

# Prevalence of the Common Associated Parasitic Diseases among Food Handlers in Restaurants in Khartoum State, Sudan 2016-2019

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## Abstract

Parasitic infection is one of the problems that affect human health, especially in developing countries. Over 800 food borne disease outbreaks are reported to the Centers for Disease Control and Prevention and most commonly occur in a restaurant setting.

A Descriptive Cross-sectional, Restaurants based, study was conducted for 360 food handlers in 96 restaurants, in Khartoum state, between June 2016 and March 2020. The general objective of this study to detect the prevalence of the common. Parasitic diseases associated with food handler in restaurants workers in Khartoum State.

Data were collected from food handlers by using Adapted verbal autopsy questionnaire, and Samples of stool (360 samples) were collected from food handlers, and placed in sterile plastic containers, properly identified with the names of the food handlers and the place of their work was written. Samples were examined in Khartoum state public health Laboratory; Intestinal parasites were examined and identified by wet preparation method by direct microscope examination. The prevalence of intestinal parasitic diseases in Khartoum state was 10%. The main parasite was Giardia (6.9%) followed by Entamoeba-histolytica (2.8%) high prevalence of intestinal parasitic diseases were found in Jabal\_awiya locality (30.8%) of food handlers were found positive for giardiasis and 15.4% for Entamiba-histoletica while half of the food handlers found negative, followed by Omdurman locality 15.7% of food handlers were found positive for giardiasis 2% for E-H. and Shareq\_Alneel locality (7.3%) found positive for giardiasis and 9.8% for Entamiba-histoletica and Khartoum locality found a negative result while 4.1% positive for giardiasis, In Karari locality was found (2.9%) positive for giardiasis and 2.9% for Entamiba-histoletica, in Ombadia locality, 2.5% found positive for giardiasis and 2.5% for Entamiba-histoletica, all food handlers in Bahri locality were found negative for all isolated parasite sample. The positive for giardiasis found high occurrence in female 12% while male 6%. For positive of Entamiba-histoletica found in male only (3.2%). Regarding of age group in age 40 years and more most of positive parasite sample were found for giardiasis (23.1%), knowledge about Transmission of foodborne diseases found significant risk factors for isolated intestinal parasite of food handlers (p value 0.041, odd ratio = 2). The occurrence of parasites odds in food handlers do not know the transmission of food disease was 2 times higher than odds occurrence of parasites in food, handlers know transmission of food disease a significant risk factors association between attitude toward Training and learning about food safety and isolated intestinal parasite (p value = .020, OR=2.713).

In conclusions, therefore the main recommendations are: further studies should be undertaken on the prevalence of intestinal parasite infections and Continuous medical checkup of food handlers should be mandatory to more alleviate the Prevalence of intestinal parasites.

## Introduction

Food is essential to human life but if contaminated can cause illness or even death. Food borne disease (F B D), is resulting from eating contaminated food stuff, and range from disease caused by microorganism to those caused by chemical exposure [1]. A food handler (F H) is one who manufactures, processes, prepares, packages, or distributes the food to consumer. The world health organization (WHO) mentioned that the food handler is involved in the whole process of food safety from farm to fork. Contamination of food served in a restaurant can occur at any point from farm to table. Intestinal parasitic infections cause significant problems in individuals and public health, particularly in developing countries, with a prevalence rate of 30-60%. Transmission of intestinal parasites that occurs directly or indirectly through food, water or hands indicates the importance of fecal-oral human-to-human transmission. Food handlers with poor personal hygiene working in the foodservice settings can be infected by different enteropathogens, possibly causing fecal contamination of foods by their hands during food preparation, and finally, maybe implicated in the transmission of many infections to the public in the local community [2]. Therefore, a proper screening procedure for food handlers is helpful in the prevention of probable morbidity and the protection of consumer health.

## Problem Statement

Foodborne diseases are responsible for the majority of mortality and morbidity worldwide with up to 30% of population in industrialized countries suffering from foodborne illness annually. The consumption of food and water contaminated with potential foodborne pathogens such as bacteria, viruses, parasites and toxins accounts for more than 250 different foodborne illnesses. According to the Centers for Disease Control and Prevention (CDC) update in 2017, each year

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about 50 million people succumb to food-based ailments, leading to the death of an estimated 3,000 people. Annually, over 800 foodborne disease outbreaks are reported to the Centers for Disease Control and Prevention (CDC) and most commonly occurs in a restaurant setting. In 2013, 51% of single-setting foodborne disease outbreaks were caused by food prepared in a restaurant [3]. The World Health Organization estimated that in developed countries, up to 30% of the populations suffer from food borne diseases each year, whereas in developing countries up to 2 million deaths are estimated per year. Centre for disease prevention and control (CDC) raised an annual report in 2011, in which it was mentioned that food borne infection was an important public problem in United State (USA). It estimated that in USA they were 48 million people (about 1 in 6) who got sick, 128000 were hospitalized and 3000 died each year at that time. In Europe, there has also been a marked increase in reported food poisoning cases. In 2009 there were 212,064 human cases of campylobacteriosis as compared to 99,020 cases of salmonellosis [4]. Food borne diseases are common in developing countries including Sudan because of the prevailing poor food handling and sanitation Practices, inadequate food safety laws, weak regulatory systems, lack of financial resources to invest safer equipment, and lack of education for food handlers. In Khartoum state food poisoning, was the third disease to be treated in the health unit of the state, the reports have reflected an increase in the number of treated cases in 2013. The annual total number cases of food poisoning in Khartoum state in 2012 was 4448 cases, was increased compared to the number of cases in 2011, 4298.

## Justification

Millions of people become sick each year and thousands die after eating contaminated or mishandled foods. It is observed that there is an increasing number of food premises in Khartoum state because it is becoming a profitable business. Khartoum State is expanding very rapidly due to rapid urbanization, and industrialization and influx of people from another state. Globally the prevalence of people eating away from home has increased.

## Research Questions

What are the food handlers' knowledge, attitudes, and practices and associated risk factors that can affect food safety and lead to food borne diseases (parasitic diseases).

## General objective

To detect the prevalence of the common associated parasitic diseases among food handlers in restaurants in Khartoum State, Sudan 2016-2019.

## Material and Method

### Study design

A Descriptive Cross-sectional, restaurant based study conducted in Khartoum State.

**Study period:** From June 2016 to March 2020.

### Study area

Khartoum state is the capital of Sudan, located in approximately northern east area of the central part of In Khartoum state there are 960 restaurants and 3633 worker in these restaurants.

### Study population

Food handlers in restaurants of Khartoum state (960 restaurants)

and (3633 Workers).

### Sampling

**Sample size for food handlers is calculated according to following formula:**

$$n = \frac{N}{1+N(e)^2}$$

**Sample size for restaurants:** 96 restaurants were included (10%) of total restaurants in Khartoum state; restaurants are selected by using simple random sample.

### Method of data collection

- Face-to-face: interviews were conducted using structured questionnaire for collecting information from food handlers covering four items.
- Socio demographic data include age sex place of residence, level of education duration of work.
- Lab analysis: Samples of stool (360 samples) were collected from the food handlers and placed in sterile plastic containers, properly identified with the names of the food handlers and the place of their work was written. Samples were examined in Khartoum state public health Laboratory. Intestinal parasites were examined and identified by wet preparation method by direct microscope examination, Apply the stool sample to small in clean microscope slide. Remove any gross fibers and particle. Immediately before the specimen dries, mixing a small amount of stool (about 2 mg) with drop of 0.85% NACL; add 1 or 2 drops of normal saline with a pipette. Mix with pipette tip. Cover the specimen with a cover slip, if fresh stool specimen is received and if blood and mucus are present, the specimen should be examined as direct mount making sure to sample the bloody areas. 1 slide was prepared from each fecal sample and Lugol iodine was used for staining. The analysis was performed by light microscopy, with magnifications of 40X for visualization and confirmation of parasitic forms. The parasite identified in slid were reported as positive.

### Data analysis and presentation

Data was coded, cleaned, entered, analyzed by using SPSS version 20. Descriptive statistics were used to determine frequencies and percentages. The relationship between variables was computed using chi-square test and p value less than 0.05 was considered significant.

The Odd Ratio (OR) and its 95% Confidence Interval (CI) were computed to find risk factors of food borne diseases.

### Ethical consideration

- The proposal of study was passed by University of Shendi, post graduate studies (Research committee).
- 2. The permission was obtained from health authority and director of laboratory of Khartoum state.
- Explanation of the study purpose and the benefits of it were given for every participant (food handlers) when asking him\ her to participate in the study to gain him\ her consent.
- Permission was taking from restaurants owner and workers under study.
- Confidentiality of data and privacy were rigorously protected. Research team was trained adequately in this aspect. Access to the confidential data was limited to researcher.

## Results

A total of 360 Food handlers were participated in this study. Nearly half of food handlers (74%) are working in Khartoum locality while few of them are working in Jabal\_awliya. (86.1%) were male and (13.9%) female; most of food handlers were Sudanese (78.9%).

Regarding age (9.2%) of food handlers were in the age group Less than 18 years followed by 18-20 years, 21-30year (34.4%), (33.9%) respectively and 3.6 more than 40years.

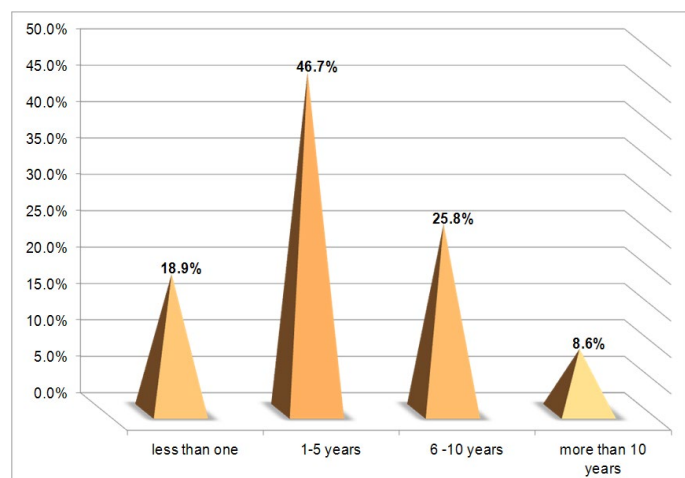
Nearly half (46.1%) of food handlers have secondary school, (33%) primary school university, 10.3% of food handlers have university education and lower percentage show in Khailwa and Illiteracy.

The Figure shows Duration of work Most of food handlers (46.7%) work from (1-5) years and (8.6%) worked more than 10 years (Figure 1).

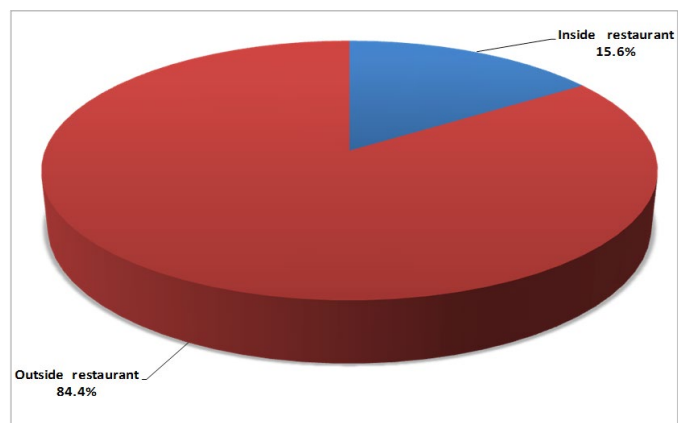
The Figure shows Place of residence Most of food handlers of study sample (84.4%) were staying outside of restaurant and (15.6%) were staying in restaurant (Figure 2).

Most of Food handlers had valid card (79.4%) and (20.6%) have not (Figure 3).

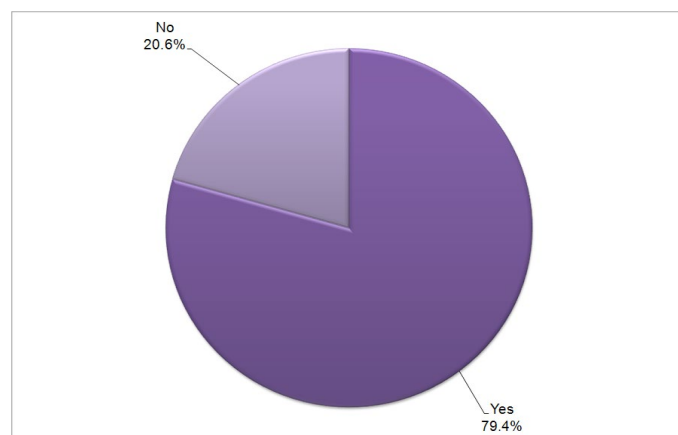
The table shows that giardiasis had the highest occurrence among food handlers of all isolated parasites sample (6.9%) followed by Entamib-histolytica (2.8%) and the most (90.3%) of food handlers were found to be negative for all isolated parasites sample (Tables 1-4).



**Figure 1:** Shows Duration of work (years) of food handlers of study sample.



**Figure 2:** Place of residence of food handlers of study sample.



**Figure 3:** Food handler of the study sample with valid medical examination card.

**Table 1:** Demography characteristics of food handlers of study sample.

	Freq.	%
<b>Localities</b>		
Khartoum	172	47.8%
Bahri	11	3.1%
Omdurman	51	14.2%
Obadiah	38	10.6%
Karari	34	9.4%
Shareq_Alneel	41	11.4%
Jabal_awliya	13	3.6%
Total	360	100%
<b>Gender</b>		
Male	310	86.1%
Female	50	13.9%
Total	360	100%
<b>Nationality</b>		
Sudanese	284	78.9%
Not Sudanese	76	21.1%
Total	360	100%

**Table 2:** Age group of food handlers of study sample.

	Freq.	%
<b>Age group</b>		
Less than 18 years	33	9.2%
18-20 years	124	34.4%
21-30 years	122	33.9%
31-40 years	68	18.9%
Above 40	13	3.6%
Total	360	100%

**Table 3:** Education level of food handlers of study sample.

	Freq.	%
<b>Education level</b>		
University	37	33.3%
Secondary	166	46.1%
Primary	120	10.3%
Khailwa	17	4.7%
Illiteracy	20	5.6%
Total	360	100%

## Discussion

Parasitic infection is one of the problems that affect human health, especially in developing countries [5]. Different studies have been conducted in the field of intestinal parasite prevalence among food

**Table 4:** The Prevalence of intestinal parasites in the stool samples of food handlers of the study sample.

Isolated parasite species	Freq.	Percent
Negative	325	90.3%
Giardialambdia	25	6.9%
Entamiba-histoletica	10	2.8%
Total	360	100%

handlers. In this study, the low prevalence of intestinal parasites was found is different from what was reported by other studies in different parts of the world [6]. This study was conducted in Khartoum state on 360 food handler in 96 restaurants and the results showed only 10% of stool specimens were positive for different intestinal parasites comparable with the study conducted in the Sari, Northern Iran the Intestinal parasites were found (15.5%) of the studied samples. And non-comparable with the study conducted in 2009 in Khartoum state Intestinal parasites were found 29.4%. While lower ones (6%) have been reported in Golestan, Northern Iran [7]. According to various studies, it is indicated that the prevalence of intestinal parasitic infections has recently changed compared to the past and the prevalence of infection has declined. This supports our study that the prevalence of intestinal parasites was low [8]. In the present study, the low prevalence observed maybe because most of those investigated possessed valid health cards (79.4%) and also had some awareness of the transmission of diseases Possible explanations include geographic difference, the time of the study, The differences in reported prevalence in various studies may be due to socioeconomic status, climatic conditions, poverty, personal and community hygiene, different study population and the year in which these studies were conducted [9]. From all positive parasites sample the giardiasis had the highest occurrence among food handlers (6.9%) followed by Entamoeba-histolytica (2.8), also in a study conducted in the Sari, Northern Iran Most of the participants were infected with Giardia lamblia (53.9%) and (15.5%), Entamoeba histolytica [10]. This agrees with other Similar studies about the prevalence of intestinal parasites among food handlers were showed gardia infections were more common than Entamoeba histolytica infections. And the studies conducted in Saudi Arabia and Sudan cleared that Giardia and Entamiba. histolytica parasites were observed in food handlers and the amount of Giardia parasite were very high in Sudan [11]. Also, a study conducted in Khartoum locality gardia was high flowed by Entamiba-histolytica. Finding is comparable with the study conducted in Khartoum state giardialambdia 9.7% and enta. histolytica 4.3% [12]. A similar study conducted in Kenya and they found out that Giardia parasite is one of 6 common types of parasites among members of restaurant staff. The results of our study for prevalence of intestinal parasites among food handler was found to be comparable to those in developing countries especially countries which are considered to be (similar to us in their health system) [13]. There are different reports on the prevalence of intestinal parasitic infection in men and women. Some of them are more common in men and by contrast, some are more common in women [14]. Cultural differences affect the gender of workers to a large extent. In a study conducted in Sari, Northern Iran, the prevalence was higher in males (19%) than in females (10.2%), with a statistically significant. In the present study the positive for giardiasis found high occurrence in female than male and E-H found in male-only.

The present study provides critical information about the level of knowledge, attitudes, and practices of food workers about food safety in restaurants of Khartoum state, an important finding of the present study was that.

Most of the Food handler possessed valid card 79.4% that may be

lead to the low prevalence of intestinal parasitic. With compared with a study conducted among Food Handlers in East and West Gojjam, Ethiopia's Majority of food handlers (64.5%)) had no medical checkup previously (were not certified) had a high prevalence of intestinal parasites(61.9%) [15]. The same study showed that certified workers had greater food safety knowledge than non-certified workers [16].

The education level of food handlers is generally perceived as one of the factors that compromised food safety and hygiene. In this study, no relationship between the level of education and isolated parasite stool sample observed that a vast percentage of food handlers who have secondary and university and Khailwa's education found to be negative. In another study a significant association was observed between the educational level of food handlers and parasitic infection assuming that they were highly aware of the importance of personal hygiene. Similar results were obtained in a study on Jakarta sidewalk food vendors [17,18]. Literacy level reduces the number of positive samples; in other words, there is an It could be interpreted that if the literacy rate increased, then awareness about parasitic infections will also increase. Therefore, the lower need for health advice and better compliance with sanitary regulations will be achieved, as noted in other studies [19,20]. These facts emphasize the need for education which is important for training of such workers.

## Conclusions

The study concluded the following:

- Nearly half of food handlers working in Khartoum locality and few of them working in Jabal\_awliya. Most of the food handlers were male and Sudanese nationality and most of them in age-18-20 years, 21-30, and 34.4%, respectively. Nearly half of the food handlers have a secondary school. Most of the food handlers are resident outside the restaurant.
- The prevalence of intestinal parasites from stool specimens of food handlers were low, the giardiasis and E-H were found to be positive and giardiasis had the highest occurrence among food handlers of all isolated parasites sample.
- Vast of food handlers were found to be negative for all isolated parasites samples.

## Recommendation

Recommendations are suggested:

- To Federal ministry of health further studies should be undertaken on the prevalence of intestinal parasite infections and associated risk factors, and also ensure from an equal distribution of free health services. More deductive research is needed to contribute further to the understanding of food handlers' practices and attitudes in order to further reduce intestinal parasitic infections in food handlers.
- To Federal ministry of health, several strategies are recommended such as stool examinations with concentration methods every three months, public education, the application of health regulations, controlling the validity of health cards and training on parasitic infection transmission.
- To state ministry of health apply more regular programs to treatments positive cases with food borne diseases spicily infection with intestinal parasites to more decreasing in parasites infection.
- To state ministry of health To Continuous checkup of food handlers should be mandatory to more alleviate the prevalence of intestinal parasites.



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