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Research article

Magnitude of Intestinal Parasite Infestation and Associated Factors among Food Handlers Working in Catering Establishments of Bonga, Mizan-Aman and Tepi Towns of Southern Ethiopia

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ABSTRACT

Introduction: Food-handlers with poor personal hygiene could be potential sources of foodborne infections. This study was conducted to determine level of intestinal parasites infestation and food hygiene practices of food handlers working in catering establishment of Mizan-Aman, Bonga and Tepi towns of south-western Ethiopia from April 1-May 20/2019.

Methodology: Institution based cross sectional study was conducted among 241 food handlers. The data was collected through face to face interview using pre tested structured questionnaires. Stool sample was taken from each participant.

Results: Intestinal parasites were identified among 40 (16.6%) of food handlers and 6 (2.5%) of them were carriers of Salmonella species. *Schistosoma mansoni* 10 (4.1%), *Trichuria* 8 (3.3%) and *Ascariss lumbercoid* 6 (2.5%), Hook worm 5 (2.1%), *E. histolytica/dispar* 4 (1.7%), *Gardia lamblia* 3 (1.2%), Tinea species 2 (0.8%) and *H. nana* and *E. vermicularis* represents 1 (0.4%) each. Average monthly income (AOR=3.77, CI 95% (1.95, 10.91)) and service year of the food handlers (AOR=1.18, CI 95% (1.12, 9.40)) were significantly associated with being infected with intestinal parasitosis.

Conclusion: Magnitude of intestinal infestation among food handlers found to be high but *Salmonella* carriage rate was low. Intestinal infestation was associated with monthly income and service year of food handlers.

Keywords: Food handlers; Catering establishment; Intestinal infestation; Helminthes; *Salmonella*

Abbreviations: CDC: Communicable Diseases Control; FBD: Food Borne Disease; MOH: Ministry of Health; WHO: World Health Organisation

INTRODUCTION

Background

Foodborne diseases are an important cause of morbidity and mortality and a significant impediment to socio-economic development worldwide, WHO estimated that 600 million cases of illness and 420,000 deaths were caused by the 31 foodborne hazards worldwide.

Food handling, preparation and service practices are important factors in determining the safety of food have been identified as the leading cause of the majority of food-borne disease. So, food-handlers with poor personal hygiene working in food-serving establishments could be potential sources of infections of many

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intestinal helminthes, protozoa and entero-pathogenic bacteria [1].

Studies done in different parts of the country showed that, the overall prevalence of intestinal parasitosis among food handlers were ranges from 12.9%-49.1%. Also, the existing literatures in Ethiopia revealed that prevalence of *Salmonella* carrier rate among food handlers of institutional catering establishment was 3.4%, 2.7% and 1.3% in Addis Abeba university, BahirDar university and Gonder university respectively. But in study conducted among student cafeteria of Hawasa university no *Salmonella* was detected from stool cultures.

Realizing scarcity of information in the study area, this study was conducted to assess magnitude of intestinal infestation and associated factor among food handlers working in catering establishments of Bonga, Mizan-Aman and Tepi towns of southern Ethiopia [2].

Objectives

General objective: To assess the magnitude of intestinal parasite infestation and associated factors among food handlers working in catering establishments of Bonga, Mizan-Aman and Tepi towns of southern Ethiopia, from April 1-May 20/2019.

Specific objectives

- To determine the magnitude of intestinal parasite infestation and associated factors among food handlers working in catering establishments of Bonga, Mizan-Aman and Tepi towns of southern Ethiopia.
- To identify factors associated with intestinal parasite infestation among food handlers working in catering establishments of Bonga, Mizan-Aman and Tepi towns of southern Ethiopia.

MATERIALS AND METHODS

Study setting and period

The study was conducted from April 1-May 20, 2019 in three towns found in southern Ethiopia, namely Bonga, Mizan-Aman and Tepi. The towns are located 405 Kms, 564 Kms and 580 Kms away from the capital city of Ethiopia, Addis Ababa, respectively. The study was conducted on institutions called Bonga general hospital from Bonga town; Mizan-Tepi university Mizan campus and Mizan-Tepi teaching hospital from Mizan town. Tepi general hospital and Mizan-tepi university Tepi campus were selected from Teppi town. All the indicated institutions have catering establishments for processing and serving foods and drinks.

Source population

All food handlers working in catering establishments found in Bonga, Mizan-Aman and Tepi towns, southern Ethiopia from April 1-May 20, 2019.

Sample size determination

Sample size was determined using the formula for single population proportion using the prevalence of intestinal parasite among food handlers which was 44.1%, with a 95% confidence interval, a margin of error of 5%. The total numbers of food handlers in the town were less than 10,000. Thus, correction formula was used. After correction the sample size was 219 and by adding 10% non-response rate, the final sample size will be 241 [7].

Data collection instrument and process

The data was collected through face to face interview using structured questionnaire and laboratory result filling format which was prepared in single document for each study participant. Socio-demographic status, food handling and personal hygiene practice of each respondent were recorded in the questionnaire. Stool examination and culture results were filled using laboratory result format.

Data collection personnel and data collection process

The data was collected by laboratory technicians. Stool-stool specimens was obtained from food handlers and then added into screw capped containers and transported to microbiology laboratory using ice packed box for microscopic examination and culture.

Stool examination for ova and parasites

Microscopic examination of stool specimens was done using direct wet mount at collection sites and formol-ether concentration method for detection of ova and parasites.

Bacterial culture and identification

After arrival in the microbiology laboratory the samples was inoculated on to MacConkey agar (Oxoid, England) after enrichment with Selenite F broth (Oxoid, England) which was prepared in 10 ml amounts and incubated at 37°C for 18-24 hours. The primary identification of *Salmonella* species was performed by the colony characteristics of culture positive samples; non-lactose fermenting colonies characterized by pale color (colorless) on MacConkey agar.

Confirmatory identification of the organism was done by a series of biochemical tests; Hydrogen Sulfide (H2S) production, indole production and motility in Sulfide-Indole-Motility (SIM) medium, citrate utilization, urease production, different carbohydrate fermentation reactions and Lysine Decarboxylase (LDC) in Simmon's citrate agar, urea agar, Kligler's Iron Agar (KIA) and Lysine Iron Agar (LIA) respectively after sub culturing on nutrient agar. All the biochemical media was obtained from Oxoid, (Hampshire, England).

Study variables

Dependent variable: Intestinal parasites infestation.

Independent variables: Socio demographic factors-age, sex, income, residence, educational status, medical check-up, service year, work category.

Hygienic practice of food handlers: Hygienic practice during food handling, cooking and storing; cleansing of utensils and personal hygiene practice.

Operational definitions

Public institute: Those institutes such as universities, college, schools, technical and vocation training institutes, hospitals, prisons.

Catering establishments: Those establishments found in the selected public institutes which cook food and drink and serves the customers.

Food handlers: Those workers, who cook, handle and serve food and drinks for the customers.

Having intestinal parasite: If at least a single ova/cyst of intestinal parasite found in the stool sample.

Positive for Salmonella: Culture positive for the *Salmonella*.

Ethical consideration

Ethical clearance was obtained from ethical review committee of Mizan Teppi university college of health sciences. Written informed consent was obtained from each study participants. Each study participants were briefed with objective, benefit and procedural steps of the study. Voluntary participation was assured and right to interrupt from interview was clearly stated. Information confidentiality of each study participants was maintained through coding of stool samples and information of each kept secret from unauthorized person. Based on the stool examination result the food handlers who were infested with intestinal parasites were treated with anti-helminthics and anti-protozoal medication.

RESULTS

Socio-demographic and work related characteristics of food handlers

A total of 241 food handlers were participated in the study with 100% response rate. More than 3/4, 211 (87.6%) and 206 (85.5%) were female and urban dwellers respectively. Out of the total, 170 (70.5%) were between age group of 21-30 years. Majority of them, 235 (97.5%) had medical checkup ever since recruited but 127 (52.7%) reported that the medical checkup was irregular (Table 1).

Table 1: Socio-demographic and work related characteristics of food handlers working in catering establishments found in Bonga, Mizan-Aman and Tepi towns, southern Ethiopia from April 1-May 20, 2019.

Variable	Category	Frequency	Percentage
Sex	Male	30	12.4
	Female	211	87.6
Age category (in years)	≤ 20	14	5.8
	21-30	170	70.5
	31-40	51	21.2
	≥ 41	6	2.5
Residence	Urban	206	85.5
	Rural	35	14.5
Medical checkup ever since recruited	Yes	235	97.5
	No	6	2.5
Frequency of medical checkups	Every 6 month	34	14.1
	Every year	71	29.5
	Irregularly	127	52.7
	Never	6	2.5

Personal hygiene, food handling and preparation practice

All study participants had hand washing habit after toileting and 229 (95.0%) of them practice hand washing before touching any food. Among the respondents, 223 (96.3%) of the food handlers finger nail were trimmed and 232 (96.3%) of them wore a personal protective's such as cap and gown [2]. Also, 116 (48.1%) and 214 (88.8%) of the food handlers reported they store foods in refrigerators and use separate utensil for raw and cooked food respectively (Table 2).

Table 2: Personal hygiene, food handling and preparation practice of food handlers working in catering establishments found in Bonga, Mizan-Aman and Tepi towns, southern Ethiopia from April 1-May 20, 2019.

Variable	Category	Frequency	Percentage
Hand washing before touching any food stuffs	Yes	229	95
	No	12	5
Wearing personal protectives during work time**	Yes	232	96.3
	No	9	3.7
Status of finger nails	Trimmed	223	92.5
	Untrimmed	18	7.5
Use separate utensil for raw and cooked food	Yes	214	88.8
	No	27	11.2

Prevalence of *Salmonella* and intestinal parasite

Stool microscopy and stool culture result showed that, 40 (16.6%) food handlers were infested with intestinal parasites and 6 (2.5%) of them were carriers for *Salmonella* species [3]. Among the parasites, *Schistosoma mansoni* 10 (4.1%), *Trichuria* 8 (3.3%) and *Ascaris lumbercoid* 6 (2.5%), Hook worm 5 (2.1%), *E. histolytica/dispar* 4 (1.7%), *Gardia lamblia* 3 (1.2%), Tinea species 2 (0.8%) and *H. nana* and *E. vermicularis* represents 1 (0.4%) each (Figure 1).

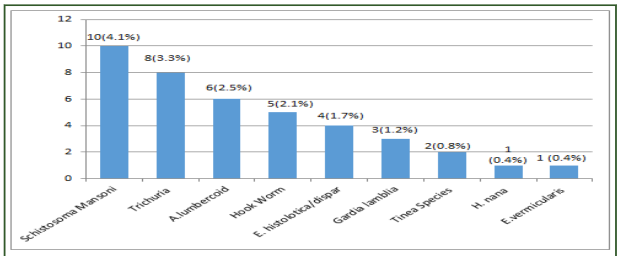

Figure 1: Types of intestinal parasites among food handlers working in catering establishments found in Bonga, Mizan-Aman and Tepi towns, southern Ethiopia from April 1-May 20, 2019.

Factors associated with intestinal parasitic infection

According to our study finding average monthly income of food handlers and total year service in the institution were the determinants of intestinal infestation among food handlers. Food handlers who earned a monthly income of 1500 Ethiopian birr and less were 3.7 times more likely to be infested than those who earned more than 1500 Eth. Birr (AOR, 3.77; 95% CI, 1.95, 10.91) [4]. Food handlers who served for 6 month up to 2 years were 1.18 times more likely to be infested by intestinal parasites than those who served for greater than 2 years in the cafeteria (AOR, 1.18; 95% CI, 1.12, 9.40) (Table 3).

Table 3: Factors associated with intestinal infestation among food handlers working in catering establishments found in Bonga, Mizan-Aman and Tepi towns, southern Ethiopia from April 1-May 20, 2019 (n=241).

Variable	Intestinal parasite identified		COR (95% CI)	AOR (95% CI)
	Yes	No		
Average monthly salary				

≤ 1500 Birr	11 (4.6%)	79 (32.8%)	0.68 (0.23, 3.89)	3.77 (1.95, 10.91)*
>1500 Birr	29 (12.0%)	122 (50.6%)	1	1
Service year				
≤ 6 months	4 (1.7%)	19 (7.9%)	0.20 (0.25, 2.67)	0.75 (0.60, 7.74)
6 month to 2 years	16 (6.6%)	66 (27.4%)	0.34 (0.12, 1.29)*	1.18 (1.12, 9.40)*
>2 years	20 (8.3%)	116 (48.1%)	1	1
Medical check-up				
Yes	33 (13.7%)	159 (66.0%)	0.54 (0.08, 5.23)	0.68 (0.72, 5.44)*
No	7 (2.9%)	42 (17.4%)	1	1

Note: *P value<0.05; COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio

DISCUSSION

According to the current study 2.5% of food handlers were *Salmonella* carriers. Similarly, previous studies done on food handlers revealed that *Salmonella* carrier status were rare [5]. Study finding from southern Ethiopia and India reported a single case of *Salmonella* carrier whereas studies from Addis Abeba University, Bahir Dar university, BahirDar town, Gonder university, Kenya and Ghana showed that the prevalence of *Salmonella* carrier rate was 3.4%, 2.7%, 1.6%, 1.3%, 2% and 2.3% respectively. Similarly study done in student cafeteria of Hawasa and Gonder town of Ethiopia indicated that no *Salmonella* was detected in stool cultures [6].

But studies done in Kuwait, Sudan, Nigeria and Malaysia showed that the magnitude of *Salmonella* infection among food handlers was 7.9%, 10%, 42.3% and 48% respectively. This high carrier rate is observed because the studies were done among street vendors with low educational level, low or no medical checkup and certification as well as poor personal hygiene practice. One of the studies stated that street vendors were more common among suspected typhoid carriers; all of them were not received any health education about typhoid disease.

In our study finding, 16.6% food handlers were infested with intestinal parasite which is slightly higher than the study reports from Iran 15.5% and Bahir Dar university of Ethiopia 12.9%. In contrary, this finding was higher than study conducted in Yebu town, Wolayita Sodo, Bahir Dar Town and University of Gonder with the overall prevalence of 44.1%, 33.8%, 41.1% and 29.21% respectively [7]. The difference might be explained by level of urbanization, level of education socio economic development, water accessibility and hygienic practice.

In the current study *Schistosoma mansoni* was the predominant intestinal parasite (4.1%), which is lower than the study finding from Gonder university 0.8% and 1.8% Nigeria.

Highest proportion of study participants had 95% hand washing practice before touching food, 100% hand washing practice after toilet visit and 96.3% of them had trimmed finger nails. But these practices didn't show significant association with magnitude of intestinal parasite [8,9]. But in other studies in Ethiopia, Arbamich university cafeteria and Yebu town had reported that hand washing practice and trimmed finger were shown as a determinant factor for parasitic infection.

This study revealed that monthly income of food handlers had association with intestinal parasite infection. Food handlers those had monthly income (≤ 1500 Birr) more likely to be infested by intestinal parasite. This might indicate better hygienic toilet, washing facility and hygienic kitchen at their home premises among those who has better income status and the source of infection might be at home premises for those less income status. Also service experience had association with intestinal parasite infection [10,11]. A service year less than 2 year increase the chance of intestinal parasite than 2 years and more service experience; this might explain by more familiarity with techniques of personal hygiene practice and it might prevents susceptibility to intestinal parasite infestation. Finally routine screening of food handlers is recommended as a valuable tool for prevention of food-borne infections [12].

CONCLUSION

The prevalence of intestinal parasite among food handlers was high but *Salmonella* carrier rate was low. Though the hygiene condition of the food handlers was good, most of them were not certified for food handling and had no regular medical checkup in the establishments where they were working. This may predispose consumers to significant risk of infestation. Average monthly income, the service year served in the institution and having medical check-up were predictors of intestinal parasite infestation among food handlers.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was obtained from ethical review committee of Mizan Teppi university college of health sciences. Written

informed consent was obtained from each study participants. Each study participants were briefed with objective, benefit and procedural steps of the study. Voluntary participation was assured and right to interrupt from interview was clearly stated.

CONSENT TO PUBLISH

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interest.

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AUTHORS' CONTRIBUTIONS

DS and EA conceived the study; ME and TW performed statistical analysis and drafted the manuscript. MG critically revised and reviewed the manuscript. All authors read and approved the final manuscript.

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