

# Prevalence of Intestinal Parasite Infections among Restaurants' Workers in Taiz City, Yemen

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**Abstract**— The prevalence of intestinal parasite infections among the restaurants' workers in Taiz city, Yemen was investigated. Stool samples (233 samples) were examined by direct smear, saline sedimentation and formal ether concentration techniques. The results in this study showed that the prevalence percentage of parasite infections was 63.1% of intestinal parasites were detected in restaurant workers. The prevalence *Entamoeba histolytica*, *Gardai lamblia* and *Entamoeba coli* was 33.4%, 9.4% and 11.2%, respectively. Moreover, it was found that more than 9.1% of restaurants' workers were harbored intestinal helminthes including *Ascaris lambercoides* (2.6%), *Hymenolipes nana* (2.6%), *Schistosoma mansoni* (0.9%), *Tania saginata* (0.4%), *Anclystoma duodenal* (0.9%), *Trichuris trichura* (0.4%) and *Enterobius vermicularis* (1.3%). The double infection with *E. histolytica* and *G. lamblia* was 1.3% and *E. histolytica* and *E. coli* was 6.9%. The infection with those parasites was also accompanied with abdominal trouble, diarrhea, constipation, nausea and vomiting. In conclusion, the high prevalence of intestinal parasitic infections among the restaurants' workers suggest that stool analysis for intestinal parasites should be periodically carried out in addition to the sanitation education and health special care for food handlers are working in restaurants.

**Index Terms**— Prevalence , Restaurant workers , Intestinal parasites , Food handlers , Personal hygiene , Taiz , Yemen .

## 1 INTRODUCTION

It is well-known that a wide range of intestinal parasites can be transmitted to humans via contaminated foods from improper environmental sanitation and because an inadequate personal hygiene by restaurant's workers or food handlers. In addition, fecal-oral and water-borne intestinal parasites infections are common transmission methods [1]. Intestinal parasites are one of the major health problems with socio-economic effects in the world, especially in developed countries in tropical and sub-tropical areas [2]. Infection of restaurant's workers with intestinal parasites pathogens, including Protozoan and helminthes could be a potential cause for the spreading of these pathogens to the customers. In addition to the risk of illness to the restaurant workers themselves [3], [4]. Several studies had been carried on intestinal parasites that prevail in Yemeni population [5 -7] and other countries [8-10]. The aim of their studies was determine the prevalence of these parasites in different regions of their countries also, there was Several studies about intestinal parasites in restaurant workers in yemen in mukallai [11] and neighbor regions in sudan [12] in sudia Arabia [13-17] and other countries [18], [19]. In addition to recently studies [20-24]. And other studies about food contamination with pathogens bacteria and parasite [25] and study about bacteria and parasite Assessment of Food Handlers in sudan [26]. According to the World Health Organization (WHO), approximately 500 million people worldwide suffer from amoebiasis, with an annual mortality between 40000 and 110 000 [27]. Globally, due to intestinal parasitic infections, some 3.5 billion people are affected; 450 million are symptomatic and yearly more than 200,000 deaths are reported [2]. The aim of this study was to determine the prevalence of intestinal parasites in restaurant workers in Taiz city.

## 2 MATERIALS AND METHODS

This study look place in the Faculty of Applied Science, Taiz University, Yemen during Collected from period December 2010 to Marsh 2011. During This study stool samples were collected from 233 restaurants workers to identify the prevalence of intestinal parasite infection among this section of community. All of them submitted to answer the survey questionnaire which included information about symptoms, educational levels, age and social state etc.. The restaurants workers were asked to bring a sample with formalin 10% in concentration in clean container. There are routine techniques for stool examination direct examination ,natural saline sedimentation via gravitation and formal ether concentration.

### 2.1 Direct Smears

Saline direct smear was used mainly for detection of motility of intestinal protozoan trophozoites, which are seen in liquid or semi liquid specimens. Iodine direct smear shows the characteristic features of the diagnostic stages in more details. Generally, direct smear is cheap, easy and the best simple way for detection of microscopic cellular exudates including RBCs, WBCs and mucous. In case of light infections, direct smears might show false negative results and if the specimens are old, the parasites will die and can be overlooked [28]. Direct stool smears were conducted by emulsifying about 2 mg of stool uniformly in a drop or two of saline in the left side of microscope slide, and similarly in iodine in the right side. Preparation were covered with cover glasses (22x22 mm) and scanned microscopically under low 10x and high 40x objective lenses.

### 2.2 Sedimentation Technique

Although, this formal ether technique cannot detect trophozoites, it is considered as the best concentration technique used in diagnostic laboratories for detection of larvae ,ova and cysts [29], [30]. Generally 10% formal saline is used to kill and pre-

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serve diagnostic stages of the parasites. Diethyl ether collects most of unwanted debris in a separate layer. All diagnostic stages that are applicable with this technique will be concentrated at the bottom of the analysis centrifuge tube. However, safety precautions should be taken, as formalin is carcinogenic, and diethyl ether is flammable and explosive.

Quantitatively, one slide from this technique is a substitute of about one thousand slides or more from the direct smear technique. Thus the greater amount of stool used, the greater the chance of recovery of diagnostic stages. Sedimentation technique was performed by emulsifying about 2 g of stool in 10-15 ml of 10% (v/v) formal-saline. The suspension was allowed to stand for 30 min, then strained through two layers of gauze into a 15 ml conical centrifuge tube and centrifuged at 2000 rpm for 5 min. When needed, washing step was repeated until supernatant becomes clear. The sediment was re-suspended with 10 ml of 10% (v/v) formal-saline and allowed to stand for 5-10 min. Three ml of diethyl ether was added, and then the tube was shaken vigorously for 30 sec and centrifuged at 2000 rpm for 5 min. After centrifugation, the applicable diagnostic stages were sedimented in the bottom of the tube. The fecal debris was separated in a layer between the diethyl ether and the 10% (v/v) formal-saline layers. Fecal debris layer was loosened by wooden stick and the tube rapidly inverted to discard the top three layers while the sediment remained at the bottom. Then, 1-2 drops of iodine were added to the sediment and mixed well. Then, part of the sediment was transferred to a microscope slide, covered with a cover glass (22 x 22mm) and scanned microscopically under low and high (10x and 40x) objective lenses. In addition to natural saline sedimentation via method is very good method to give us good results.

### 2.3 Statistical Analysis

The data obtained in this study were tested for close association using the chi square test to know the relationship between the variables and presence of intestinal parasites. The differences were considered to be statistically significant ( $P < 0.05$ ).

### Calculation of Prevalence Rate

Prevalence rate for infected restaurant workers was calculated as follows: Prevalence (%) = (Number of restaurant workers infected by a species of Intestinal) / (Total number of restaurant workers examined)  $\times 100$ .

## 3 RESULTS

The total number of screened restaurant worker included in this study was 233 all of them from Male with age range from (12-60). Table1 demonstration the prevalence of parasitic infection among restaurant workers. The types of detected intestinal parasites also their percentage is illustrated in the same table *E. histolytica* shows the high percentage (53.1%). The infected restaurant workers with parasites suffer from abdominal disorders are cited in Table 2. Additionally, the details of table is the complaints versus to parasitic infection, where the majority of Sufferings are related to the main parasites in Yemen i.e. *E. histolytica* and *Giardia lamblia*. All Symptoms are shared to both *E. histolytica* and *Giardia*. The age dis-

tribution of the screened individual showed 59.5% were aged <21 years, 72.7% were 21-30 years, 57% were 31-40 and 44% were >40 years old. The infection rates were also comparable for education level 55.5%, 60%, 75.9% ,64% and 50% in those workers for illustrate, primary school, middle school, secondary school and university respectively. The infection rate were also Comparable for social state 62% and 64% and those workers for single and married respectively. And the infection rates were also comparable for some risk factors as in Table3

TABLE 1. PERCENTAGE AND PREVALENCE OF INTESTINAL PARASITES DETECTED OF STOOL EXAMINATION OF RESTAURANT WORKERS

Type of parasite	No. infection	Parasite %	Prevalence %
<i>E. coli</i>	26	17.7	11.2
<i>E. histolytica</i>	78	53.1	33.4
<i>G. lamblia</i>	22	15	9.4
<i>H. nana</i>	6	4	2.6
<i>Tenania</i>	1	0.7	0.4
<i>Schistosoma mansoi</i>	2	1.4	0.9
<i>Asc. Lambercoides</i>	6	4	2.6
<i>Enterbios vermicularis</i>	3	2	1.3
<i>Ancylostoma</i>	2	1.4	0.9
<i>Trichuris trichora</i>	1	0.7	0.4
Total	147	100	63.1

TABLE 2. RESTAURANT WORKERS COMPLAINT VERSUS PERCENTAGE AND PARASITIC INFECTION

Symptoms	No.	%	<i>E. c</i>	<i>E. h</i>	<i>G. l</i>	<i>H. n</i>	<i>T. s</i>	<i>S. m</i>	<i>A. l</i>	<i>E. v</i>	<i>A. d</i>	<i>T. t</i>
Abdominal pain	65	44.2	11	34	12	3	0	1	1	0	2	1
Diarrhoea	46	31.3	7	24	9	3	0	0	0	0	2	1
Constipation	42	28.6	10	22	7	1	0	0	1	0	0	1
Headache	68	46.3	11	36	13	3	0	1	2	0	1	1
Nausea & vomiting	31	21.1	3	18	8	0	0	1	0	0	0	1

APP: *E. c*= *Entamoeba coli*, *E. h*= *Entamoeba histolytica*, *G. l*= *Giardia lamblia*, *H. n*= *Hymenolipes nana*, *T. s*= *Tania saginata*, *S. m*= *Schistosoma mansoni*, *A. l*= *Ascaris lambercoides*, *E. v*= *Enterobius vermicularis*, *A. d*= *Anclystoma duodenal*, *T. t*= *Trichuris trichura*.

TABLE 3. FREQUENCY OF PARASITIC INFECTION IN STOOL SAMPLES OF RESTAURANT WORKERS BY AGE, EDUCATION LEVEL AND SOME RISK FACTORS (N=233 SAMPLES)

Variable	No. examined	No. infected (%)	Chi-square (X <sup>2</sup> )	P Value
Age				
<21	74	44 (59.5%)		
21-30	99	72 (72.7%)		
31-40	35	20 (57%)	8.84	0.03
>40	25	11 (44%)		

Education level				
Illiterate	54	30 (55.5%)	6.79	0.15
Primary school	55	33 (60%)		
Middle school	58	44 (75.9%)		
Secondary school	50	32 (64%)	1.72	0.19
University	16	8 (50%)		
Social state				
Single	108	67 (62%)	22.30	<0.001
Married	125	80 (64%)		
Eating with unwashed hands				
Yes	98	79 (80.6)	22.17	<0.001
No	135	68 (50.4)		
Eating unwashed fruit & vegetables				
Yes	153	113 (73.9)	1.27	0.26
No	80	34 (42.5)		
Contact with soil				
Yes	146	93 (63.7)	2.30	0.13
No	87	54 (62.1)		
Contact with animals				
Yes	85	59 (69.4)	8.81	0.12
No	148	88 (59.46)		
Occupation				
Dealing with fruit & vegetables	42	34 (80.95)		
Bakers & confectioners	33	18 (54.55)	23	(60.53)
Dealing with meat	38	23 (60.53)		
Cooks & kitchen helpers	54	31 (57.41)		
Waiters	37	25 (67.57)	16	(55.17)
Fast food sellers	29	16 (55.17)		
Total	233	147 (63.1%)		

## 4 DISCUSSION

The World Health Organization regards illness due to contaminated food as one of the most widespread health problems in the contemporary world [31]. The food handlers in the restaurants are the sensitive group of population that can be a focus for contamination by these parasitic infectious agents as they are in direct contact with clients. Additionally, asymptomatic carriers of intestinal parasites are a particular public health hazard, especially if they work in catering facilities, where they may become a source of infection [5]. Intestinal parasites are frequent among food handlers in many countries [14], [16-19]. The prevalence of intestinal parasites is varied in different regions of Yemen:

*E. histolytica* *dispor* (1.7-31.69%), *Giardia* (10.2-19.73%), *H. nana* (0.05-5.3%) and *A. lumbricoides* (0.42–15.9%) [5-7]. These parasites also have different prevalence in neighbor countries.

High prevalence of parasitic infection (63.1%) in this study compared to other surveys as 7.56% in Dammam and Al-Khobar [14], 14.2 % in Al-Medina [15], and 12.8 % in Riyadh [16], shows higher degree, but slightly lower than 33% in Tabriz, Iran [18], 44.95% in Brazil [19], and 31.4 % in expatriates of Al-Khobar [17]. In addition to studies in hadhramout [11], Khartoum [12] and Makkah [13]. In the present study the infectivity of intestinal parasitic infection (63.1%) in restaurant workers in Taiz city of yemen was much higher than that study in hadhramout of yemen which found that 28.7% of restaurant workers were infected with intestinal parasites [11]. It is also much higher than that obtained in Sudan where the infection rate with intestinal parasites was 30.5% [12]. It is also much higher than that obtained in Makkah where the infection rate with intestinal parasites was (31.94%) [13]. In addition to recently studies in Ethiopia[20] the prevalence of parasitic infections (52.1%) ,in Southern Iran (34.9%)[21] ,in North Central Nigeria (55.9%)[22] ,in city of Brazil (19%)[23], in Northern Iran(15.5%)[24] .All these recently studies were less than the prevalence in this study . This high infectivity may be due to the discrepancy in socioeconomic status, environmental conditions, sanitation systems, waste management, lack of personal hygiene and untreated infected individuals can serve as roving reservoirs of infection for long-life parasites [32], may explain this difference. The two parasites, *E. histolytica/dispor* and *Giardia* were the most frequent parasites in Taiz, the double infection with *E. histolytica* and *G. lamblia* were 1.3% and *E. histolytica* and *E. coli* were 6.9%, and most of the symptoms declared were shared with these infections especially abdominal pains and diarrhea. Additionally nausea and vomiting, also abdominal pains were shared with most parasitic infections (Table 2). Contaminated food plays a major role in the occurrence of diarrhea diseases [31]. In this survey, all infected restaurant workers who suffer from diarrhea were infected with *E. histolytica/dispor* and *Giardia*, the two parasites transmitted by direct contact and highly favored by the habits and costumes of the people, so simple hand-washing was efficacy to reveal a significant decline in microbial hand contamination of the food handlers from 72.7% to 32% [33]. The majority of infected restaurant workers are eating with unwashed hands and eating unwashed fruit & vegetables ,also the infections increase when contact with animal and soil (Table 3). We conclude that take no care about the health measurements help in dissemination of parasitic agents can take place easily and this will raise health hazard.

## 5 CONCLUSION

In conclusion undoubtedly, continuous health supervision, annual medical examination and prompt treatment of infected food-handlers minimizes the effect of duration of work on infection rates. The effectiveness of current pre-employment screening policy must be annual and systematic surveillance is needed. Food safety education is a critical prerequisite, and health education in general should be increased to raise awareness of the society about intestinal parasites problems [16], [17], [19], [31]. Our duties as researchers anywhere in the world explored credibility, accuracy and precision in results.

This is the first essential step to treatment this problem to minimize the distribution of intestinal parasitic agents. This for general interests.

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