



## Magnitude of Intestinal Parasites among Food Handlers Working in Food Service Establishments in Gondar Town, Northwest Ethiopia: A Cross Sectional Study

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### ABSTRACT

**Background:** As in most of African countries, intestinal parasites have been widely distributed in Ethiopia and are among the ten top causes of morbidity and mortality nationwide. Statistics for food borne illness in various industrialized countries show that up to 60% of cases may be caused by poor food handling techniques and by contaminated food served in food service establishments. Epidemiological information on the prevalence of various intestinal parasitic infections in different regions/ localities is a prerequisite to develop appropriate strategies.

**Objective:** The aim of this study was to determine the prevalence of intestinal parasites among food handlers working in different food service establishments in Gondar town.

**Methods:** A cross sectional study was conducted on food handlers working in different food service establishments in Gondar town. Stool samples were collected from 140 food handlers and processed using formol-ether concentration method and then microscopically examined for intestinal parasitic infections. Pre-tested and structured questionnaire was used to study the socio-demographic characteristics of food handlers. *Chi-square* test and *p*-value were used to assess associations between risk factors and the parasite isolation rate.

**Results:** Of the 140 food handlers surveyed for intestinal parasites, 64 (45.75%) had parasites. prevalence of *Ascaris lumricoides* was the highest (28.75%), followed by Hookworm (15.18%), *Entamoeba histolytica/dispar* (14.29%), *Giardia lamblia* (12.99%), *Trichuris trichuria* (10.39%), *Shistosoma mansoni* (7.79%), *Strongyloides stercoralis* (6.4%) and *Isoospora belli*, *Hymenolopsis nana* and *Taenia* species each accounting 1.3%. Being an illiterate and inactive role of the town municipality are determined as a risk factor for parasitic positivity of food handlers.

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**Conclusion:** The finding of parasites in food handlers predict as they are potential source of infection to their customers. The active roles of the town municipality and educating food handlers have a great impact on reduction of parasitic positivity of food handlers.

**Keywords:** Food handlers; Hygiene; Intestinal parasites; Parasitic positivity

## INTRODUCTION

As far back as the documentation of human history goes, consumption of food un safe for health and its consequences have been one of man's major health problem. They still remain to be a major public health concern globally. These food borne disease are caused by bacteria, virus fungus and parasites [1]. Intestinal parasitosis refers to a group of disease caused by one or more species of protozoa and helmenths (cestodes, trematodes and nematodes). These parasites are responsible for the major share of morbidity and mortality in community where there is overcrowding, poor environmental sanitation and poor personal hygienic practice, economic and social conditions also affect distribution of human parasite [2-4]. Parasitic infections caused by intestinal protozoa and helminthes affect more than 2 billion people worldwide [5]. In tropical countries, parasitic diseases remain among the most ubiquitous and serious health problems with striking high prevalence rates of the major protozoan and helminthic infection [6]. As in most of African countries, intestinal parasites have been widely distributed in Ethiopia and are among the ten top causes of morbidity and mortality nationwide. According to the ministry of health of Ethiopia, intestinal parasitism accounts for 8.5% of all male and 10.4% of all female outpatient infection. Prevalence rates higher than 70% and high rate of multiple infections from those infected individuals have been reported from many parts of the country [7]. Although the prevalence rates of individual parasites vary considerably attitudinally in different parts of the country, several studies show that *A. lumbricoides* is the most prevalent intestinal parasite, followed by *T. trichuria*, Hookworm species and *S. stercoralis* [8]. The prevalence of *A. lumbricoides* infection was 29% in the high lands; 35% in the temperate areas and 38% in the lowlands. The prevalence of Hook worm infection was highest in the lowlands (24%) followed by the temperate (15%) and highland (17%) areas and the difference were significant. *Tricuris trichuria* infection exhibited similar prevalences in all altitudinal regions (13% on the average). Earlier works showed that intestinal parasitism had prevalence rates of 20%-70% in Gondar region [9]. High prevalence of intestinal parasitic infection affect the health status of individuals mainly affecting physical and mental development causing malnutrition, anemia, stunting, cognitive impairment, lowered educational achievements and interfering with productivity. Parasitic infections especially helminthic infections are clearly persistent within human communities in endemic areas and hence remain infectious for other healthy individuals [10]. Transmission of intestinal parasites is effected directly or indirectly through faces contaminated objects such as food, water, soil and finger. Although various modes of transmission of intestinal parasites

are known to exist, several have shown the higher magnitude of hand to mouth transmission as potential sources of exposure to parasitic infection. Accordingly food handlers with poor personal hygiene working in food service establishments could be potential sources of infection for many of the intestinal helmithe and protozoa. Food handlers who harbor and excrete intestinal parasites may contaminate food from their faeces to their hands and then to food process and healthy person may be infected by eating contaminated food. The importance of food handlers as threats in the transmission of parasitic disease has been stressed by several authors. Statistics for food borne illness in various industrialized countries show that up to 60% of cases may be caused by poor food handling techniques and by contaminated food served in food service establishments. Aggravated problems exist in the developing world. A study conducted in Awassa town in 2000 revealed that the overall prevalence of intestinal parasites among food handlers was 63%, with *G. lamblia* (33.3%), *E. histolitica* (21.5%), *A. lumbricoid* (18.2%) and Hookworm species (10.8%). Therefore, a special attention should be given to food handlers for their personal hygiene and sanitation, health status and awareness, their health behavior, etc. It is common that in Ethiopia and most of developing countries food handles have little knowledge about safe food processing up to consumption practice and importance of personal hygiene in control off intestinal parasites. With this information at hand, the most practical and economic control and prevention measures should be undertaken. The main aim of this study was to determine the prevalence of intestinal parasites in those food handlers working in different levels of food service establishments; and to compare the prevalence rate among different levels of food service establishments.

### General Objective

The general objective of this study was to determine the prevalence of intestinal parasites among food handlers working in different food service establishments.

### Specific Objectives

- To determine the prevalence of intestinal parasites among food handlers working in different food service establishments in Gondar town.
- To measure the factors associated with the incidence of intestinal parasites in those food handlers working in different levels of food service establishments.

## MATERIALS AND METHODS

### Study Area

The study area was Gondar town which is the capital city of North Gondar zone in Amhara region. It is located about 750 kms North-west of Addis Ababa. It has an area of 40.27 km<sup>2</sup> and like most other towns the population size is increasing and there are many public services like 24 hr electric power, telecommunications, postal service and 211 food service establishments. It has also two hospitals and private and government clinics.

### Study Design and Period

A cross sectional study was designed and conducted on food service establishments in Gondar town North west Ethiopia from September to December 2021. The lists of food service establishments were obtained from industry, investment and development office of Gondar town. Each level of food service establishment was considered as a cluster and the number of clusters to be studied was determined using a probability proportional to size technique from each strata. Simple random sampling technique was used to select the number of subjects from each cluster to be studied. There were about 1043 food handlers working in different levels of food service establishments. Out of which 182 were the sample size for this study, four were from government hotels, four from bar and restaurant with recreation, 106 from private hotels, 46 from restaurants and 22 from tea and breakfast rooms. Pre-tested and structured questionnaires were used to produce general information on socio-demographic characteristics of food handlers. They were asked for their views on determinants of hygienic and sanitary conditions within the establishments they work. Stool samples were taken from the selected food handlers using a leak-proof plastic caps containing 8 ml of 10% formalin.

The sample size for the study was determined using a statistical formula:

$$n = \frac{Z^2 p(1-p)}{d^2} = \frac{(1.96)^2 \times 0.63(0.37)}{(0.07)^2} = 182$$

### Stool Sample Collection and Examination

From each study subjects sufficient amount of fresh stool samples were collected using small clean plastic cups containing 8 ml of 10% formalin preservative. All specimens were processed by formol-ether concentration method and microscopically examined for helmenth eggs, larvae and cysts of protozoan parasites. Data analysis was made manually using scientific calculator and the results were presented in Table.

### Ethical Consideration

- The ethical clearance for the study was taken from Gondar town municipality and university of Gondar, college of medicine and health sciences.
- The study subjects (food handlers) were not forced to be part of the study and the aim of the study was explained to each food service establishments.

## RESULTS

Out of total selected 182 food handlers in all establishments, 140 of them responded making an overall coverage of 77%. Majority of the respondents were in the age of 10-20 (60%) years old and educational level of illiterate (46.43%) (Table1).

**Table 1:** Socio-demographic characteristics of food handlers working in different food service establishments in Gondar town.

	Government hotels			Bar and resturant			Private hotels			Resturant			Tea and breakfast			Total N (%)
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
Age	10-20	1	1	2	2	2	27	29	1	32	33	3	16	19	84 (60%)	
	21-30	1	1	4	4	2	16	18		12	12	1	3	4	39 (27.85%)	
	31-40	2	2	1	1	2	4	4	1	2	3		2	2	73 (9.29%)	

	41-50										2	2				2 (1.4 3%)
	>50					1		1						1	1	2 (1.4 3%)
	Total	4	4	1	7	8	5	47	52	2	48	50	4	22	26	140 (10 0%)
Educational level	Illiterate	2	2		6	6		20	20		29	29	2	6	8	65 (46. 43 %)
	Read and write	1	1		1	1	1	2	3		1	1	1	1	2	8 (5.7 1%)
	01- 06			1		1	3	15	18	1	13	14		8	8	41 (29. 29 %)
	07- 12	1	1					8	8	1	4	5	1	6	7	21 (15 %)
	>12					1	2	3			1	1		1	1	5 (3.5 7%)
Marital status	Married	1	1		5	5	2	14	16	1	18	19		5	5	46 (32. 86 %)
	Un- married	3	3	1	2	3	3	33	36	1	30	31	4	17	21	94 (67. 14 %)
Income per month in Birr	<10 00							9	9	2	28	30	1	16	17	56 (40 %)
	100 1-2 000			1	6	7		23	23		11	11	2	5	7	48 (34. 28 %)
	200 1-4 000	4	4				5	14	19		9	9				32 (22. 86 %)
	>40 00				1	1		1	1				1	1	2	4 (2.8 6%)
Type of latrine	Private	4		7			48			50			26			135 (96. 43)
	Public			1			4									5 (3.5 7%)
	Open field															0 (0% )

	Pipe	4	8	52	50	26	140 (100%)
Water source	Spring						0 (0%)
	Well						0 (0%)
	River						0 (0%)
Style of washing food service utensils	Only by water and soap		6	35		23	108 (77.14%)
	By water and soap						0 (0%)
	With other chemicals	4	2	17	6	3	32 (22.86%)
Working cloth	Clean gown with hair net	2	6	32	22	11	73 (52.14%)
	Normal	2	2	20	28	15	67 (47.86%)
Municipality role in waste disposal	Present	4	8	24	18	10	64 (45.71%)
	Absent			28	32	16	76 (54.29%)

From the total 140 sampled stool specimens examined, 64 (45.75%) were positive for any one parasite and multiple infections were identified in 12 (18.75%) of the positive cases which accounts 8.6% from the total samples. *A. lumricoides* was found to be the most prevalent parasite, 22 (28.75%), followed by Hookworm, 12 (15.18%), *E. histolytica*, 11 (14.29%), *Giardia lamblia*, 10 (12.99%), *T. trichuria*, 8 (10.39%), *S. mansoni*, 6 (7.79%), *S. stercoralis*, 5 (6.4%) and *I. belli*, *H. nana* and *Taenia* species each accounting 1 (1.3%) of

the five levels of food service establishments, restaurants showed a greater prevalence of intestinal parasites among food handlers 25 (32.47%), followed by private hotels, 24 (3.17%), tea and breakfast rooms, 21 (27.27%), bar and restaurant with recreation, 5 (6.49%) and Government hotels, 2 (2.6%) (Tables 2-5).

**Table 2:** Result of stool examination of food handlers in those five levels of food service establishments.

	Government Hotels			Bar and resturant			Private hotels			Resturant			Tea and breakfast			Total N (%)
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
Cyst of <i>G. lamblia</i>								2	2		3	3	1	4	5	10 (12.99%)
Ova of <i>A. lumbricoides</i>		2	2		2	2		10	10		6	6		3	3	22 (28.57%)
Cyst of <i>E. histolitica</i>					3	3	1	1	2		2	2		4	4	11 (14.29%)
Ova of <i>T. trichuria</i>								4	4		1	1	1	2	3	8 (10.39%)
Ova of Hook worm					1	1		3	3		4	4		4	4	12 (15.58%)
Larvae of <i>S. stercoralis</i>											3	3	1	1	2	5 (6.49%)
<i>I. belli</i>								1	1							1 (1.3%)
<i>S. mansoni</i>							2		2	1	3	4				6 (7.79%)
<i>H. nana</i>											1	1				1 (1.3%)
<i>Taenia</i> species											1	1				1 (1.3%)
Total positive	0	2	2	0	4	4	3	12	15	1	27	28	2	13	15	64 (45.71%)
Total negative	0	2	2	1	3	4	2	35	37	1	21	22	2	9	11	76 (54.29%)
Total	0	4	4	1	7	8	5	47	52	1	48	50	4	22	26	140 (100%)

**Table 3:** Variables having an association with parasitic positivity of study subjects in observed value.

Variables	Parasitic positivity		Total
	positive	Negative	
<b>Educational level</b>			
Illiterate	29	36	65
Read and write	6	2	8
01-6	20	21	41
7-12	6	15	21
>12	3	2	5
Total	64	76	140
<b>Municipality role</b>			
Present	33	31	64
Absent	31	45	76
Total	64	76	140

**Table 4:** Variables having an association with parasitic positivity of study subjects in observed expected value.

Variables	Parasitic positivity		Total
	positive	Negative	
<b>Educational level</b>			
Illiterate	29.7	35.3	65
Read and write	3.66	4.34	8
01-6	18.75	22.25	41
7-12	9.6	11.4	21
>12	2.3	2.7	5
Total	64	76	140
<b>Municipality role</b>			
Present	29.25	34.75	64
Absent	34.75	41.25	76
Total	64	76	140

**Table 5:** Value of  $X^2$  for variables having an association with the parasitic positivity.

Variables	Value of AOR (CI=0.05)	
	$X^2$ calc	$X^2$ tab
Being an illiterate	9.6	9.49
No municipality role	4.23	3.84

## DISCUSSION

Epidemiological study on the prevalence of infection of intestinal parasites in different localities is a primary objective to identify high risk communities and formulate appropriate intervention. In line with this view, the current study attempted to assess a prevalence of intestinal parasitic infections in food handlers working in different levels of food service establishments in Gondar town. The result of this study showed the occurrence of several intestinal parasites of public health importance among food handlers working in different levels of food service establishments in Gondar town. Absent and/or low prevalence of intestinal parasites might be due to the single technique used in this study. Specific methods such as the adhesive scotch tape for *E. vermicularis*; water emergency for *S. stercoralis* (if fresh stool samples were examined) and kato-thick smear for most intestinal parasites were also good. As a result, much greater rate of parasites would have been found if these methods in combination were used in this study. A review of literatures reveals very few investigations of intestinal parasites in those food handlers working in different food service establishments in different towns. Earlier studies showed that intestinal parasites had a prevalence rate of 20%-70% in Gondar region and the result of the current study also found within this range (45.75%). This might be due to similarity in the study area. A study conducted by Michael J on safe food handling revealed that *A. lumbricoides* was the most prevalent intestinal parasite in different parts of the country, which is in line with the result of this study. A similar study conducted on the investigation of intestinal parasites among food handles by Sahilemariam Z, et al revealed that ova, larva and cyst of intestinal parasites were isolated from 58.4% of study subjects, which was greater when compared to the findings of this study (45.75%). This might be due to variations in non-included group and the over mentioned factors. It is known that many customers are served by the food service establishments serving lunch, dinner, snack and breakfast daily, which needs the various quality indicators of food handlers such as regular medical check-up, wearing outer garments, wearing clean gown, wearing hair net. But as this study showed 47.86% of the study subjects didn't have clean gown, hair net and outer garments which are the main parts of the quality indicators of food handlers. Establishments which accompanied 54.29% of the study participants didn't have gotten the municipality role in waste disposal management instead they dispose waste using open field. To know whether there is an association between parasitic positivity and the two variables, educational level and municipality role, a *chi-square* test was done. Accordingly, the

adjusted odds ratio for the variables being an illiterate and inactive role of municipality were 9.6 and 4.23 respectively ( $P < 0.05$ ). Therefore, being an illiterate and inactive role of municipality determined as an associated factors for parasitic positivity of food handlers.

## CONCLUSION

The finding of these parasites in stool specimen of food handlers may predict the source of infection to the customers. Results from such studies would therefore contribute in identifying the source for the infection and in breaking the chain of transmission by recommending the implementation of personal and environmental hygiene, regular screening of food handlers for parasites and periodic dewarming. The impact of each measure would be maximized through health education program and training on basic principle of hygienic ways of food handling directed to food handlers working in different food service establishments in particular and the communities in general. The active roles of the town municipality and educating food handlers have a great impact on reduction of parasitic positivity. The town municipality, Zonal and Woreda health departments and other responsible body must establish regular supervision and inspection systems for food service establishments and give appropriate feedback to all owners or managers at regular intents and give appropriate feedback to all owners or managers at regular intervals.

## CONFLICT OF INTERESTS

The authors announce that there is no any competing interest.

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