Original article

Prevalence of *Salmonella typhi* and intestinal parasites among food handlers in Bahir Dar Town, Northwest Ethiopia

Bayeh Abera[1], Fantahun Biadegelgen[1], Belay Bezabih[2]

Abstract

Background: Food borne diseases are a global public health problem. Food handlers play a major role for the transmission of food borne diseases.

Objectives: This study was aimed at exploring the prevalence of intestinal parasites, *S. typhi* carrier rate and risk factors among food handlers at Bahir Dar town.

Methods: A cross -sectional survey was conducted among food handlers working in different kitchens. A pre-tested structured questionnaire was used for collecting data. Stool samples were investigated for intestinal parasites and *S. typhi* as per the standard laboratory methods.

Results: Among 384 food handlers, females comprised 300 (78%). The majority 371 (96.6%) were young adults (12-40 years). The median year of service was 1 year (1 month to 24 years). All food handlers had no previous medical checkup and 54 (14%) were certified as food handlers. One hundred fifty eight (41.1%) food handlers had intestinal parasites and 6 (1.6%) were found positive for *S. typhi*. Of these, 25 (6.5%) were suffering from diarrhoea. Nine species of intestinal parasites, 2 protozoa (*E. histolytica/*dispar 12.76% and *G. lamblia* 7. 0%*)* and 7 helminthes (*A. lumbricoides,* 11.7%*, Hookworm,* 8.1%, *S. stercoralis,* 2.86%*, S. mansoni,* 1.8%*, Taenia species,* 1.3%*, H. nana,* 0.5% and *T. trichiuria,* 0.5%) were detected.

Conclusion: Inexperienced and poor personal hygienic food handlers play a role for transmission of food borne infections. Local health authorities should implement food handler's training on food safety, institute periodic focused medical check up for food handlers and improve human waste disposal. [*Ethiop. J. Health Dev.* 2010;24(1):46-50]

Introduction

Food borne diseases are a public health problem in developed and developing countries. The World health organization (WHO) estimated that in developed countries, up to 30% of the population suffer from food borne diseases each year, whereas in developing countries up to 2 million deaths are estimated per year (1, 2).

Intestinal parasitic infections are public health problems especially in the developing countries. Studies indicated that intestinal parasitic infections result in malnutrition, morbidity, mortality and socioeconomic impact owing treatment cost and hospitalization (3). Intestinal parasites, which have direct life cycle, are transmitted by faecal oral route to human through poor personal hygiene (4, 5).

S. typhi is one of the major causes of food and water borne gastroenteritis in human (6) and remains an important health problem worldwide. The World Health Organization estimates 16 million new cases and 600,000 deaths of typhoid fever were estimated each year (7). The emergence of antimicrobial resistant *S. typhi* including to chloramphenicol has been an issue (8). Moreover, Yismaw G et al reported that 79.2% and 44.1%of *S. typhi* isolated from clinical samples in Gondar University hospital were resistant to chloramphenicol and gentamicine respectively (9). Studies had demonstrated that food handlers harbour *S. typhi* asymptomatically (10-12).

Food handlers with poor personal hygiene and inadequate knowledge on food safety could be the source of food borne pathogens (13-14). The consequence of food contamination varies among countries and regions of the world depending on climate, geography and degree of social and economical development (14).

In Bahir Dar town, eating and drinking in food services establishments, such as hotels, restaurants and snack bars is becoming a common practice. Information on intestinal parasites, *S. typhi* and risk factors among food handlers in the study area is limited. Thus, this study was aimed to determine the prevalence of intestinal parasites, S .*typhi* and exploring risk factors among food handlers working in food service establishments in Bahir Dar town.

Methods

Study design and area

A cross sectional study was conducted among food handlers working in food service establishments in Bahir Dar town from April 01-30, 2009. Bahir Dar town is the capital of Amhara National Regional State and one of the tourist destinations in North West Ethiopia (560kms away from Addis Ababa).

Study population

Food handlers working in different kitchens of food service establishments were enrolled. The study subjects

[1]Medical Microbiology, Immunology and Parasitology department, College of Medicine and Health Science College, Bahir- Dar University P.O.Box, 1498, Bahir Dar, E-mail: bayeabera@yahoo.com
[2]Regional Health Research Laboratory Center, Bahir Dar, Ethiopia

were selected by proportional random sampling from 95 different cafeterias and restaurants. A pre-tested structured questionnaire was used to collect data on age, sex, educational level, years of service, status of training and hand washing practices.

Sample collection and transport

Stool specimen was collected from each food handler in a clean stool cup by medical laboratory technicians and transported into the Microbiology laboratory at Bahir Dar Regional health research Laboratory with in an hour of collection.

Microscopic examination of stool

Intestinal parasites were investigated microscopically from each stool samples using both direct smears mount in saline and formal-ether concentration sedimentation procedures as per the standards (15).

Culture and identification

For isolation of *S. typhi*, stool samples were enriched in Selenit F broth for 18 hours prior to inoculating into the plates of Salmonella-Shigella agar (Oxoid, UK). After 24 hours of incubation at 37 ^{o}C, *S. typhi* was identified following the standard procedures (16).

Antimicrobial susceptibility testing

Antimicrobial susceptibility tests were performed on Mueller-Hinton agar (Oxoid, Hampshire, UK) by disc-diffusion method (17). The antimicrobial agents tested were: ampicillin (10 µg), tetracycline (30 µg), chloramphenicol (30 µg), gentamicin (10 µg) and norfloxacillin (10 µg) (Oxoid, UK). The resistance and sensitivity were interpreted according to the National Committee for Clinical Laboratory Standards (18). A reference strain of E. Coli ATCC 25922 was used as quality control during antimicrobial susceptibility tests.

Ethical consideration

The data were collected after written informed consent was obtained from all study participants, and the study was approved by the Research Ethics Committee of the Bahir Dar University. Participants found positive for intestinal parasites and *S. typhi* were treated.

Statistical analysis

Statistical analysis was done using SPSS version 16.00 soft ware. The Chi-square test was employed to associate intestinal parasites with food handlers' hygienic practices. A p-value of < 0.05 was considered to indicate statistical significant differences.

Results

Study population

Three hundred eighty four food handlers (300 females and 84 males) were included in the study. Their mean age was 22 years, ranging from 12-65 years. Significantly, the majority (96.6%) of food handlers were very young adults including children age. The educational levels, age category and work experiences were shown in (Table 1).

In hand washing practices, 348 (90.6%) food handlers had a habit of hand washing after toilet. However, a few number (11.2%) of food handlers had a habit of hand washing after touching dirty materials and different body parts (hair, nose and ear) between handling of food items. None of the participants had had medical check up including stool examination previously. Fifty four (14%) food handlers were certified for training in food handling and preparation (Table 2).

Table 1: **Sociodemography of food handlers versus intestinal parasites positivity in Bahir Dar town 2009**

Characteristics	Frequency number (%)	Positive for parasites number (%)
Sex		
Female	300 (78)	131 (34.1)
Male	84 (22)	27 (7.0)
Age (years)		
12-19	103 (26.8)	35 (9.1)
20-40	268 (69.8)	71 (18.5)
≥ 41	13 (3.4)	2 (0.5)
Educational levels		
Non-literate	113 (29.4)	53 (13.8)
1-6 grade	167 (43.5)	69 (18)
7-12 grade	69 (18)	27 (7.0)
>12 grade	35 (9.1)	9 (2.3)
Service year		
<1 years	202 (52.6)	98 (25.5)
1-2 years	119 (31)	39 (10)
Above 2 years	63 (16.4)	21 (5.4)
Total	384 (100)	158 (41.4)

Table 2: **Hygienic practices of food handlers in relation to parasites positivity in Bahir Dar town, 2009**

Variables	Frequency	Positive for parasites	Relative risk	95% confidence interval	P-Value
Certified in food training					
Yes	54	19	0.76	0.52-1.11	0.17
No	330	139			
Hand washing after toilet					
Yes	348	147	1.38		
No	36	11		0.83-1.38	0.23
Hand washing after touching dirty Materials					
Yes	41	9	0.51	0.28-0.91	0.013
No	343	149			
Touching body parts					
Yes	2	-			
No	382	158			
Medical check up					
Yes	-	-			
No	384	158			

Intestinal parasites

Stool examination of food handlers reveled that 158 (41.1%) had one or more intestinal parasites. Mixed intestinal parasite infections were detected in 9 (2.3%). Twenty five (6.5%) of food handlers were suffering from diarrhea. The most prevalent intestinal parasite species were *E. histolytica* /dispar 49 (12.76%) and A. *lumbricoides* 45 (11.7%) (Table 3).

Table 3: **Prevalence of intestinal parasites among food-handlers Bahir Dar town, 2009**

Parasites species	Frequency number (%)
Protozoa	
E. histolytica /dispar	49 (12.76)
Trophozites form	10 (2.6)
Cyts form	39 (10.16)
G. lamblia	27 (7.0)
Trophozotes form	6 (1.56)
Cyst form	21 (5.44)
Helminthes	
A. lumbricoides	45 (11.7)
Hookworm	31 (8.1)
S. stercolaris	11 (2.86)
T. trichiura	2 (0.52)
S. mansoni	7 (1.8)
Taenia species	5 (1.3)
H. nana	2 (0.52)
Mixed Helminthiasis	
A. lumbricoides and Hook worm	4 (1.04)
A. lumbricoides and *S. stercolaris*	3 (.78)
A. lumbricoides and Taenia species	1 (0.26)
S. mansoniand and S. stercolaris	1 (0.26)
Total	9 (2.34)

Salmonella typhi

Stool cultures of food handlers showed that 6 (1.6%) were carried *S. typhi*. Four *S. typhi* carriers had also intestinal parasites. The isolated *S. typhi* revealed high resistances against six antimicrobial agents tested (Table 4)

Table 4: **Antimicrobial resistance of *S. typhi* isolated from food handlers, Bahir Dar town, 2009**

Antimicrobial agents	Resistance Number (%)
Chloramphenicol	2 (33.3)
Norfloxacillin	1 (16.6)
Cotrimoxazole	5 (83.4)
Tetracycline	4 (66.7)
Ampicillin	6 (100)
Gentamicin	2 (33.3)

Discussion

In this study, the overall prevalence of intestinal parasites among food handlers was higher 158 (41.1%) compared to previous study done at Gondar town (29.1%) in North West Ethiopia (19). However, T/ Mariam *et al* reported that 63% food handlers had intestinal parasites at Awassa town in Southern Ethiopia (20). High prevalence of intestinal parasitosis is attributed by poor personal hygienic practices and poor environmental sanitation (P=0.013).

It was noted that 25 (6.5%) food handlers working in the kitchens were suffering from diarrhea. Active trophozite forms of *E. histolytica*, *G. lamblia* and larva of *S. stercoralis* were associated with diarrheic food handlers as described in (Table 3). *G. lamblia* infected food handlers can directly transmit giardia to consumers if ingested via contaminated food and water because *G. lamblia* cysts does not need environmental maturation (21). Moreover, Mintz *et al* found that food handlers infected with *G. lamblia* were a vehicle for giardia outbreak in commercial food establishment (22). Thus, food handlers should be in a good health and those suffering from diarrhea must be excluded from work until they have been completely free of symptoms.

The study has also attempted to isolate *S. typhi* from stools of food handler. Six (1.6%) food handlers were found infected with *S. typhi*. However, in Gondar town, Andargie *et al* (19) reported that no salmonella species were isolated in food handlers. Chronic asymptomatic *S.*

typhi carrier food handlers may be a potential source of *S. typhi* transmission. *S. typhi* showed high resistances against ampicillin, cotrimoxazole, tetracycline, and chloramphenicol, genentamicin and norfloxacillin indicated that antimicrobial resistance of *S. typhi* is an increasing concern.

In this study, most food handlers working in the kitchens were very young adults including children. The majority had inexperienced with low educational levels, which agrees with previous study in Mekelle town (23) North Ethiopia. None of the food handlers had had medical check up including stool examination in the past. However, in Mekelle town, Zeru K *et al* found that 63 (22.7%) food handlers had medical check up (23).

Assessment of hand washing practices revealed varied results. Food handlers' hand washing practices after toilet (90.6%) was in parallel with the previous reports in Gondar town (19). However, only few had practices of hand washing after touching dirty materials and different body parts between handling of food items. These reflected that food handlers lack awareness about food contamination with poor hygienic practices. Health education intervention on food safety and hygiene must be strengthening to ensure food safety during processing, preparation and storage in food services establishments.

In conclusion, food handlers working in the kitchens were suffering from multiple species of intestinal parasites with 1.6 % *S. typhi* carrier rate. The majorities were inexperienced with poor personal hygienic practices. It is recommended that local health authorities should implement interventions such as food handler's training on food safety, institute periodic focused medical check up for food handlers and improve human waste disposal.

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