, satellite towns under Bahir Dar city administration include Tiss Abay, Zenzelma, Zegie Sebatamit, and Meshentie.

5.7 Sample size and sampling methods

5.7.1 Sample size determination

For the first objective

The sample size was calculated using sample size determination for the estimation of a single population proportion formula. Taking 61.9% parasite prevalence from previous study (20), 95% of confidence level ($z\ \alpha/2=1.96$) and 5% of marginal error (d=0.05).

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

$$n = (1.96)^2\ 0.619(1-0.619)/0.05^2=362$$

For the second objective: - factors associated with intestinal parasitic infection in food handlers. In this case, the sample size was calculated by using EPI Info version 7 software program by using different variables from different studies (considering power; 80%, 95% CI, ratio (unexposed: exposed), outcome in unexposed group (%), adjusted odds ratio and outcome in exposed group (%).

Table 1: Sample size determination for intestinal parasitic infection of food handlers by using associated factors

Variables	CI (%)	Power (%)	Ratio (unexposed : exposed)	Outcome in unexposed group (%)	Adjusted odds ratio (%)	% outcome in exposed group	Sample size
Received food hygiene training (18)	95	80	1.272	21.43	0.34	5.7	252
Receiving feedback from customers(18)	95	80	0.36	23.58	0.36	11.2	257
Regular hand washing after visiting toilets(45)	95	80	0.111	30	3.39	13.06	253
Having trimmed finger nails (45)	95	80	0.423	21	2.39	12.1	264
Regular hand washing before meal (45)	95	80	0.136	27.08	4.77	13.07	133
preparing food when suffering from disease (46)	95	80	0.116	15.39	3.08	33.5	449
using common knife for cutting raw flesh food and other food (46)	95	80	0.504	23.02	1.72	36	622
Hand washing before food handling (46)	95	80	1.02	37.2	1.691	24.9	497
Formal education (39)	95	80	0.45	36.4	2.11	21.7	295
Hand washing after toilet use by soap (39)	95	80	3.44	28.5	2.43	13.8	266

From the above sample size determination by using the prevalence and associated factors the largest sample is 622.

Since the total number of the source population was 526 and which is below 10,000 a correction formula was used to adjust the sample size as follows:

$$\frac{n}{1+\frac{n}{N}} = \frac{622}{1+\frac{622}{526}} = 285$$

The initial sample size was 285 and finally, by considering a 10 % non-response rate (29 subjects), the final sample size was 314.

5.7.2 Sampling technique and procedures

A stratified random sampling technique was used. Proportional sample size was allocated for each satellite towns and food handlers were selected randomly by computer-generated random numbers from the lists of food handlers which was obtained from Bahir Dar health office

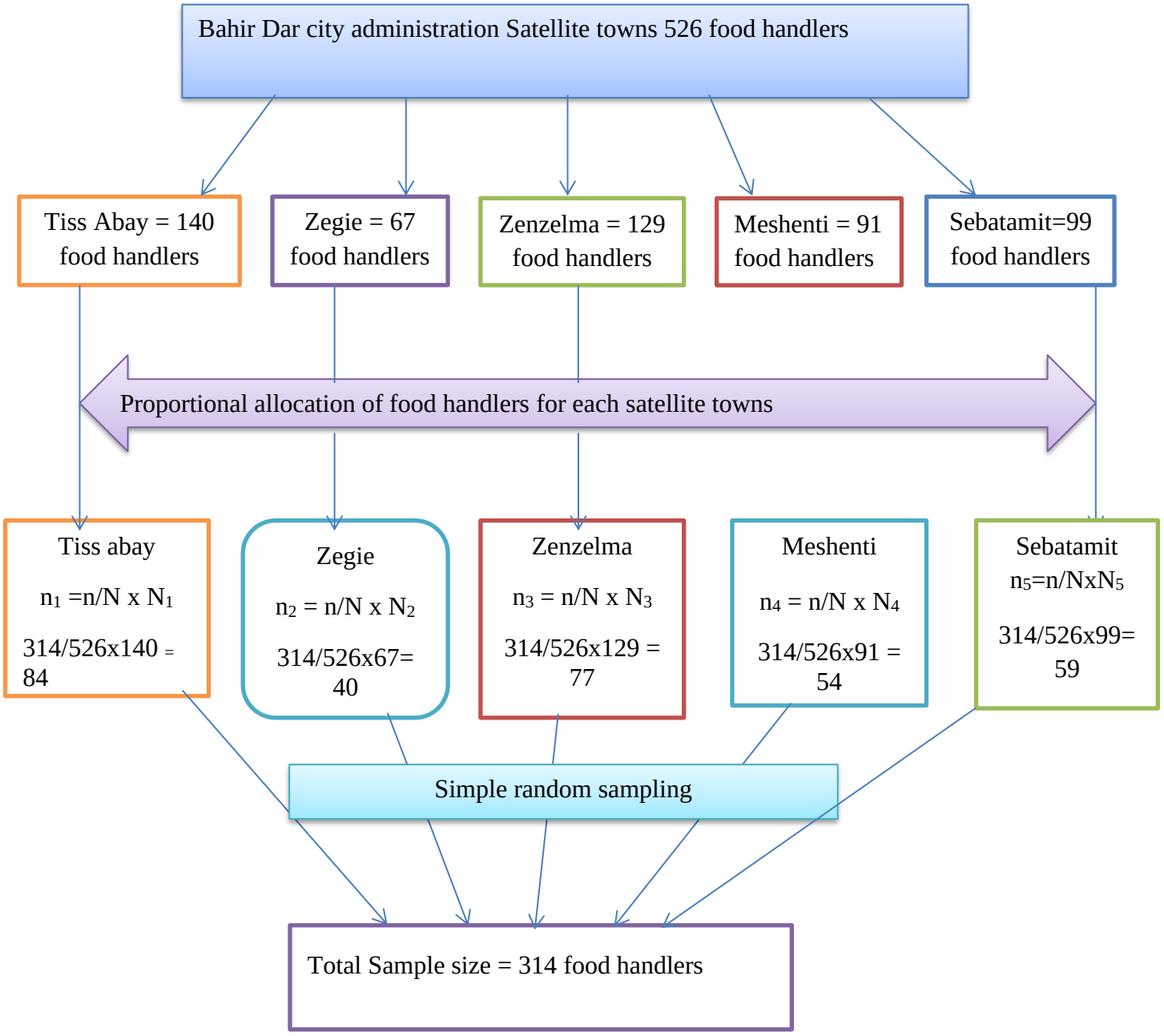

Figure 2: Schematic presentation of the sampling procedures of intestinal parasitic infections among food handlers in satellite towns Bahir Dar city administration, 2019

5.8 Data collection method

Data related to socio-demographic characteristics and personal hygiene practices of food handlers and related risk factors were collected by face to face interviews using a pre-tested structured questionnaire and supplemented with physical observation. A total of six personnel were recruited for data collection, supervision and parasitological analysis.

An estimated pea-size fresh stool samples (2–3 g) were collected in a labeled, clean wide-mouthed plastic container from food handlers by laboratory technicians and transported to respective health centers of the town together with a filled questionnaire for processing and examination. After receiving the specimen, a microscopic examination of the stool sample was done by direct wet mount preparations in normal saline. Both the 10× and 40× objectives were used for the detection of worms, eggs, and larvae of helminthes and cysts and trophozoites of protozoan parasites.

5.9. Data management and analysis

Data were cleaned, coded and entered into EPI-DATA version 3.1 and exported to SPSS version 20 for analysis. Missing data was checked by observing frequency results. Descriptive statistics such as frequency, percentage, median and inter-quartile range were used. Bi-variable binary logistic regression was carried out to identify candidate variables ($p<0.25$) for multivariable binary logistic analysis. Then multivariable binary logistic regression analysis was performed using those candidate variables to investigate statistically significant predictors of intestinal parasitic infection by adjusting for possible confounders. Finally, Independent variables with P-values less than 0.05 from multivariable binary logistic regression were declared as statistically significant. An adjusted odds ratio with 95% confidence intervals was used to assess the strength of associations. The goodness of fit model was checked by Hosmer Lemeshow statistic and p-value greater than 0.05 was considered as a fit model. Results were presented using tables, graphs and described by narration.

5.10 Data quality assurance

To ensure the quality of this research training was given to data collectors and supervisors on the objective, importance of the study, confidentiality of information, respondent's right, techniques of interview, observation, about pre-test and specimen collection procedures. A pretest was carried out in 5% of sample participants to assess the validity of the questionnaire by trained data

collectors to check the clarity of questions, ambiguity, the arrangement of questions, order & options for the questions and skipping pattern accordingly. The whole data collection procedures were closely supervised by field supervisors and investigators to ensure the completeness and reliability of the gathered information throughout the data collection process. Experienced laboratory technicians were recruited for parasitological laboratory examinations. Close supervision was applied during the stool sample collection to make sure that participants bring their own stool specimens. A standard operational procedure of examinations were followed, slides were cross-checked by other laboratory technology experts.

5.11 Ethical consideration

Ethical clearance was obtained from the collage of medicines and health sciences ethical review committee of Bahir Dar University and submitted to Bahir Dar city administration office to get permission. The purpose and importance of the study were explained at all levels and written informed consent was obtained from all food handlers. All food handlers were assured that the data had not any negative consequences on any aspects of their life. Confidentiality was kept by not exposing or shearing the information gathered from the respondents at all levels of the study. Participants who were not willing to participate and want to withdraw at any step of an interview in the study would be informed to do so without any restriction. Those food handlers who were found to be positive for different intestinal parasites were treated and provide information on prevention and control measures of IPIs.

6. RESULTS

6.1 Socio-demographic characteristics of food handlers

A total of 314 food handlers were interviewed with a 100% response rate. Of the total food handlers, 263 (83.8%) were females. The median age of the participants was 22 years with an inter-quartile range of 8 years. One hundred forty-six (46.5%) participants lay in the age group of 21–30 years. Hundred percent of the study participants were Orthodox Christian followers.

Table 2: Socio-demographic characteristics of food handlers in satellite towns Bahir Dar, Northwest Ethiopia, September-October, 2019 (n=314)

Variables	Categories	Frequency	Percentage
Age in years	≤20	118	37.6
	21-30	146	46.5
	31-40	37	11.8
	>40	13	4.1
Sex	Male	51	16.2
	Female	263	83.8
Ethnicity	Amhara	299	95.2
	Agew	15	4.8
Marital status	Single	173	55.1
	Married	101	32.2
	Divorced	27	8.6
	Widowed	13	4.1
Educational status	Unable to read and write	48	15.3
	Able to read and write	20	6.3
	Primary school	113	36
	Secondary and above	133	42.4
Monthly income/salary	≤500	43	13.7
	501-700	74	23.6
	701-1000	72	22.9
	>1000	125	39.8
Family size	≤ 4	226	72
	>4	88	28
Service in years	<1	151	48.1
	1-5	140	44.6
	>5	23	7.3

Living at the workplace	Yes	246	78.3
	No	68	21.7
Responsibility	Cooker	84	26.8
	Waiter	129	41
	Cleaner	9	2.9
	Serving both	92	29.3

6.2 Personal hygiene and safety-related factors of food handlers

Out of the total 314 food handlers, 161 (51.3%) washed their hands after visiting toilets, 169 (53.8%) washed their hands before meals, 290 (92.4%) washed their hands regularly before handling and preparing food, 148 (47.1%) trimmed fingernails, 233 (74.2%) have no medical check-ups, 43 (13.5%) was taking food hygiene and safety training and 227 (72.3) utilize latrine (Table 3).

Table 3: Intestinal parasitic infection and personal hygiene and safety-related factors of food handlers in satellite towns of Bahir Dar, Northwest Ethiopia, September-October, 2019 (n=314)

Variables	**Categories**	**Intestinal parasites**	
		Yes	**No**
		No. (%)	**No. (%)**
Hand washing after visiting the toilet	Yes	38 (23.6)	123 (76.4)
	No	81 (52.9)	72 (47.1)
Hand washing before a meal	Yes	46 (27.2)	123 (72.8)
	No	73 (50.3)	72 (49.7)
Hand washing before food preparation	Yes	108 (37.2)	182 (62.8)
	No	11 (45.8)	13 (54.2)
Finger nail status	Trimmed	36 (24.3)	112 (75.7)
	Untrimmed	83 (50)	83 (50)
Shoe wearing	Yes	109 (37.9)	179 (62.1)
	No	10 (38.5)	16 (61.5)
Wearing uniform	Yes	26 (32.1)	55 (67.9)
	No	93 (39.9)	140 (60.1)
Deworming	Yes	3 (10.3)	26 (89.7)
	No	116 (40.7)	169 (59.3)
Eating uncooked/raw foods	Yes	31 (39.2)	48 (60.8)
	No	88 (37.4)	147 (62.6)
Consume remaining foods	Yes	6 (42.9)	8 (57.1)
	No	113 (37.7)	187 (62.3)
Food hygiene and safety training	Yes	10 (23.3)	33 (76.7)
	No	109 (40.2)	162 (59.8)
Utilization of latrine	Yes	83 (36.6)	144 (63.4)
	No	36 (41.4)	51 (58.6)
Medical check up	Every 3 months	3 (23.1)	10 (76.9)
	Every 6 months	7 (36.8)	12 (63.2)
	9 months and above	16 (32.7)	33 (67.3)
	Never	93 (39.9)	140 (60.1)
Regular inspections	Every 3 months	9 (33.3)	18 (66.7)
	Every 6 months	35 (42.7)	47 (57.3)
	9 months and above	15 (27.3)	40 (72.7)
	Never	60 (40)	90 (60)
Medical checkup during employment	Yes	5 (29.4)	12 (70.6)
	No	114 (38.4)	183 (61.6)

6.3 Food and drinking establishment related factors

A total of 284 (90.4%) eating and drinking establishments had designated handwashing facilities, 246 (78.3%) had a latrine, 218 (69.4%) had private tap water, 35 (11.1%) had shower facility and 200 (63.7%) had kitchen facility (Table 4).

Table 4: Intestinal parasitic infections with respect to food and drinking establishment related factors in satellite towns of Bahir Dar, Northwest Ethiopia, September-October, 2019 (n=314)

Variables	**Categories**	**Intestinal parasites**	
		Yes	**No**
		No. (%)	**No. (%)**
Latrine facility of the working area	Yes	91 (37)	155 (63)
	No	28 (41.2)	40 (58.8)
Types of latrine	Open pit	63 (38.2)	102 (61.8)
	Open pit with slap	5 (25)	15 (75)
	Improved	23 (37.7)	38 (62.7)
Functional toilet	Yes	83 (37.1)	144 (62.9)
	No	8 (42.1)	11 (57.9)
Source of water in the working area	Private tape water	77 (35.3)	141 (64.7)
	Protected hand dug well	21 (41.2)	30 (58.8)
	Others	21 (46.7)	24 (54.3)
Having a separate dressing room	Yes	26 (39.4)	40 (60.6)
	No	93 (37.5)	155 (62.5)
Hand washing facility	Yes	104 (37.7)	172 (62.3)
	No	15 (39.5)	23 (60.5)
Availability of shower	Yes	13 (40.6)	19 (59.4)
	No	106 (37.6)	176 (62.4)
kitchen facility	Yes	81 (40.5)	119 (59.5)
	No	38 (33.3)	76 (66.7)
Solid waste disposal facility	Yes	52 (38)	85 (62)
	No	67 (37.9)	110 (62.1)
Liquid waste disposal facility	Yes	22 (31.9)	47 (68.1)
	No	97 (39.6)	148 (60.4)
To clean utensils and drinking cup	Using water only	16 (30.2)	37 (69.8)
	Water with detergents	103 (39.5)	158 (60.5)
Water storage container	Jerica (narrow neck)	67 (35.4)	122 (64.6)

	Not narrow neck	52 (41.6)	73 (58.4)
Using common knife	Yes	63 (36.4)	110 (63.6)
	No	56 (39.7)	85 (60.3)
Types of establishments	Restaurants	34 (44.2)	43 (55.8)
	Cafeterias	24 (46.2)	28 (53.8)
	Snacks	56 (34.8)	105 (65.2)
	Bakery	5 (26.3)	19 (73.7)
Licensed establishments	Yes	63 (37.3)	106 (62.7)
	No	56 (38.6)	89 (61.4)
Working hours per day	≤8	3 (17.7)	14 (82.3)
	>8	116 (39.1)	181 (60.9)

6.4 Prevalence of intestinal parasites among food handlers

From the total 314 participants, 119 of them were infected with intestinal parasites making the prevalence rate of 37.9% (95% CI 32.5%, 43.29%). The proportion of protozoan infections was 75 (63%), helminthes infections 32 (26.9%) and mixed infections 12 (10.1%). The most prevalent parasite species was Entamoeba histolytica 62 (52.1%).

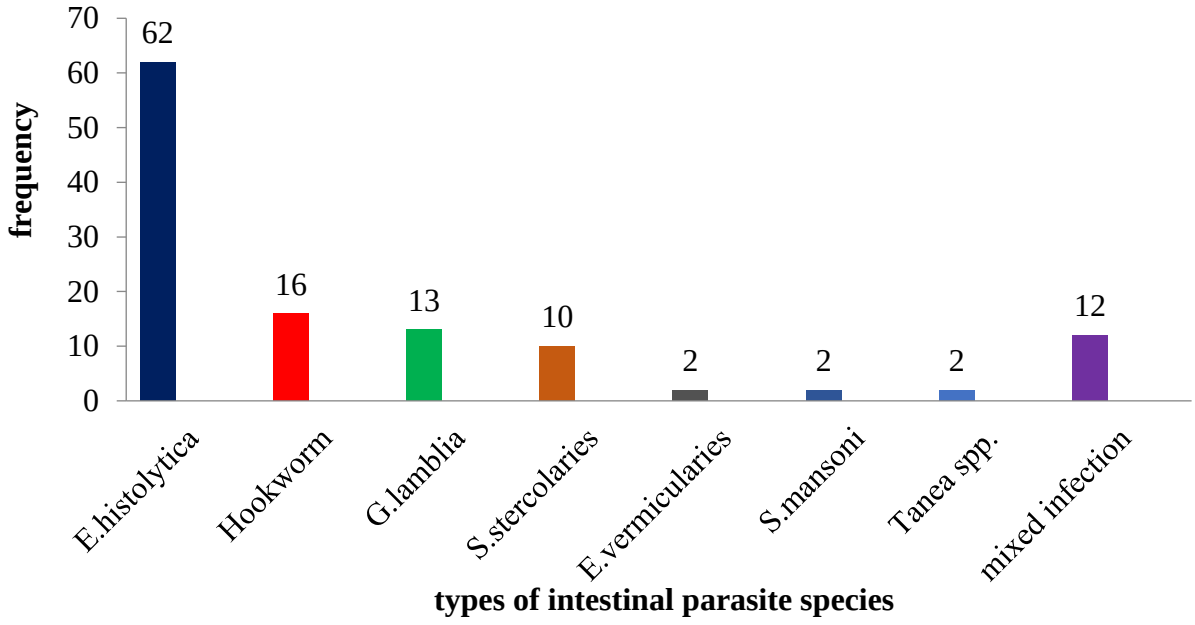

Figure 3: Bar chart showing the proportion of different intestinal parasite species among positives in satellite towns of Bahir Dar, Northwest, Ethiopia, 2019 (n=119)

6.5 Factors associated with intestinal parasitic infection among food handlers

Among the total variables included in the bi-variable binary logistic regression analysis, ten variables (sex, educational status, deworming, family size, wearing uniform, hand washing after the use of the toilet, fingernail status, hand washing before meals, living at workplace and food hygiene and safety training) were associated with intestinal parasites at p-value <0.25. Then multivariable binary logistic regression analysis was performed using those candidate variables. In the multivariable binary logistic regression analysis hand washing before meals, hand washing after visiting toilets, fingernail status and deworming were found to be significantly associated with intestinal parasitic infection.

The odds of being infected by intestinal parasites among food handlers who did not have hand washing before eating meals were over 2 times (AOR 2.168; 95% CI 1.293, 3.634) higher than those who washed their hands.

The odds of being infected by intestinal parasites among food handlers who did not have hand washing after toilet use were about 4 times (AOR 3.863; 95% CI 2.288, 6.522) higher than those who did.

The odds of intestinal parasitic infections were over 3 times higher (AOR: 3.152, 95 % CI [1.854–5.357]) for food handlers who had untrimmed fingernail as compared to those who trimmed their fingernails.

The odds of being infected by intestinal parasites among food handlers who didn't take anti-helminthic in the last six months were over 5 times (AOR: 5.151, 95 % CI [1.451–18.286]) higher than those who took anti-helminthic in the last six months ((Table 5).

Table 5: Multivariable binary logistic regression analysis of predictors for intestinal parasitic infection among food handlers in satellite towns of Bahir Dar, Northwest Ethiopia, September-October, 2019 (n=314)

Variables	Intestinal parasites		COR (95% CI)	AOR (95% CI)	P- value
	Yes	No			
	No. (%)	No. (%)			
Sex					
Male	14 (27.5)	37 (72.5)	0.569 (0.293, 1.105)	0.564 (0.267, 1.189)	0.132
Female	105 (39.9)	158 (60.1)	1	1	
Educational status					
Education					0.36
Unable to read and write	24 (50)	24 (50)	2.500 (1.267, 4.932)	1.950 (0.896, 4.244)	0.092
Able to read and write	9 (45)	11(55)	2.045 (0.785, 5.331)	1.031 (0.356, 2.988)	0.954
Primary school	48 (42.5)	65 (57.5)	1.846 (1.087, 3.136)	1.489 (0.809, 2.741)	0.201
Secondary and above	38 (28.6)	95 (71.4)	1	1	
Hand washing after visiting toilets					
Yes	38 (23.6)	123 (76.4)	1	1	
No	81 (52.9)	72 (47.1)	3.641 (2.247, 5.901)	3.863 (2.288, 6.522)	<0.001*
Hand washing before eating a meal					
Yes	46 (27.2)	123 (72.8)	1	1	
No	73 (50.3)	72 (49.7)	2.711 (1.695, 4.337)	2.168 (1.293, 3.634)	0.003*
Family size					
≤ 4	81 (35.8)	145 (64.2)	1	1	
>4	38 (43.2)	50 (56.8)	1.36 (0.824, 2.247)	1.321 (0.730, 2.392)	0.358
Living at the workplace					
Yes	99 (40.2)	147 (59.8)	1	1	
No	20 (29.4)	48 (70.6)	0.619 (0.346, 1.106)	0.824 (0.417, 1.631)	0.579
Deworming					
Yes	3 (10.3)	26 (89.7)	1	1	
No	116 (40.7)	169 (59.3)	5.949 (1.759, 20.114)	5.151(1.451, 18.286)	0.011*
Food hygiene and safety training					
Yes	10 (23.3)	33 (76.7)	1	1	
No	109 (40.2)	162 (58.8)	2.220 (1.051, 4.691)	1.849 (0.810, 4.217)	0.144
Fingernails status					
Trimmed	36 (24.3)	112 (75.7)	1	1	
Not trimmed	83 (50)	83 (50)	3.111 (1.919, 5.044)	3.152 (1.854, 5.357)	<0.001*
Wearing uniform					
Yes	26 (32.1)	55 (67.9)	1	1	
No	93 (39.9)	140 (60.1)	1.405 (0.823, 2.400)	1.298 (0.692, 2.436)	0.417

*significant at p-value < 0.05, 1= reference category

7. DISCUSSION

The overall prevalence of intestinal parasitic infection in the current study was 37.9%. This was consistent with the finding of a similar study in Wolliata Sodo 33.68% (36), Jimma 33% (40) and South Iran 34.9% (28). However, it was higher than studies done in Harmaya 25.2% (39), Southern Brazil 28% (25), Western Iran 9% (26), Northwest Iran 3.73% (27) and Dubai 2% (30). This might be due to the time of the study, poor personal hygiene practice and environmental sanitation, lack of clean and safe water supply and geographical area of the study. It was also lower than studies done in Addis Ababa 45.3 % (37), Nekemit town 52.1% (34), Yebu town 44.1% (35), Mekelle 52.45% (38), Jos, Northcentral Nigeria 55.9% (32), Philippines 90% (29) and Gambia 46.3% (31). This might be due to differences in the socio-demographic features and method of assessing the presence of parasites.

The current study showed that the prevalence rate of protozoan infections was found to be higher than that of helminthic infections. This was in agreement with previous studies done in Addis Ababa (37), Mekelle (38), Northwest Iran (27) and Western Iran (26). This could be due to the transmission and distribution of protozoa through cysts is more direct and simpler than worms. Also, it might be due to that protozoa are immediately infectious.

The predominant parasite identified in the present study was Entamoeba histolytica. The finding was similar with studies from different parts of Ethiopia such as in Nekemit town (34), Addis Ababa (37), Mekelle (38), Haramaya (39) and other countries (31, 32). The high prevalence of this parasite could be due to the fact that protozoa are immediately infectious, whereas eggs of helminthes may need awhile to become infective. About 90% of infections are asymptomatic. Once infected, individuals may indefinitely propagate the protozoa unless treated. In addition, even if hygienic facilities improve in the food and drinking establishements it might be impossible to clean the food handlers from preexisting infection, especially Entamoeba spp. However, the predominant parasite was found to be Ascaris lumbericoides in other studies (29, 36, 40). This could be due to the eggs of parasites are known to adhere to dust, fruits and vegetables, seasonal variations and geographical conditions.

Regular hand washing after visiting toilets had a statistically significant association with intestinal parasitic infection. Food handlers who didn't practice regular hand washing after visiting toilets were about four times more likely to be infected by intestinal parasites than their counterparts. This finding appeared to be consistent with those of other studies that noted statistically significant results for the same predictor variables. These studies include East and West Gojjam prison (20), Chagni town (45), Harmaya university (39), Jimma university hospital, Ethiopia (40), and Arbaminch (46). This reflected that food handlers lack awareness about food contamination with poor hygienic practices. Also, this is due to the fact that proper hand washing practices break the chain of transmission for intestinal parasites. But, the finding of this study was disagreement with a study that was not statistically significant results for the same predictor variables in Wollo (43). This discrepancy could be influenced by social desirability and characteristics of study subjects.

Food handlers who didn't practice regular hand washing before meal were over two times more likely to be infected by intestinal parasites than those who did. This finding also appeared to be consistent with the findings of other studies conducted at Yebu town (35), Chagni town (45) and East and West Gojjam prison (20). This is due to the reason that proper hand washing practices break the chain of transmission for intestinal parasites. Also, hand washing before a meal reduces intestinal parasites by preventing ingesting of the infective stage of the parasites by 68% (48). But the study conducted at East Wollega disagreement with the current finding that regular hand washing before meal had statistically significant association with intestinal parasitic infections (47). This might be due to the variation between study populations, little variations among the study participants and when it comes to this variable they are more concentrated towards one of another category.

Having untrimmed fingernails was another factor that was significantly associated with intestinal parasitic infection. Food handlers who didn't have trimmed fingernails were over three times more likely to be infected by intestinal parasites than those who had trimmed their fingernails. This finding was supported by studies conducted in Yebu town (35), Arbaminch (46), Jimma (40), Chagni town (45), Haramaya (39), East and West Gojjam prison (20) and Wollo (43). This could be due to the area underneath untrimmed fingernails is troublesome to clean and harbors most organisms and serve as a good mode of transmission. Nail clipping was also found to decrease intestinal parasite re-infection rates by 49% (48).

Food handlers who had never been dewormed showed a statistically significant higher prevalence of infection by intestinal parasite. This was in agreement with the previous study in Bogota Colombia (44). Although prophylactic deworming programs in children and pregnant women have been recommended, our findings may support the effectiveness of deworming programs in food handlers as we could show a decreasing prevalence of intestinal parasites. This was due to that deworming might treat infected individuals and reduced community level burden, and preventing new infections.

8. LIMITATIONS

- Since the study was conducted in one season, so seasonal variations were not considered.

9. CONCLUSIONS

The overall prevalence of intestinal parasitic infection in this study was high. Lack of regular hand washing before meals, lack of hand washing after visiting toilets, having untrimmed fingernails and had never been deworming for intestinal parasites were statistically significant predictors for intestinal parasitic infection among food handlers.

10. RECOMMENDATIONS

Based on the results of the study the following are recommended:

I. For food handlers
   - Food handlers should practice hand washing at critical times especially hand washing after visiting toilets and before eating a meal.
   - Food handlers should be trimming their fingernails regularly.

II. For MOH
   - The deworming programs of FMOH should be better to include food handlers.

III. For researchers
   - Further studies should be conducted to indicate the impact of intestinal parasitic infections in different seasons.

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12. ANNEXES

Annex –I information sheet and consent form

Greeting

Good morning/Good afternoon**.**

My name is _____ I am a student in Bahir Dar University College of Medicine and Health Science, Department of Biostatics and Epidemiology. This study focus to assess the prevalence of intestinal parasites and associated risk factors among food handlers working in food and drinking establishments at satellite towns of Bahir Dar, Amhara region, Ethiopia. The finding of this study will provide timely and proper prevention and controls of intestinal parasites for food handlers. You are selected to participate in this study which is designed by the researcher because you fulfill all requirements to be a sample.

The data that we obtained in this interview will use only for research purpose and your response will keep confidential. For this purpose, your name will not be written here and there is no way of linking your individual responses to the final result of the study findings. The study has no risk to you, spending a maximum of 30 minutes of your time and if you face any problem in relation to the research you can contact a responsible person based on the address below. You have the right not to respond at all or to withdraw in the meantime, but your participation is highly valuable for the success of this research objective. Therefore, we politely request your cooperation to participate in this interview.

Do you agree to participate in this study? If yes, continue. Signature----------

Thank you for being a volunteer to participate in the study.

Name of data collector _____ Signature _____

Date of interview _____

Name of principal investigator - Getahun Worku

Bahir Dar University College of medicine and Health Sciences, Department of Biostatistics and Epidemiology

Phone NO.: +251-918584411 E-mail:- getahunwrk@gmail.com

Annex-II Amharic version information sheet and consent form

ጤና ይስጥልኝ

ስሜ---------- ይባላል፡፡ ወደ እርስዎ የመጣሁት ኢፒዲሚዮሎጅ ሁለተኛ ዲግሪ በባህርዳር ዩኒቨርሲቲ ህክምና እና ጤና ሳይንስ ኮሌጅ ስር በሚካሄደው ጥናት የመረጃ ስብሰባ አባል በመሆን ነው፡፡ የዚህ ጥናት መጠይቅ የሚያተኩረው በአማራ ክልል በባህርዳር ከተማ በሚገኙ ሳተላይት ከተሞች በሚሰሩ የምግብና የመጠጥ ቤት ሰራተኞች የአንጀት ጥገኛ ትላትሎች መጠንና አጋላጭ ሁኔታዎችን ለመለየት የተዘጋጀ ሲሆን እርስዎ ለጥናቱ የሚያስፈልጉ መስፈርቶችን አሚልተው በመገኘትዎ የጥናቱ አባል አድርገነዎታል፡፡

በመሆኑም ይህ መጠይቅ ሲዘጋጅ ተገቢ የሆኑ መረጃዎችን ለማግኘት ሲሆን ከእርስዎ የሚገኘው መረጃ ለጥናትና ምርምር ተግባር ብቻ የሚውል ነው፡፡ ከእርስዎ የሚገኙት ምላሾች ሚስጥራዊነታቸው የተጠበቁ መሆናቸውን እየገለጽኩ ለዚህም ዓላማ ሲባል የእርስዎ ስም በመጠይቁ ላይ የማይጻፍና የጥናቱ የመጨረሻ ውጤት የግል ማንነት ጋር የማይገናኝ መሆኑን ከወዲሁ አረጋግጣለሁ፡፡ ከዚህ በተጨማሪ ይህ መጠይቅ ከ30 ደቂቃ ያልበለጠ ጊዜ ከመሻማት ውጭ ምንም ዓይነት ጉዳት የማያደርስ ሲሆን ከጥናቱ ጋር በተያያዘ ለሚከሰቱ ማንኛውም ጉዳዮች ከዚህ በታች በተቀመጠው አድራሻ ሊያገኙን የሚችሉ መሆኑን እያስገነዘብኩ በጥናቱ ላይ ያለመሳተፍና የማቋረጥ መብትዎ የተጠበቀ ነው፡፡

የእርስዎ መሳተፍ ግን ከምንም በላይ ለጥናቱ ዓላማ መሳካት ወሳኝ በመሆኑ በመጠይቁ እንዲተባበሩኝ ስል በታላቅ አክብሮትና ትህትና እጠይቃለሁ፡፡

በጥናቱ ለመሳተፍ ፈቃደኛ ነዎት? መልስዎ አዎ ከሆነ መጠየቁን ይቀጥሉ ፊርማ----------

የመረጃ ሰብሳቢው ስም---------- ፊርማ----------

ያስታውሱ፤ ስለዚህ ጥናት ማንኛውም ጥያቄ ካለዎት በማንኛውም ጊዜ ከዚህ በታች በተጠቀሱት አድራሻዎች መጠየቅ ይችላሉ፡፡ የዋና ተመራማሪው አድራሻ፤ ጌታሁን ወርቁ፤ ባህርዳር ሕክምና እና ጤና ሳይንስ ኮሌጅ፣ የባዮስታስቲክስና ኢፒዲሞሎጅ ዲፓርትመንት ኢ-ሜይል፣ getahunwrk@gmail. com ስልክ ፣ +251918584411

Annex –III English Questionnaires

Questionnaire code_____

Part- I demographic and socio-economic factors

S. No.	Questions	Response and coding categories	Skip
101	How old are you?	Age in years_____	
102	Sex	1. Female 2. Male	
103	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Others, specify_____	
104	What is your ethnicity?	1. Amahra 2. Agew 3. Oromo 4. Others _____	
105	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
106	What is your educational status?	1. Unable to read and write 2. Able to read & write 3. Primary 4. Secondary 5. Higher	
107	How many is your monthly income/ salary?	_____EBR	
108	Dou you live at workplaces?	1. Yes 2. No	

109	Family size living with you	_____	
110	Responsibility	1. Cooker 2. Waiter 3. washier 4. Serving both	
111	Work experiences /services in year	_____ years	

Part –II environmental factors

S. No.	Questions	Response and coding categories	Skip
201	Do you have a latrine facility?	1. Yes 2. No	If no skip to Q#204
202	What types of latrine?	1. Open pit 2. Open Pit with slab 3. VIP 4. Others, specify_____	
203	Is it functional?	1. Yes 2. No	
204	Is there hand washing facility?	1. Yes 2. No	
205	Do you have functional kitchen availability?	1. Yes 2. No	
206	Do you have a shower facility?	1. Yes 2. No	
207	Water source	1. Protected hand dug well 2. Private tape water 3. Others ,specify------	
208	Water storage container	1. Jeri can (narrow neck) 2. Not narrow neck 3. Others_____	

209	Do you have a solid waste disposal facility?	1. Yes 2. No	
210	Do you have a liquid waste disposal facility?	1. Yes 2. No	
211	Do have a separate dressing room for workers?	1. Yes 2. No	
212	Types of establishments	1. Restaurants 2. Cafeterias 3. Snacks 4. Bucher houses 5. Bakeries 6.Tej houses	
213	Does establishment is Licensed?	1.Yes 2. No	

Part –III Behavioral factors

S. No	Questions	Response coding and categories	Skip
301	Have you wearing the shoe? By observation	1. Yes 2. No	
302	Do you eat uncooked raw foods or vegetables?	1. Yes 2. No	
303	Have taken ant-helminthic in the past six months	1. Yes 2. No	
304	Do you wash your hand after toilet use?	1. Yes 2. No	If, no skip to Q# 306
305	If yes?	1. With water only 2. With water and soap	
306	Do you wash your hand before a meal?	1. Yes 2. No	If, no skip Q# 308

307	If yes?	1. With water only 2. With water and soap	
308	Do you wash your hand before handling and preparing food?	1. Yes 2. No	If, no skip to Q#310
309	If, yes?	1. With water only 2. With water and soap	
310	Used to clean utensils and drinking cup	1. water and detergent 2. water only	
311	Have you used a common knife for cutting raw fresh food and other food?	1. Yes 2. No	
312	trimmed fingernails , observe it	1. Yes 2. No	
313	Do you utilize latrine?	1. Yes 2. No	
314	Do you wear a uniform/gown, head cover? (by observation)	1. Yes 2. No	
315	regulatory inspections	1. every 3 months 2. every 6 months 3. every 9 months and above 4. never	
316	Medical checkup (by observing the certificate)	1. Every 3 months 2. Every 6 months 3. Every 9 months and above 4. never	
317	Do you certify in food training? check the certificate	1. Yes 2. No	
318	Medical checkup during employment (check certificate)	1. Yes 2. No	
319	Work duration	_____hours	
320	Do you consume the remaining food?	1. Yes 2. No	

Annexes –IV Amharic questionnaires

የመጠየቁ ኮድ_____

ክፍል አንድ---ማህበራዊና ኢኮኖሚያዊ ሁኔታዎችን በተመለከተ

ተ. ቁ	ጥያቄዎች	ምላሾችና ኮድ	ማለፍ
101	አድሜዎ ስንት ነው?	_____ዓመት	
102	ፆታ	1. ወንድ 2. ሴት	
103	ሀይማኖትህ/ሽ ምንድን ነው?	1. ኦርቶዶክስ 2. ሞስሊም 3. ፕሮቴስታንት 4. ሌላ ካለ ይጠቀስ _____	
104	ብሔር	1. አማራ 2. አገው 3. ኦሮሞ 4. ሌላ ካለ ይጠቀስ _____	
105	የጋብቻ ሁኔታ	1. ያላገባ 2. ያገባ 3. የፈታ 4. ባለ የሞተባት	
106	የት/ት ደረጃ	1. ያልተማረ/ች 2. ማንበብ መጻፍ የሚችል 3. አንደኛ ደረጃ 4. ሁለተኛ ደረጃ 5. ከፍተኛ	
107	ወርሃዊ ደሞዝ	_____ብር	
108	ከሚስሩበት ቦታ ነው የሚኖሩት?	1. አዎ 2. አይደለም	

109	የቤተሰብ መጠን	_____	
110	ሃላፊነት	1. ምግብ አብሳይና ጋጋሪ 2. አስተናገጅ 3. እቃ አጣቢ 4. ሁሉንም	
111	ስንት ዓመት የስራ ልምድ አለዎት?	_____ ዓመት	

ክፍል-ሁለት የአካባቢ ሁኔታዎችን በተመለከተ

ተ.ቁ	**ጥያቄዎች**	**ምላሽና ኮድ**	**ማለፍ**
201	ሽንት ቤት አለ?	1. አለ 2. የለም	የለም ከሆነ መልስዎ ወደ ጥ#204 ይለፉ
202	የሽንት ቤት አይነት	1. ክፍት 2. መቀመጫ ያለው 3. የተሻሻለ መፀዳጃ ቤት 4. ሌላ ካለ ይጠቀስ---------	
203	ሽንት ቤቱ ይሰራል ?	1. አዎ 2. አይደለም	
204	የእጅ ማስታጠቢያ አለ ?	1. አዎ 2. የለም	
205	የሚሰራ ኪችን አለ?	1. አዎ 2. የለም	
206	የሚሰራ ሻውር አለ ?	1. አዎ 2. የለም	
207	ውሃ ከየት ነው የሚያገኙት?	3. ከግል ባንባ 4. ከጉድጋድ 5. ሌላ ካለ ይጠቀስ----------	

208	ከቤት ውስጥ የውሃ ማጠራቀሚያ እቃ	1. ጀሪካን (አፈ ጠባብ) 2. አፈ ሰፊ እቃ 3. ሌላ_____	
209	የደረቅ ቆሻሻ ማጠራቀሚያ አለ?	1. አለ 2. የለም	
210	የፈሳሽ ቆሻሻ ማጠራቀሚያ አለ?	1. አለ 2. የለም	
211	ለሰራተኞች የተለየ የመልበሻ ክፍል አለ?	1. አለ 2. የለም	
212	የምግብና መጠጥ ዓይነት	1. ሪስቶራንት 2. ካፌ 3. ቁርስ ቤት 4. ስጋ ቤት 5. ዳቦ መጋገሪያና መሸጫ 6. ጠጅ ቤት	
213	የምግብና መጠጥ ቤቱ የንግድ ፍቃድ አለው ?	1. አዎ 2. የለም	

ክፍል- ሶስት የስነ-ባህሪ ሁኔታዎችን በተመለከተ

ተ. ቁ	**ጥያቄዎች**	**ምላሾችና ኮድ**	**ማለፍ**
301	ጫማ ለብሰዋል ? በማየት?	1. አዎ 2. የለም	
302	ያልበሰሉ ምግቦችን ይመገባሉ?	1. አዎ 2. የለም	
303	በለፉት ስድስት ወራት ውሰጥ የአንጀት ጥገኛ ትላትል መዳህኒት ወስደዋል?	1. አዎ 2. የለም	
304	ከሽንት ቤት ከተጠቀሙ በሓላ እጅዎትን ይታጠባሉ?	1. አዎ 2. የለም	የለም ከሆነ መልስዎ ወደ ጥ#306 ይለፉ

305	መልስዎ አዎ ከሆነ?	1. በውሃ ብቻ 2. በውሃና በሳሙና	
306	ምግብ ከመብላትዎ በፊት እጅዎን ይታጠባሉ?	1. አዎ 2. የለም	የለም ከሆነ መልስዎ ወደ ጥ#308 ይለፉ
307	መልስዎ አዎ ከሆነ?	1 .በውሃ ብቻ 2 በውሃና በሳሙና	
308	ምግብ ከማቅረብዎና ከማብሰልዎ በፊት እጅዎን ይታጠባሉ?	1. አዎ 2. የለም	የለም ከሆነ መልስዎ ወደ ጥ# 310 ይለፉ
309	መልስዎ አዎ ከሆነ?	1. በወሃ ብቻ 2. በወሃና ሳሙና ብቻ	
310	የምግብ እቃዎችና የመጠጥ ብርጭቆች የሚፀዱት በምንድን ነው?	1. በዉሃና በኬሚካል 2. በዉሃ ብቻ	
311	ለሁሉም ምግብ መክተፊያ የምትጠቀሙት የጋራ ቢላዋ ነው?	1. አዎ 2. አይደለም	
312	የእጅ ጣትዎ የጥፍር ሁኔታ? በማየት	1. የተሰተካከለ 2. ያልተቆረጠ	
313	ሽንት ቤት ይጠቀማሉ	1. አዎ 2. የለም	
314	የደንብ ልብስ ትለበሳለችሁ? ጋዉን፣ የፀጉር መሸፈኛ በማይት	1. አዎ 2. የለም	
315	የምግብና መጠጥ ቤት ቁጥጥር በየስንት ጊዜው ይደረጋል?	1. አይደረግም 2. በየሶስት ወሩ	

		3. በየስድስት ወሩ 4. በየዘጠኝ ወሩና ከዚያ በላይ	
316	የጤና ምርመራ በየስንት ጊዜው ያደርጋሉ? የምስክር ወረቀት ማየት	1. አላደረግሁም 2. በየሶስት ወሩ 3. በየስድስት ወሩ 4. በየዘጠኝ ወሩና ከዚያ በላይ	
317	የምግብ ዝግጅት ስልጠና በየዓመቱ ይወስዳሉ? የምስክር ወረቀት ማየት	1. አዎ 2. የለም	
318	ስትቀጠሩ የጤና ምርመራ ታደርጋላችሁ? የምስክር ወረቀት ማየት	1. አዎ 2. የለም	
319	በቀን ስንት ሰዓት ይሰራሉ?	_____ሰዓት	
320	የተረፉ ምግቦችን ይመገባሉ?	1. አዎ 2. የለም	

Annexes- V Laboratory investigation result recording form Parasitology result

Code	Intestinal parasites	Remark

Annexes –VI Declaration

I, the under signed, declared that this is my original work, has never been presented in this or any other university, and that all the resource and materials used for the research has been fully acknowledged.

Name of principal investigator: Getahun Worku Signature_____date_____

Approval of the advisors

Name of Advisors

1. professor Getu Degu signature _____date _____

2. Gebiyaw Wudie signature _____ date _____

Approval of the examiner

Name of internal examiner Signature Date

1. Mulkamu Bedimo _____ _____

External examiner's name_____ signature_____ date_____