Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.71, 2018

Prevalence of Intestinal Parasitic Infections Among Food Handlers & Hygienic Facilities in Selected Orphanage Centers in Addis Ababa, Ethiopia

Sintayehu Bedaso [1*] Gulilat Desse [1*] Ketema Bacha [2*]
1.Department of Food Science and Nutrition, Addis Ababa University, Po. Box - 1176, Addis Ababa, Ethiopia
2.Department of Biology, College of Natural Sciences, Jimma University, Po. Box - 307, Jimma, Ethiopia

Abstract
According to the Ethiopian Central Statistics Agency report, in 2004; about 436,726 were orphan children by both parents throughout the country. Among those, Addis Ababa accounted 29,926 orphan children. However, in the capital city of Ethiopia, there are 99 orphanage centers. The centers give priority only to the availability of food but not of its safety. Thus, this study aimed at determining the prevalence of intestinal parasitic infections among food handlers and the overall hygienic practices/facilities of the centers. A cross-sectional study was conducted from February to May 2010 in four orphanage centers using standardized and structured questionnaire. A total of eighty stool samples from all (40) food handlers were collected and examined through Direct Fecal Smear (DFS) technique for intstinal parasites. The findings of the study showed that 14(35%) of the food handlers from all (four) orphanage centers were infected with one of either protozoan or helmintheic parasites. The most common intestinal parasitic infections encountered among these infected individuals were A. lumbricoides (50%), followed by E. histolytica (42.86%), G. lamblia (21.43%) and Taenia species (7.14%). Improper food storage, poor personal hygiene and food handling practices of the food handlers and poor sanitary facilities were also the major defects observed. Fifty percent of the floor and 75% of the walls and ceilings of the kitchens were found in poor sanitary conditions hugely contributing for food contamination. In general, the hygienic facilities of the centers were poor and high prevalence of the intestinal parasites with high possibility of their transmission to the children.
Keywords: orphanage centers, food handlers, intestinal parasites, hygienic practices and facility

1. INTRODUCTION

Foodborne disease is defined as any disease of an infectious or toxic nature caused by consumption of contaminated food. Foodborne disease outbreak is the occurrence of two or more cases of a similar foodborne disease resulting from the ingestion of a common food (WHO, 2008).

Food can be contaminated by physical, chemical and microbiological agents. The microbial agents responsible for food borne diseases are bacteria, viruses, parasites and fungi (Stewart, 1997). However the sources of food contamination are diverse. Unhygienic food handlers can also inoculate the food with infected excreta, pus, respiratory drippings' or other infectious discharges (Dugassa, 2007). A study conducted in Malaysia showed that approximately 10-20% of foodborne disease outbreaks are due to contamination by the food handlers (Zain & Naing, 2002). Thus, it requires proper screening procedure in order to monitor the hygienic practices of the food handlers to preventing possible morbidity.

Furthermore, the transmission of enteric pathogens including helminthes, protozoa, and enteropathogenic bacteria occurs directly or indirectly by food, water, nails, and fingers contaminated with feces indicating the importance of fecal-oral person-to-person transmission. Food handlers harboring and excreting enteric pathogens may contaminate foods with fecal material via their fingers to food processing system and eventually to healthy individuals (Abel, et al., 2009).

Intestinal parasitic infections are among the major diseases of concern to public health throughout the world (WHO, 1987). Some of the parasite species are associated with severe morbidity often resulting in mortality, particularly in less developed tropical and subtropical countries. Amoebiasis, giardiasis, ascariasis, hook worm infection, and trichuriasis are among the most common intestinal parasitic infections worldwide and are closely related to socio-economic status, poor sanitation, inadequate medical care and absence of safe drinking water supplies (WHO, 1999).

In developing countries where financial resources are scarce, food control issues usually receive low priority in public health programs. Food-borne illnesses are perceived as mild, self-limiting diseases and their health and economic consequences are often overlooked. A lack of information leads to underestimation of the health significance of unsafe food; at times, no resources at all are assigned to food safety, and food control measures and food-borne disease investigation and surveillance are neglected. As no data on food-borne illnesses or other health and economic effects of unsafe food are generated, policy-makers continue to give the subject low priority, and so the cycle continues (Theo, 2003).

When there is a serious food-borne disease outbreak, food control matters receive attention for a few days and are highlighted by the media (Theo, 2003); as the case happened with the recent food and waterborne disease

outbreak here in Ethiopia (Addis Ababa, in 2010). Once the incidence is over, however, it is soon forgotten and the experience gained is not translated into management decisions. So that, we can imagine how much infants/children especially those living as immunologically compromised, are at risk of recurrent foodborne disease outbreaks.

Nutritional status of a child not only depends on food availability and access to it but also affected by the presence of parasites. Carbohydrates as well as other nutrients such as protein, fats and vitamins are found to be less absorbed during diarrheal and other gastrointestinal (GI) infections. Diarrhea, including that of parasitic origin, remains one of the most common illnesses in children, and one of the major causes of infant and childhood mortality in developing countries (Simona, et al., 2006). Because of their particular vulnerability and the long-term adverse consequences of malnutrition, children should have safe, nutritious and adequate food services. To this effect, this study was designed to evaluate the prevalence of intestinal parasitic infections among food handlers in selected orphanage centers in Addis Ababa and also to assess the hygienic facilities of the centers.

Thus, this study aimed at determining the prevalence of intestinal parasitic infections among food handlers and assess the overall hygienic practices and facility of the centers. Finally, the research findings may suggest increasing the awareness of the food handlers and responsible officials about the importance of good hygienic practices in their food preparation and services indicating the possible risks of foodborne disease outbreaks and their safety measures to reduce microbiological contamination.

2. METHODS AND MATERIALS

2.1. Data Collection Using Questionnaire

Standardized and structured questionnaire was developed for the purpose of data collection after reviewing relevant literatures and modified to be used in the specified study area. It was prepared originally in English and then translated into Amharic by the researcher and a sanitarian in order to obtain content validity. Finally the questionnaire was administered in Amharic. The questionnaire was designed to obtain information on socio-demographic characteristics of owners/managers and food handlers, repair condition of kitchens and dining rooms for the children, availability of sanitary facilities like water supply, latrine facility, refuse management, food utensil washing facility, and shower services, storage system of food and food utensils as well as to measure the knowledge and practice of food handlers through observation and interview.

2.2. Analysis of Intestinal Parasites

2.2.1. Sample Collection and Sampling Technique

Four orphanage centers were selected to be included in the study using simple random sampling technique (lottery method) from among 99 orphanage centers that have signed agreement with the Bureau of Women's and Children Affairs of Addis Ababa. In each of the centers, all the food handlers (8 from center ''01'', 6 from center ''02'', 6 from center ''03''and 20 from center ''04'') who agreed to participate in the study were included. The participants were given an overview concerning the study. As a local study in Philippines (Manila) had shown that two stool examinations done on separate days increased the recovery rate of intestinal parasites by 19% (Donato et al., 2003), two stool cups were given to each participant for specimen storage, on two separate days. The maximum interval of time between the first stool sample and the second stool sample should not exceed one week. This time period was set with the assumption that there might be no significant difference in the participant's heath status (infected or not infected). Instruction was given to the participants not to mix stool samples with urine or even water. Each sample was examined immediately after collection in the nearby clinical laboratory through direct fecal smear technique (DFS). Because, the direct wet film is most useful for detecting the trophozoite stage of amoebae and flagellates and it enables the observer to study the motility of the organism; it can only be seen in unfixed samples ideally observed within 30 minutes of passage (not arrival).

2.2.2. Procedure for the Analysis of Intestinal Parasites

The samples were prepared by mixing about 2 mg of feces with one to two drops of normal saline placed on a clean glass slide using an applicator stick. A uniform suspension was made and covered with a 22 mm^2 glass cover slip then mounted on the light/compound microscope for observation. Finally, data obtained from stool examination were entered and analyzed using the EPI Info (version 6) statistical packages. Dysenteric (watery) stools were examined before solid stools, as protozoan trophozoites are more likely to be present in watery stool, and trophozoites have a shorter survival time in feces than cysts (Donato et al., 2003).

2.3. Ethical Consideration

Ethical clearance was obtained from ethical committee of Food Science and Nutrition Program, Faculty of Science, Addis Ababa University. Formal letter was written to all 4 of the orphanage centers and concerned officials were informed about the purpose of the study. Informed consent was obtained from owners/managers of the orphanage centers and food handlers after a brief explanation of the objectives and benefits of the study. Confidentiality of

the respondent was maintained. On the other hand advise were given for managers and food handlers of the centers to improve hygienic preparation of food in the centers where gross unsanitary conditions encountered during the survey. With the same manner food handlers found to be ova positive during stool examination were provided with anti-helmintheic and anti-protozoan drugs.

3. RESULTS AND DISCUSSION

3.1. General Information

Of the total 99 orphanage centers in Addis Ababa, four (one governmental and three non-governmental orphanage centers), only those giving food services in the center's campus to the children were selected by lottery method and included in the study.

The orphanage centers included in the study were coded as:

- ''01''= Abebech Gobena Children's Care and Development Association
- ''02''= AHOPE Children's Home
- ''03''= Kebebe Tsehay Orphanage Center
- ''04''= SOS Children's Village

3.2. Sanitary Conditions of the Centers and Hygienic Practices of the Food Handlers:

3.2.1. Characteristics of Study Unit

All of the centers provide services for the children to achieve their basic necessities inside the campus. Only one of the orphanage centers had periodic physical examination for the food handlers, once per year. One of the centers was managed by the founder of the association while the others 3(75%) were managed by recruited persons.

The total number of children, having services of their basic necessities in the centers was 350 (207 male & 143 female). Among them, 111 (31.7%) (66 male & 45 female) orphan children were HIV positive. The majority 212(60.6%) of the children were in the age range of 6-14, 129(36.9%) in 0-5 and 9(2.6%) of them were greater than 14 years old.

3.2.2. Socio-demographic Characteristics of the Center Managers

Table 1, Socio-demographic characteristics of the owners/managers of selected orphanage centers in Addis Ababa, 2010 (n=4)

Characteristics	Frequency
Sex	
- Male	1
- Female	3
Age Range	
- 21-30	1
- 31-40	2
- greater than 70	1
Educational Status	
Illiterate	0
Literate - Elementary	1
- Degree and above	3
Marital Status	
- Single	1
- Married	2
- Widowed	1

As shown in Table 1, of the total four owners/managers, three of them were females. The mean age was found to be 42.1 years ranging from 30-75. Two 0f the managers were married, one widowed and one single. All the managers were literate, including elementary school (6^{th} grade) to second degree. In food service establishments, managers must be trained in the principles of food hygiene so that they can in turn train and supervise the workers responsible for processing, preparation, storage and service of food (Dugassa, 2007). But none of the managers had got any training about food safety in these centers.

3.2.3. Socio-demographic Characteristic of the Food Handlers

Table 2, Socio-demographic characteristics of the food handlers engaged in food preparation in selected orphanage centers in Addis Ababa, 2010 (n=40)

Characteristics	Frequency	Percent (%)
Sex - Male	0	0
- Female	40	100
Age Range - 21-30	9	22.5
- 31-40	17	42.5
- 41-50	8	20
- 51-60	6	15
Educational Status		
- Illiterate	4	10
- Literate - elementary	13	32.5
- high school	13	32.5
- 12th grade completed	7	17.5
- diploma	3	7.5
Marital Status - single	14	35
- married	13	32.5
- divorced	5	12.5
- widowed	6	15
- separated	2	5
Service year/experience in food preparation practices		
0-5	17	42.5
6-10	6	15
11-15	5	12.5
>15 years	12	30

All of the food handlers were females. The mean age was found to be 41.11 ranging from 26-60 years. About 27 (67.5%) of them were not married (single = 14 (35%), divorced = 5 (12.5%), widowed = 6 (15%) and separated = 2 (5%)). Thirty six (90%) of them were literate (elementary school to diploma level). Table 2 also presents that the average service year of the food handlers in food preparation practices was 13 years.

3.2.4. Physical Conditions of Kitchens and Food Preparation Practices

All 4 of the orphanage centers had kitchens with floor constructed either from bricks/plastered in two or concrete/cement in the other two centers. In two of the centers cleanliness of floor in the kitchen was not kept at time of visit. Cleanliness of wall and ceiling of the kitchens was also not kept in 3(75%) of the centers and had poor repair conditions. Only 2(50%) of the centers had kitchens with adequate lighting system. In 1(25%) of the kitchens chimney was not installed for ventilation or removal of smoke. Two of the centers kitchen room was infested with insects like flies and cockroach. In one of the kitchens all the food handlers did not wear appropriate overcoat. Furthermore, it was found that only in 1(25%) of the kitchens, food handlers were advised by the manager/owner on safe handling practices of food though themselves did not have any training about food safety. In 2(50%) of the kitchens, food handlers were regularly supervised while in the other 2(50%), they were intermittently supervised by the managers/owners on their normal work of food preparation. In 2(50%) of the kitchens all equipments used for processing were not smooth, free from crack and easily cleanable type. In 3(75%) of the kitchens, cleanliness of processing equipments was not kept at time of visit while in 2(50%) of the kitchen, cooked foods were not stored in proper manner that can prevent contamination of food. In general, the physical condition of the kitchens and food preparation practices showed that the orphanage centers need to improve their hygienic facilities to achieve their goals of creating better generation through providing services to the children.

3.2.5. Refrigerator

Refrigerators were available in all (100%) of the centers for storage of perishable and semi-perishable foods. This was found to be a better condition when compared to other findings of similar studies conducted in the sanitary conditions of food catering establishments in Addis Ababa (only 40.2% of mass catering establishments had refrigerators) followed by the report from Mekelle of 66.3% and Awassa 90.3% (Kinfe and Abera, 2005).

The temperature range between 41^{0} F and 140^{0} F is considered as the "danger zone" because these temperatures are very conducive to bacterial growth. Within this range, bacteria grow most rapidly (Julie, 2007). Though in all of the centers refrigerators were available for storage of perishable foods, the refrigerators had fixed temperature reading, adjusted to be $<10^{o}$C only in one of the centers. Regarding the manner of food storage in it, perishable and non perishable foods were stored together in all centers indicating that the centers have poor storage of food in refrigerators. In two of the centers cooked and raw foods were stored in the same refrigerator, cooked foods in the upper compartment and in the other two, cooked and raw foods were stored in the same refrigerator side by

side. This indicates that their knowledge of keeping food safe storing under the right temperature through adjusting the refrigerators, the need of putting foods separating raw foods from cooked ones, and even use of different compartments is very poor. As a result, there is the possibility of cross-contamination between cooked and raw foods at storage and fast microbial growth.

3.2.6. Physical Conditions of the Dining Rooms

The dining rooms in all four orphanage centers had floors constructed from bricks/plastered and did not have cracks in which dirt can lodge. In all of the centers, the wall of the dining rooms were maintained in good conditions and kept clean, having smooth and easily cleanable surfaces. The ceiling of the dining room was not kept clean and free from dust, soot and web of spider with poor repair condition in one of the centers. In the other one, all the workers engaged in delivering food did not wear appropriate overcoat; and in three of them, they did not wear hair cover. Consequently, there will be high possibility of microbial transmission from the food handlers to the ready-to-eat foods and in turn to the children as hair and outer garments are sources of bacteria if proper hygiene of the food handlers is not kept. Because bacteria including those classified as pathogenic such as staphylococci inhabit hair, nasal cavity and other parts of the human body.

3.2.7. Store Room & Water Supply

All the orphanage centers had a separate store rooms which were free from any insect infestation during visit. And only in one of the centers, cleanliness of the store room was not kept. The entire orphanage centers had water pipe installed from municipal services; and water storage tankers for shortage time.

3.2.8. Sanitary Facilities of the Centers

3.2.8.1. Latrine facility:

The entire orphanage centers had privately owned toilet rooms; two of them had flush type toilets and the other two had dry pit latrines. In all of the centers the toilets were separated for male and female usage. In two of the centers, 2 seats were available. In one of the centers there were 4 seats; and 6 in the other center. In two of the centers, the toilets were not clean and comfortable to use at time of visit. In one of the centers, flies were observed and hand wash basin was not provided to use after toilet near the toilet room and were improperly managed. Thus, poorly managed latrines create a favorable medium for the breeding and multiplication of insects that can carry microorganisms and contaminate food and food utensils and equipment and reach the mouth of a healthy individual (Kinfe and Abera, 2005). This problem will be crucial in those centers with no basins near the toilets.

3.2.8.2. Hand washing facility/lavatory:

In two of the orphanage centers, hand wash basins were not present near the dining room and the children use the same basin before meal and after toilet in these centers and soap was not provided for hand washing in one of these centers. This may result in transmission of enteric pathogens through faeco-oral contamination of infected individuals to a healthy one. In three of the centers, there was closed type; properly designed receptacles of liquid wastes from the hand wash basin while the other center had open trench that can collect fraction of generated liquid waste.

3.2.8.3. Shower services:

Only in one of the centers, shower service was available for the workers (food handlers). There was also a separate room for clothing, resting and placing of clothes and other materials for the workers only in one of the centers.

3.2.8.4. Washing basin for utensils and method of cleaning:

One of the most widely used and accepted methods of food utensil washing method is the three compartments sink or vat system. This system is used to wash, rinse and sanitize food utensils and equipments (Kinfe and Abera, 2005). But in all of the centers, washing basins for washing utensils had only two compartments fixed with smooth surface metal in two and fixed rough surface cement/concrete type basins in the other two of the centers. In majority, three of the centers, cleanness of washing basin and area around it were not kept during visit. Therefore, it requires an integrated effort of the regulatory body and owners to reach a universally used three compartment-washing device as clean and sanitized food utensils are crucial both aesthetically for the presentation of appetizing food and to safeguard the health of consumers (children) in the centers.

In one of the centers, hot and cold water with detergent used, while in the other three, only cold water with detergent used for cleaning of utensils. But the utensils were socked with chemicals after wash only in one of the centers intermittently. About two of the centers did not have drying racks for sanitized utensils and were stored in containers or shelves under conditions which could not protect against contamination and that suits growth of microorganisms on leftover foods.

3.2.9. Solid waste handling and disposal:

Appropriate refuse receptacles were placed in the appropriate place in all of the centers but in one of them the receptacle was not durable. Garbage and refuse generated from kitchens and other work areas should be collected and stored in proper container or receptacle. The receptacles should be durable, easily lifted and transported, (Kinfe and Abera, 2005). Nevertheless, in three of the centers, the receptacles were not fit to cover and tight and in one of these centers, the receptacles were filled and splashed in the area in a manner that can aid spreading of flies as observed during visit. But the refuses were transported to final disposal before overfilling in the majority of the

centers. And in all centers solid wastes were disposed by municipal services.

3.2.10. Liquid waste handling and disposal:

In all of the centers, liquid waste disposing drainage system was installed. The type of drainage systems were found to be closed which can collect all generated liquid wastes in three and open trench in one of the centers. In one of the centers, the liquid wastes were disposed to open dumping area which can aid breeding of flies and affect sanitary conditions of the center and in turn cause contamination of foods by microbes.

3.2.11. Knowledge of food handlers

Table 3, Knowledge of food handlers and source of information in selected orphanage centers in Addis Ababa, 2010

Knowledge	frequency	Percent (%)
Have you ever heard about foodborne diseases?		
- yes	40	100
- no	0	0
What is your source of information?		
- mass media	30	75
- health professionals	16	40
- formal training and written display	4	10
How can foodborne diseases be transmitted?		
- contaminated foods	10	25
- contaminated hands	17	42.5
- contaminated water	1	2.5
- vectors	5	12.5
- I do not know	4	10
How can food be contaminated?		
- when exposed to flies	20	50
- handling in contaminated environment or air	15	37.5
- using of dirt equipment	21	52.5
- using of contaminated water for cleaning and food preparation	5	12.5
- dirt hands	18	45
- using of the same container for cooked and raw foods	3	7.5

The overall strategy for reducing food borne illness is to place emphasis on education about proper food storage and preparation practice along with strict and more targeted enforcement. (Dugassa, 2007). As shown in Table 3, all the food handlers heard about foodborne diseases. Mass-media was the first source of information followed by health professionals while formal training and written displays were the least, accounting for 30(75%), 16(40%) and 4(10%), respectively. But as shown in Table 3, 4 (10%) of them did not know any of the ways through which a foodborne disease can be transmitted and only 1(2.5%) did know that a foodborne disease can be transmitted through contaminated water while 17 (42.5%), 10(25%) and 5(12.5%) knew that it can be transmitted through contaminated hands, contaminated foods and vectors respectively. In general, there was knowledge gap among the food handlers about the way foodborne disease can be transmitted so that they could not protect consumers (children) against foods contaminated by pathogens.

It is also found that only 5 (12.5%) of the food handlers knew foods can be contaminated by using of contaminated water for cleaning of equipments and food preparation. Majority 37 (92.5%) of them did not know that food can be contaminated by using of the same container for storage of cooked and raw foods. Among them answered for multiple questionnaire, 15 (37.5%), 18(45%), 20(50%) and 21(52.5%) knew that food can be contaminated with handling food in contaminated environment, dirt hands, when exposed to flies and using a dirt equipment respectively. This shows that the food handlers had different degree of awareness and hence the cares they take during handling also vary. The hygiene quality of food handlers and cooks are key elements of food safety. Thus, improving the awareness of food handlers should be the priority issues of the centers. The greatest challenge to protect population from food-borne infection is to spread information and knowledge about the sources and routes of transmission of pathogens into food products (Gun and Satu, 2007).

3.2.12. Practices of Food Handlers

Table 4, Distribution of practice of food handlers in relation to food safety in selected orphanage centers, Addis Ababa, 2010

Practices	Frequency	percent
Wear of appropriate over coat		
- yes	27	67.5
- no	13	32.5
Wear of appropriate hair cover		
- yes	13	32.5
- no	27	67.5
Over coat and visible body part		
- clean	13	48.1
- not clean	14	51.9
Short trimmed and cleaned nail		
- yes	31	77.5
- no	9	22.5
Wear of jewelry		
- yes	28	70
- no	12	30
Nail paint during visit		
- observed	18	55
- not observed	22	45
Washing of hands before work on day of interviewing		
- yes	40	100
- no	0	0

As shown in Table 4, only 13(32.5%) of the food handlers had hair cover and 27(67.5%) did wear appropriate overcoat. Among them, cleanliness of the overcoat was kept only in 13(48.1%) of the food handlers. Moreover, 9(22.5%) of them did not keep their finger nails trimmed and cleaned during visit.

Food handlers may be the source of food contamination either as carriers of pathogens or through poor hygienic practices. All food handlers have a basic responsibility to maintain a high degree of personal cleanliness and observe hygienic and safe food handling practices. Keeping hands clean, shortening fingernails, wearing clean working garment and hair cover (hair net and cap) are some of the precautions that a food handler must maintain (Kinfe and Abera, 2005). But in this study food handler's practice towards personal hygiene and sanitary food handling is found unsatisfactory. A total of 27(67%) of the food handlers were found wearing working outer garments which are lower than the result of a study conducted in sanitary conditions of mass catering establishments in Awassa (86%) but higher than the finding at Addis Ababa (54.2%) in the same case; on the other hand, the proportion of clean outer garments/overcoat were much lower than the 74% case in Awassa, (Kinfe and Abera, 2005). But greatest care needs to be taken by food handlers during their food preparation practices in orphanage centers as children especially under five are more prone to foodborne diseases caused by microbial contamination.

Majority, about 28(70%) of the food handlers did wear jewelry on their hands, ear and different body parts which was much higher than in similar study conducted at Mekele town (35.7%) and Awassa (28.7%) (Kinfe and Abera, 2005). In 22(55%) food handlers, it was observed that their finger nails were painted. The overall practice of food handlers towards personal hygiene and food handling is not to the acceptable level. Because food handlers are expected to have a high degree of personal cleanliness and safe food handling practices especially those serving children and immunocompromised people as these are more vulnerable groups.

Food handlers known or suspected to be suffering from infectious diseases like diarrhea, visible infected skin lesions (boils, cuts), respiratory infection and discharges from ear, eye and nose should be suspended from food handling and preparation until they become cured. The purpose of this measure is to prevent food contamination and thereby the spread of infectious disease through the ingestion of contaminated food. But in this study, any visible skin rush, skin boils, cut and wound were not observed in any of the food handlers while preparing foods except one (2.5%) having discharges from the eyes and nose. All 40(100%) of them had washed their hands before work on day of interviewing. In addition, it was found that none of the food handlers smokes cigarette.

Since source of food contamination are diverse (Dugassa, 2007), controlling the overall sanitary condition of the centers, health status of workers and raising the awareness of managers and food handlers has great roles in improving of food safety and prevention of food borne illness and its transmission.

3.3. Prevalence of Intestinal Parasitic Infections among Food Handlers

During the study period (February-May, 2010), a total of 80 fecal samples from 40 food handlers of the selected

orphanage centers in Addis Ababa were examined. Of these, 14 (35%) harbored parasitic ova, cyst and/or trophozoites. This was almost similar to the result observed during Sanitary Survey of food and Drinking Establishments in Ambo Town West Showa Zone Oromia Region, Ethiopia. According to the report, the overall prevalence of intestinal parasites among food handlers working in mass catering establishments in Ambo town were 34.7% (Dugassa, 2007).

Studies indicate that parasitic infections cause malabsorption, diarrhea, and other states of poor health. These parasites are commonly transmitted through ingestion of contaminated food or water as a result of poor sanitation and hygiene. In some instances, transmission occurs through close contact between infected and uninfected individuals as in infected food handlers and consumers, respectively (Donato et al., 2003). The high prevalence of parasites among the food handlers is thus an indication of poor hygienic practices, low awareness on food safety and poor supervision from the management body.

Species-wise Prevalence

Table 5, Prevalence of intestinal parasites among food handlers in selected orphanage centers in Addis Ababa, 2010.

Parasites	frequency	Percent (%)
E. histolytica	6	15
G. lamblia	3	7.5
A. lumbricoides	7	17.5
Taenia species	1	2.5

As shown in Table 5, evidence was found in stool samples for the prevalence of two protozoan and two helmintheic parasitic infections. The helmitheic infections with 20% detection rate include nematode infections i.e, *Ascaries lumbricoides* 7 (17%). Among cestodes, *Taenia* species 1 (2.5%) were observed while none of the trematodes was seen; this may be due to their necessity to have two or more intermediate hosts (Ellin, 2003). The most common protozoans reported to lead to digestive disorders include *Giardia lamblia* and *Entamoeba histolytica* (Babiker, 2009). In this study, there was a total of 9 (22.5%) cases of protozoan infections harbored *Giardia lamblia* 3 (7.5%) and 6 (15%) *Entameba hstolitica* out of all the food handlers examined indicating the validity of the report.

In this study, the most common intestinal parasitic infections encountered among infected individuals were *A. lumbricoides* (50%) this might be due to their simple life cycle that does not require an intermediate host but may be passed from one human to another by fecally contaminated water or vegetables (Ellin, 2003), followed by *E. histolytica* (42.86%), *G. lamblia* (21.43%) and *Taenia* species (7.14%) showing similarity with the result obtained in Ambo town with detection rate of 37.2%, 32.6% and 9.3% for *A. lumbricoides, E. histolytica, G. lamblia* respectively, excluding Taenia species (Dugassa, 2007).

Table 6, Parasite/organism infection rates among food handlers according to diagnostic procedure employed in selected orphanage centers in Addis Ababa, April 2010.

	Positive for parasites		
Diagnostic procedure	**No.**	**Percent**	**Total**
DFS 1st stool examination	8	20	40
DFS 2nd stool examination	9.5	22	40

A local study in Philippines (Manila) had shown that two stool examinations done on separate days increased the recovery rate of intestinal parasites by 19% (Donato et al., 2003). As it is presented in Table 6, among the total number of 40 food handlers examined, 8(20%) of them were positive for any intestinal parasites in the first diagnosis and 9(22.5%) of them were known to be positive in the second stool examination by DFS technique indicating an increase in the recovery rate of parasitic infections by 2.5%.

According to the results obtained from the stool examination, (Table 7); in the first orphanage center coded as ‘‘01’’, 4, 2 and 1 of the food handlers were infected with *A. lumbricoides, E. histolytica* and *G. lamblia,* respectively, and 2 were infected with two or mixed intestinal parasites. In the second orphanage center which is coded as ‘‘02’’, 3 different individuals were infected with three different parasites, *E. histolytica, A. lumbricoides* and *Taenia* species. In the third one coded as ‘‘03’’, one food handler was infected with *E. histolytica* while another had *A. lumbricoides.* In the fourth orphanage center, ‘‘04’’ 2, 1, and 2 of the food handlers were infected with *E. histolytica, G. lamblia and A. lumbricoides,* while one of these were mixed infected.

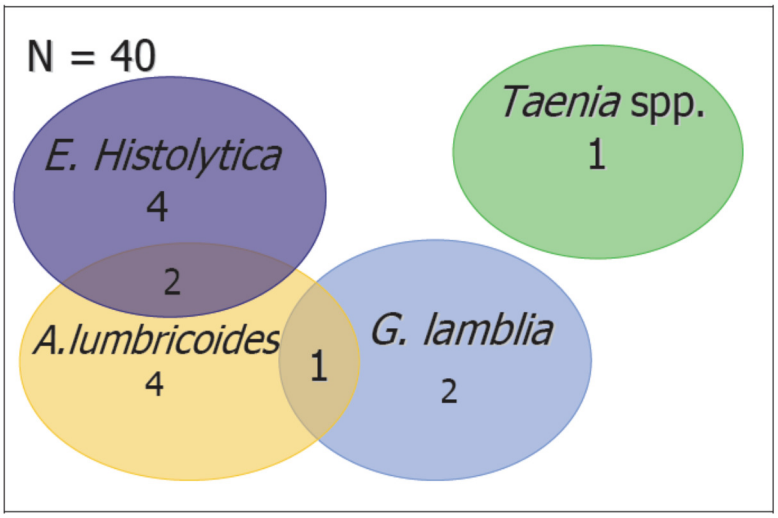

Fig 1, Venn diagram of parasites detected. Numbers in circles indicated the number of positive cases, N = Total number of the food handlers examined

From the Venn diagram (Fig. 1), there were about 11 (78.6%) food handlers who carried one parasite and 3 (21.4%) food handlers who had mixed infections. Among the mixed infected individuals 3 food handlers had two parasitic infections, 2 (66.6%) were infected with *E. histolytica* and *A. lumbricoides* and 1 (33.4%) were infected with *A.lumbricoides* and *G.lamblia*.

Table 7.Distribution of intestinal parasites among food handlers classified by orphanage centers in Addis Ababa, April, 2010.

	Orphanage centers (coded)				
Parasites/organisms	01	02	03	04	Total (%)
Protozoan parasites					
E. histolytica	2	1	1	2	6 (15)
G. lamblia	1	1	0	1	3 (7.5)
Helminthes					
A. lumbricoides	4	0	1	2	7 (17.5)
Taenia species	0	1	0	0	1 (2.5)
Total	7	3	2	5	17 (42.5)

In general, Table 7 shows that out of 8 food handlers in ‘‘01’’ orphanage center 5 (62.5%) of them were infected with at least one of either the protozoan or helmintheic intestinal parasites while 3 (50%), 2 (33.3%) and 4 (20%), in ‘‘02’’, ‘‘03’’ and ‘‘04’’ centers containing 6, 6 and 20 food handlers respectively. The food handlers in the center coded as ‘‘01’’ demonstrated the highest prevalence (62.5%) followed by ‘‘02’’ (50%), ‘‘03’’ (33.3%) and ‘‘04’’ (20%) orphanage centers. This indicates that there might be high possibility of oocyst or cyst transmission of the parasites from infected food handlers to healthy children thorough contaminated food if proper hygienic practices cannot be maintained.

4. CONCLUSION

The study has shown that intestinal parasitic infections among food handlers are not uncommon with a detection rate of 35%. This finding is of particular significance since infected food handlers may be at risk of developing illness themselves, and may pose a threat to the health of the children. For instance all protozoans discussed in this study are transmitted via the fecal-oral route from infected food handlers to healthy children.

Based on the findings of this descriptive cross sectional study, the following could be concluded:

i. Most of the orphanage centers were found with poor repair and sanitary condition of the kitchens, unclean conditions of processing equipments, inappropriate use of refrigerators (temperature reading and storage of raw and cooked foods together), improperly managed toilet facilities, absence of hand washing basin near the dining room, inappropriate solid waste storage receptacles and lack of the standard three compartment food utensil washing facility.

ii. The knowledge and practice of Food handlers towards foodborne disease, personal hygiene and food handling practices were found to be unsatisfactory in all of the orphanage centers.

iii. Most of the food handlers did not get any training in relation with food safety and most of them did not have a clear image of how food can be contaminated and resulting in foodborne diseases. This may cause foodborne disease outbreak in the centers as many of them did not know how these diseases can be transmitted.

5. RECOMMENDATION

- Health sectors, municipalities and Non Governmental Organizations should work together to improve the sanitary facilities of the centers and in turn protect the health of the children to reduce the economic burden of the country due to foodborne diseases.
- The food handlers having direct contact with foods need to have periodic physical examinations including stool test for enteric pathogens at least twice a year to prevent the shealth defects of the food handlers and avoid transmission of these pathogens through contaminated foods.
- The orphanage centers should be supported by concerned bodies and also monitored regularly whether their activities are to the standard or not.
- Moreover, integrated effort need to be made to reduce the spread of HIV/AIDS and maternal death which have been contributing a lot to the nation's high number of orphans.

6. REFERENCES

Abel O. Onyango, Eucharia U. Kenya, John J.N. Mbithi, Musa O. Ng'ayo (2009): Pathogenic *Escherichia coli* and food handlers in luxury hotels in Nairobi, Kenya, *Travel Medicine and Infectious Disease*, doi:10.1016/j.tmaid.07.005

Babiker M.A., Ali M.S.M. and Ahmed E.S. (2009): Frequency of intestinal parasites among food-handlers in Khartoum, Sudan, *Eastern Mediterranean Health Journal*, Vol. 15, No. 5

Donato G. Esparar, Vicente Y. Belizario, Jr. MD, MTM&H and Janus Rowlan D. Relos (2003): Prevalence of Intestinal Parasitic Infections among Food Handlers of a Tertiary Hospital in Manila using Direct Fecal Smear and Formalin Ether Concentration Technique, *University of the Philippines M,anila,* MSc. Thesis

Dugassa Guteta (2007): Sanitary Survey of Food and Drinking Establishments in Ambo Town West Showa Zone Oromia Region, Addis Ababa University, Ethiopia

Ellin Doyle (2003): Foodborne Parasites, A Review of the Scientific Literature, Food Research

Gun Wirtanen and Satu Salo (2007): Microbial contaminants and contamination routes in food industry, VTT Symposium 248, Espoo Finland

Julie Garden-Robinson: (2007): Food Safety Basics: A Reference Guide for Foodservice Operators, North Dakota State University and U.S. Department of Agriculture

Kinfe Z. and Abera K. (2005): Assessment of the Sanitary Conditions of Food Establishments in Mekelle Town *Ethiop.J.Health Dev.*2007; 21(1):3-11

Simona Peruzzi, Chiara Gorrini, Giovanna Piccolo, Adriana Calderaro, Giuseppe Dettori, Carlo Chezzi (2006): Prevalence of intestinal parasites in the area of Parma during the year 2005, ACTA BIOMED; 77: 147-151

Stewart, G.F. (1997): Introduction to Food Science and Technology, Academic Press, New York, NY and London

Theo Van de Venter (2009): Emerging Food-borne Diseases: a global responsibility, Food, Nutrition & Agriculture, FAO corporate document repository

WHO (World Health Organization) (2008): Foodborne Disease Outbreak: Guidelines for Investigation and Control

WHO (World Health Organization) (1987): Prevention and control of intestinal parasitic infections, WHO, Techl Rep. Ser. No. 749, 1–86

WHO (World Health Organization) (1999): Removing Obstacles to Healthy Development, Geneva, World Health Organization.

Zain MM, Naing NN. (2002): Socio-demographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: A preliminary report. *Southeast Asian J. Trop Med Public Health*; 33(2):410-417