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Prevalence of intestinal parasites among food handlers at cafeteria of Jimma University Specialized Hospital, Southwest Ethiopia

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ABSTRACT

Objective: To assess the prevalence of intestinal parasites and associated risk factors among food-handlers working at cafeteria of Jimma University Specialized Hospital, Jimma, Ethiopia.
Methods: Socio-demographic and associated risk factors data were collected using a pretested structured questionnaire. Stool and finger-nail specimens were screened for intestinal parasites using direct wet mount and formol-ether concentration sedimentation techniques. Data were edited, cleaned, entered and analyzed using statistical package for social science (SPSS) version 20. $P \leqslant 0.05$ was taken as statistically significant.
Results: A total of 94 food-handlers working at cafeteria of Jimma University Specialized Hospital were participated in the study. From the total 148 samples (94 stool and 54 finger-nails content) examined, 31 (33%) were positive for one or more parasites. Over all eight types of intestinal parasites were identified. The most prevalent parasite identified was *Ascaris lumbricoides* (16%) followed by *Entamoeba histolytica/dispar* (4.3%). There was significant association between parasitic infection and food handlers who did not practice hand washing after defecation and before serving food.
Conclusions: Relatively high prevalence of intestinal parasites is detected indicating poor hygiene practice of the food-handlers at the study site. The study also identified finger-nail status, hand washing after defecation and before serving food as determinants of intestinal parasitic infection. It is crucial for provision of regular training on strict adherence to good personal hygiene and hygienic food-handling practices as well as regular inspection and medical checkup of food-handlers.

1. Introduction

Parasitic diseases are among the most important infectious diseases and pose health problems in many countries, especially in developing countries. The World Health Organization (WHO) estimated that 3.5 billion people worldwide are infected with intestinal parasites and as many as 450 million of them are sick due to intestinal parasites, the majority being children[1].

Different reports have indicated the presence of strikingly high prevalence rates of the major protozoan and helminth infections in tropical countries, where parasitic diseases remain among the most ubiquitous and serious health problems[2,3]. Lack of clean and safe water, high population density, lack of proper disposal of waste, noncompliance with health standards, lack of adequate washing of vegetables, and consumption of uncooked meat lead to high prevalence of intestinal parasites[4]. Studies in different parts of Ethiopia revealed that there is different level of infection of intestinal parasites among studied groups and in different regions of the country[5,6]. In order to address this public health importance, the Federal Ministry of Health of Ethiopia has considered intestinal parasites infection as one of the priority among neglected tropical diseases in its National Master Plan of NTDs control strategies[7]. It has been indicated that high intensity infections with intestinal parasites and other food-borne diseases would negatively affect the health status of the individuals. Among those negative sequels, it may worth to mention malnutrition, anemia, stunting, and cognitive impairment altogether interfering with the overall productivity[8,9]. Food-handlers who harbor and excrete intestinal parasites may contaminate food and serve as continues source of food-borne infections. Contamination

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The study protocol was ethically approved by Ethical Clearance Committee of Institute of Health, Jimma University and letter of cooperation was written to medical director of the JUSH and head of the cafeteria services. Samples and other related data were taken after getting written consent of the study subjects.

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could happen through different ways during food processing, handling or serving, and the healthy person (consumers) may be infected by eating or drinking this contaminated food stuffs[10]. The importance of food-handlers as threats in the transmissions of parasitic diseases has been stressed by previous local study in Ethiopia[11]. According to recent reports, the prevalence rates of the intestinal parasites infections among food-handlers in different part of the world range from 28.7% to 52.2%; for instance 28.7% in Yemen[12], 29% in Iran[13], 29.2% in India[14], 29.4% in Sudan[15], 31.9% in Saudi Arabia[16], 33.9% in Qatar[17], 38.2% in Brazil[18], and 52.2% in Turkey[19]. Studies conducted in Ethiopia also revealed the variation of intestinal parasites infection both in prevalence (ranging from 29% to 72%) and frequently identified parasite species indicating the existence of poor hygiene practices among food-handlers[20-23]. Food-handlers who are potentially infected with parasitic infections may pose a real threat and serve as source of infection to those who are more susceptible to infection like hospitalized patients and/or immunologically compromised patients, justifying the importance of a proper food handling in the hospital environment and cafeterias. This study aimed at assessing the prevalence of intestinal parasites and associated risk factors among food handlers working at cafeteria of Jimma University Specialized Hospital (JUSH), Jimma Ethiopia.

2. Materials and methods

2.1. Study area and period

A cross sectional study was conducted at JUSH, which is found in Jimma Town (352 km southwest of Addis Ababa, the capital of Ethiopia). It is the only teaching and referral hospital in the southwestern part of the country. It has four major clinical departments (Internal Medicine, Surgery, Pediatrics and Gynecology/Obstetrics) and four minor departments (Psychiatry, Ophthalmology, Dermatology and Dentistry). The hospital has a capacity of 450 beds with a total of 750 staff (supportive and technical). It provides services for approximately 9 000 in-patient and 80 000 out-patient attendances coming to the hospital from the catchment population of about 15 000 000 in a year. There are about 100 food handlers (93 females and 7 males) who are working at JUSH cafeteria at the time of this study. The study was conducted from April 1 to May 15, 2016.

2.2. Study subjects

All food-handlers working at JUSH cafeteria during the study period and being willing to participate without taking anti-parasite drug(s) in the last two weeks prior to this study were invited to take part in the study. Accordingly, 94 out of 100 food-handlers participated.

2.3. Socio-demographic data and associated factors

Data on socio-demography and associated risk factors were collected using a pretested structured questionnaire by trained nurses.

2.4. Laboratory data collection, processing and parasite identification

Samples of finger-nail contents (food-handlers with untrimmed fingers) were collected from both hands of each study subject using sterile-moistened cotton-tipped swab and placed into a sterile test tube. Stool sample was also collected from each study subject in a clean stool cup pre-labeled with study subject identification code. The finger-nail contents and stool samples were examined microscopically for intestinal parasites using direct wet mount preparations in normal saline and iodine solution. In addition, formalin-ether concentration sedimentation procedure was done for all stool samples[24].

2.5. Data analysis

Data were edited, cleaned, entered and analysed using statistical package for social science (SPSS) version 20. $P \leqslant 0.05$ was taken as statistically significant.

2.6. Ethical considerations

The study protocol was ethically approved by Ethical Clearance Committee of Institute of Health, Jimma University and letter of cooperation was written to medical director of the JUSH and head of the cafeteria services. Samples and other related data were taken after getting written consent of the study subjects. All results were kept confidential and study subjects tested positive to any parasites were given their laboratory result and advised to take their result to the physician for proper treatment with close follow-up by the trained data collector nurses to guide them to receive proper treatment.

3. Results

3.1. Socio-demographic data

From a total of 100 food-handlers working at JUSH and invited to participate, 94 food-handlers were enrolled in this study and provided complete data on socio-demographic characteristics and samples with a response rate of 94%. Among them, 87 (92.5%) were females and 7 (7.5%) were males. The age distribution of the study subjects showed that 72.3% (68/94) were between 20 and 40 years, 18.1% (17/94) were less than 20 years and 9.6% (9/94) were above 40 years. Regarding their educational status, 44.7% (42/94) of the food-handlers were seven to tenth grade, 18.1% (17/94) were one to sixth grade, 13.8% (13/94) were above twelve grade, 10.6% (10/94) were those who can read and write, 6.4% (6/94) were eleven to twelve grade and 6.4% (6/94) were illiterate. Among 94 food-handlers participated in this study, 42.5%, 39.4% and 18.1% were waiters, cookers, and cleaner of utensils, respectively. The majority 74.5% (70/94) of food-handlers had 5 or less years of work experience (Table 1).

Table 1
Socio-demographic characteristics of food-handlers, JUSH, Jimma, Ethiopia, 2016.

Variables	Category	Frequency [*n* (%)]
Sex	Male	7 (7.5)
	Female	87 (92.5)
Age in years	< 20	17 (18.1)
	20–40	68 (72.3)
	> 40	9 (9.6)
Educational status	Illiterate	6 (6.4)
	Read and write	10 (10.6)
	1–6	17 (18.1)
	7–10	42 (44.7)
	11–12	6 (6.4)
	> 12	13 (13.8)
Job position	Cook	37 (39.4)
	Cleaning utensils	17 (18.1)
	Waiter	40 (42.5)
Year of service	< 1	34 (36.2)
	1–5	36 (38.3)
	6–10	9 (9.6)
	11–20	7 (7.4)
	> 20	8 (8.5)

3.2. Prevalence of intestinal parasites

From the total 148 samples (94 stool and 54 finger-nail contents) examined, 31 (33%) were positive for one or more parasites. Over all 8 types of intestinal parasites were identified. The most prevalent parasite identified was *Ascaris lumbricoides* (*A. lumbricoides*) (16%) followed by *Entamoeba histolytica/dispar* (4.3%) (Table 2). Finger-nail sample was taken from 54 study participants who have untrimmed finger-nail and from the total of 54 samples of finger-nail contents examined, 10 (18.5%) were found to be positive for ova and cysts of different intestinal parasites. Among these positive subjects, 4 of them harbored ova of *A. lumbricoides*, 2 had ova of *Trichuris trichiura*, 2 had ova of *Taenia* spp. and 2 individuals each harbored 1 ova of hookworm species and 1 cyst of *Giardia lamblia*, respectively (Data not shown).

Table 2
Type and prevalence of intestinal parasites isolated from stool and finger nail specimens of food handlers at JUSH, Jimma, Ethiopia, 2016.

Parasite species isolated	Frequency [*n* (%)]
A. lumbricoides	15 (16.0)
Trichuris trichuira	2 (2.1)
Hookworm species	1 (1.1)
Hymenolepis nana	2 (2.1)
Giardia lamblia	2 (2.1)
Entamoeba histolytica/dispar	4 (4.3)
Taenia species	2 (2.1)
Enterobius vermicularis	1 (1.1)
Hookworm and *Giardia lamblia*	2 (2.1)
Total	31 (33.0)

3.3. Associated risk factors

Different risk factors were assessed for possible association with intestinal parasites infection among the study participants. Hands washing before serving food and after toilet use were significantly associated with parasite 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 habit 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 significant association between wearing of hair-cap, training, medical checkup, use of gown/apron, job position, sex and age 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. Untrimmed finger-nails showed a higher prevalence than the trimmed ones and the difference was statistically ($P < 0.05$) significant (Table 3).

Table 3
Association of intestinal parasitic infections and potential risk factors among food handlers

Variables	Category	Result		COR (95% *CI*)	*P* value
		Positive [*n* (%)]	Negative [*n* (%)]		
Sex	Male	2 (28.6)	5 (71.4)	1.05 (0.19, 5.78)	0.96
	Female	24 (27.6)	63 (72.4)	1	
Age in years	< 20	3 (17.6)	14 (82.4)	1	
	20–40	20 (29.4)	48 (70.6)	1.33 (0.18, 9.91)	0.78
	> 40	3 (33.3)	6 (66.7)	2.08 (0.54, 8.03)	0.29
Job position	Cook	10 (27.0)	27 (73.0)	1.28 (0.45, 3.60)	0.65
	Cleaning	7 (41.2)	10 (58.8)	2.41 (0.71, 8.15)	0.16
	Waiter	9 (22.5)	31 (77.5)	1	
Hand washing before serving	Yes	3 (7.7)	36 (92.3)	1	
	No	23 (41.8)	32 (58.2)	4.20 (1.42, 12.43)	0.001
Wash hands after toilet	Yes	2 (4.3)	44 (95.7)	1	
	No	24 (50.0)	24 (50.0)	9.00 (2.75, 28.69)	0.00
Finger nail	Trimmed	2 (5.0)	38 (95.0)	1	
	Untrimmed	24 (44.4)	30 (55.6)	6.19 (1.97, 19.87)	0.02
Wearing of cap	Yes	16 (25.8)	46 (74.2)	1	
	No	10 (31.2)	22 (68.8)	1.31 (0.51, 3.34)	0.58
Training	Yes	5 (22.7)	17 (77.3)	1	
	No	21 (29.2)	51 (70.8)	1.98 (0.60, 6.53)	0.26
Medical checkup	Yes	14 (23.0)	47 (77.0)	1	
	No	12 (36.4)	21 (63.6)	1.99 (0.76, 4.85)	0.17
Gown/Apron	Yes	25 (27.2)	67 (72.8)	1	
	No	1 (50.0)	1 (50.0)	2.68 (0.16, 44.50)	0.49

COR: Crude odds ratio.

4. Discussion

This study is one of the few studies that have attempted to assess the prevalence of intestinal parasites among food-handlers in the hospital settings by taking both stool and finger-nail content samples. Examination of stool specimens showed a greater prevalence of intestinal parasites than their counter finger-nail contents. The study revealed that out of the total of finger-nail contents examined 18.5% were found to be positive for ova and cysts of intestinal parasites, which was somewhat higher than the previous study conducted in Jimma Town, Ethiopia by Sahlemariam and Mekete (10.9%)[25]. However, it was much lower than the isolation rate of intestinal parasites from school children

in Nigeria (54.8%)[26]. This difference might be attributed to the time gap and also the difference in the segment of study subjects studied where in the later, school children are thought to be more exposed to environmental contamination. The presence of cysts and ova of parasites in the finger-nail contents indicates level of contamination that could be taken as signal and potential sources of direct transmission for intestinal parasites.

The observed high prevalence of *A. lumbricoides* from finger-nails in this study is in agreement with previous reports elsewhere[25,26]. This could be attributed to high survival time of infective eggs in the contaminated environment indicating improper faecal disposal. In turn, this might have linked and contributed to the high prevalence rate of intestinal parasites recorded in the study area. A few studies across the world have determined the prevalence of intestinal parasites among food-handlers working in hospital cafeterias. Food-handlers may be infected by a wide range of enteropathogens and have been implicated in the transmission of many infections to the public through poor personal hygiene practice. In this study, the overall prevalence of intestinal parasites among food-handlers was 33% which is in consistence with the study conducted in Wolaita, Ethiopia (33.68%)[27] and comparable with the study done in Arba Minch, Ethiopia (36.0%)[28], Nigeria (38.1%)[29], Khartoum, Sudan (30.5%)[15]. The present prevalence is higher than 20.6%% in Hawassa University, Ethiopia[30], Western Iran (9%)[31], Sari, Northern Iran (15.5%)[32]. It was lower than the prevalence of 58.4% which was from Jimma, Ethiopia[25], 41.1% from Bahirdar Town[23] and 41.1% from Yebu Town, Ethiopia[20]. The differences might be due to differences in climate, geographical location and socio-demographic features including poverty and overall hygienic status of the populations studied. Moreover, it may depend as well on the distribution and prevalence of certain species of parasites especially those transmitted through faecal-oral ways. On the other hand, our results revealed almost similar prevalence and in accordance with other findings which indicate that those identified parasites are potentially circulating among these people coming from poor families, lacking proper housing, safe water supplies and hygienic waste disposal systems. The predominant parasite identified in the present study was *A. lumbricoides* with a prevalence of 16.0% followed by *Entamoeba histolytica* (4.3%). This was consistent with the finding of a study conducted in Yebu and Gondar Town (Ethiopia), in which *A. lumbricoides* was the predominant parasite reported with a prevalence of 17.8% and 18.1%, respectively[20,28]. Bodies of knowledge have indicated the existence of high prevalence of ascariasis and entamebiasis in a given community as a good indicator of improper faecal disposal and use of poor water quality among the study participants which might hold true with the present study as well.

Absence and/or the low prevalence of other intestinal parasites might be due to the technique used in this study (which could be taken as limitation of our study by the readers). Had most sensitive and/or combination of methods and multiple stool samples been used, much greater rates of parasites would have been recovered in this study indicating the 'true prevalence' of parasites is likely higher than what is reported in this study.

Poor personal hygiene, including inadequate hand washing among food handlers is a common practice that contributes to food born diseases. Improvement of food workers' hand washing practice is, therefore, crucial in reducing the incidence of food borne illnesses[21]. In the present study, the practice of hand washing after using toilet among the food-handlers was relatively poor (48.9%) compared with the study conducted in Mekelle (70.4%)[21] and Bahir Dar, Ethiopia (90.6%)[23] and in Maharashtra, India (49.38%)[33]. The high level of infection observed among the category that did not wash hands after defecation and before serving food for the consumers could be the result of poor hygienic habits whereby soiled finger-nails, dirty hands and indiscriminate eating exacerbates the transmission of these parasites. There was significant association between parasitic infection and people who did not practice hand washing after defecation and before serving food. It has been well documented that the contaminated hands play a major role in faecal-oral transmission in developing countries. In contrast, washing hands before eating or after defecation has been considered as important measures of reducing possible contamination of foods and or drinks and infection by intestinal parasites to greater extents[34].

Though high percentages of parasitic infections were detected among food-handlers who didn't take training, not undergoing periodic medical checkup and didn't use aprons, no significant association was observed. The study also identified finger nail status, hand washing after defecation and before serving food as determinants of intestinal parasite infection. Therefore, in order to further reduce intestinal parasites infections in food handlers, training should be given on strict adherence to good personal hygiene and to hygienic food-handling practices. In addition, regular and proper screening procedures need to be in place in such environment in order to diagnose and give proper treatment of food-handlers thereby preventing possible transmission of the infections and morbidity of hospitalized patients and consumers at large. Moreover, it appears also logical to do more intense research extending to bacteriological analysis taking samples from food-handlers and the environment around the cafeteria including but not limited to utensils, tables, vegetables and related food stuffs.

Conflict of interest statement

We declare that we have no conflict of interest.

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