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Occurrence of Intestinal Parasites and Hygiene Characters among Food Handlers in Gaza Strip, Palestine.

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Abstract

Background: The present study aimed at investigating the presence of intestinal parasites among food handlers in Gaza Strip.

Methods: A cross-sectional study was carried out where a total of 214 stool samples were collected from food handlers. The study was performed in the period between October 2007 to April 2009. The stool samples were tested by wet mount using normal saline, Lugol's iodine and sedimentation techniques using formalin and ether. A questionnaire was filled for each food handler including, age, residence, hygiene characters, work place and education level.

Results: The study revealed an overall prevalence of parasites in food handlers of 24.3%. The most common protozoan parasite was *Entameba histolytica/dispar* (19.2%). It was found that the age group 26-36 years had the highest prevalence of *Giardia lamblia*. It was found that city workers had the highest prevalence of intestinal parasites while camp workers had the lowest prevalence.

Conclusions: It is concluded that a high percentage of food handlers are infected with intestinal parasites. It is recommended that food handlers should be subjected to regular medical examination that includes stool analysis.

Key words: Food handlers, parasites, prevalence, Gaza strip.

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حدوث الطفيليات المعوية وخصائص النظافة بين مقدمي الأغذية في قطاع غزة-فلسطين

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الخلاصة: هدفت الدراسة الحالية للبحث في وجود الطفيليات المعوية بين مقدمي الأغذية في قطاع غزة-فلسطين. تم عمل دراسة مقطعية حيث تم جمع 214 عينة براز من مقدمي الأغذية وأجريت الدراسة في الفترة الواقعة بين أكتوبر 2007 إلى ابريل 2009. تم اختبار عينات البراز بطرائق مختلفة: الفحص المباشر للعينة باستعمال المحلول الملحي، والصبغ بالايودين، والترسيب بالايثر الفور مال. تم ملئ الاستبانة من كل مقدم أغذية والتي اشتملت على معلومات مثل: العمر، مكان الإقامة، خصائص النظافة، مكان العمل ومستوى التعليم. كشفت الدراسة إن نسبة الشبوع العامة للطفيليات بين مقدمي الأغذية وصلت إلى %24.3. وكان الأكثر شيوعاً طفيل المتحولة الحالة للنسج/ دسبار %19.2. وجد أن الفئة العمرية 26-36 سنة كان لها أعلى معدل شيوع للجاء رديا للمبيلة. بينت الدراسة أن معدل شبوع الطفيليات كان أعلى بين مقدمي الأغذية المقيمين في المدينة بينما المقيمين في المخيم اقل شيوعاً. خلصت الدراسة أن هناك نسبة عالية من مقدمي الأغذية مصابة بالطفيليات المعوية وبالتالي يوصى الباحثون أن يخضع مقدمي الأغذية لفحص طبي منتظم والذي يتضمن تحليل عينة براز.

Introduction:

Studies have proved that there are many places in Gaza strip especially in refugee camps have considerable prevalence of intestinal parasites, which pose various risks on the health of those people - especially children. In a study that included 489 school children (6-11 years old) in Gaza city Yassin and co-workers reported different prevalence of intestinal parasites in the Gaza strip, showing an overall prevalence of *Giardia lamblia* of 62.2%,

followed by *Ascaris lumbricoides* (20.1%) and then *Entamoeba sp.* (13.3%) [1]. Shubair and co-workers reported similar percentages and the same parasites among 6-11 years old school children, including 556 subjects in Gaza [2]. In a study carried out among school children in Deir El-balah town, Gaza strip, Al-Hindi found that the overall percentage of positive cases with intestinal parasites was 36.3% [3]. The order of prevalence of intestinal parasites

was as follows; *G. lamblia* (38%), *Entamoeba sp* (36.4%), *A. lumbricoides* (14%) and *Hymenolepis nana* (9.7%), where these parasites are considered endemic in Palestinian society due to poor sanitation measures and improper health practices [4]. The most recent study on the prevalence of intestinal parasites among Palestinian children was carried in Al-Nasser paediatrics hospital in Gaza and was shown to be 33.7% [5]. According to the above literature, the problem of parasitic infection still exists in the local community [6]. The most common parasites detected in Gaza strip were *G. lamblia*, *E. histolytica*, *E. coli*, *A. lumbricoides*, *E. vermicularis*, *H. nana* [7].

It is estimated that the reported incidence of food-borne disease represents less than 10 percent, and maybe less than 1 percent, of the real incidence [8].

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 the case of infected food handlers and consumers [9].

Literature from neighbouring countries focussed upon the prevalence of intestinal parasites among food handlers. In Jordan, the potential enteropathsogens in the stool of food handlers was found with a prevalence of 12.3% [10]. While in Gualyobia, Egypt 19% of food handlers had intestinal parasites [11]. Another study carried out in Sirte-Libya by Fathy [12] showed that food handlers are more prone to acquire and transmit feco-oral infection and high prevalence of *Blastocystis hominis* was recorded [35.55].

Objectives of the study:

To determine the prevalence of intestinal parasites among food handlers in popular restaurants, bakeries, hospital kitchens, police stations, university cafeterias, and slaughterhouses. To identify the isolated intestinal parasites and describe the hygiene practices.

Subjects, Materials and Methods:

Study Population and sample size: The population included

214 food handlers from different regions in the Gaza strip. Their ages ranged from 15 to 36 years old. The present cross-sectional study was conducted in the period between October 2008 and April 2009. Food handlers who participated in the study were bakery workers (n=22), cafeteria workers (n=36), kitchen workers, (n=112) and slaughterhouse workers (n=29). They were selected randomly from 23-work place distributed in Gaza Strip.

Sampling and collection methods: All food handlers participated in the present study provided one stool sample, which was obtained in a clean, sterile, and well-sealed plastic container with a top cover including a self-spoon to collect the sample. Each container was labelled with subject name and date of collection.

Questionnaire: A questionnaire was designed and distributed to food handlers who provided a stool sample and interviewed in their place of work. The data collected included personal demographic data such as name, age, sex and residence, personal

hygienic practices such as hand washing, nail cutting and wearing protective clothing at work. It also included work environmental conditions such as ventilation, special resting area, frequency of cleaning and waste disposal.

Parasitological methods:

Direct wet smear microscopy: Direct wet microscopic examination of stool for intestinal parasites stages was performed. One drop of normal saline Lugol's iodine and about 2 mg of stool were mixed on a microscopic glass slide, covered with 22 mm x 22 mm cover slip and examine under the microscope at 10x, 40x and 100x.

Sedimentation technique: The formalin-ether sedimentation technique was used to detect the parasites and ova as described in [13].

Ethical Considerations: Ethical approval was obtained from the Ministry of Health in 2008 and from Helsinke committee in Gaza. Permission was obtained from each bakery, restaurant, cafeteria, kitchen, and slaughterhouse directors. Verbal

approval from each food handler was obtained who were informed about the objectives of the study.

Statistical analysis: The collected data of work were analyzed by using SPSS version 7 (Statistical Package for Social Studies [14]. Analyses of variable, frequency tables, cross tabulation, Chi-square test, and graphs were performed.

Results:

The present study included 214 of food handlers from five governorates; Gaza north, Gaza, Mid zone, Khanyounis and Rafah in the Gaza strip. Their sex was distributed as 206 males (96.5%) and 8 females (3.7%). It was found that in direct smear microscopy that the overall prevalence of infected individuals reached to 52/214 (24.3%). The most common protozoan parasite was *E. histolytica/dispar* with a percentage of 19.2% , *G. lamblia* 2.3%, *E. coli* 1.9% while the other parasites were detected as 0.5% separately like; *Hymenolepis nana*, *Strongyloides stercoralis*, *Blastocystis hominis*, *Endolimax nana*, *Dientamoeba fragilis*, *Enterobius vermicularis*.

Table 1. shows that both age groups 15-25 years old and 26-36 years old had a similar prevalence of intestinal parasites, while individuals who are >36 years old had the highest prevalence (28.3%). Gaza Governorate had the highest prevalence (29.6) of the intestinal parasites, while Rafah had the lowest (11.1%). Food handlers with primary level education were found to have the highest prevalence of intestinal parasite infection (31.4%).

Bakery workers had the highest prevalence (40.9%) while restaurant workers had zero prevalence and was of statistical significance. Workers living in areas with waste drainage through open sewers had highest prevalence (42.9%) while those living in areas with cesspool system had the lowest prevalence (17.9%). As shown in table 2. seeking medical care had no effect on acquiring parasitic infection as both groups, seekers and non-seekers, showed comparable levels of infection. Food handlers who used personal protective equipment during the work had lower parasitic infection than

those who do not, 23.8% compared to 25.4%, but without statistically significant difference ($p>0.05$). In addition, food handlers who used gloves

during work had higher levels of parasitic infection than those who did not. The same applied to hand washing.

Table 1. Distribution of intestinal parasitic infection due to different variables (n=214).

Variable	Infected (%)	Not – Infected (%)	P-value (Chi-square)
Age group			
15-25 y (n=67)	15 (22.4)	52 (77.6)	(0.689)
26-36 y (n=87)	20 (23.0)	67 (77.0)	
>36 y (n=60)	17 (28.3)	43 (71.7)	
Governorate			
Gaza North (n=48)	12 (25.0)	36 (75.0)	(0.412)
Gaza (n=81)	24 (29.6)	57 (70.4)	
Mid Zone (n=39)	9 (23.1)	30 (76.9)	
Khan younis (n=19)	4 (21.1)	15 (78.9)	
Rafah (n=27)	3 (11.1)	24 (88.9)	
Education			
Primary (n=35)	11 (31.4)	24 (68.6)	(0.537)
Preparatory (n=71)	19 (26.8)	52 (73.2)	
Secondary (n=81)	16 (19.8)	65 (80.2)	
University (n=27)	6 (22.2)	21 (77.8)	
Marital status			
Single (n=53)	12 (22.6)	41 (77.4)	(0.746)
Married (n=161)	40 (24.8)	121 (75.2)	
Work type			
Bakery workers (n=22)	9 (40.9)	13 (59.1)	(0.079)
Popular restaurants workers (n=15)	0	15 (100)	
Cafeteria workers in Universities (n=36)			
Kitchen workers in hospitals and police stations (n=112)	9 (25.0)	27 (75.0)	
slaughterhouse workers (n=29)	28 (25.0)	84 (75.0)	
	6 (20.7)	23 (79.3)	
Waste drainage			
Closed sewers (n=179)	44 (24.6)	135 (75.4)	(0.377)
Cesspool (n=28)	5 (17.9)	23 (82.1)	
Open sewers (n=7)	3 (42.9)	4 (57.1)	
Rearing animals in the house			
Yes (35)	9 (25.7)	26 (74.3)	(0.491)
No (179)	43 (24.0)	136 (76.0)	
Did the workers had health education sessions			
Yes (187)	44 (23.5)	143 (76.5)	(0.317)
No (27)	8 (29.6)	19 (70.4)	
Monitoring the Ministry of Health for food			
Yes (117)			(0.096)
No (97)	33 (28.2)	84 (71.8)	
	19 (19.6)	78 (80.4)	

Table 2. Personal hygiene characters during the work with relation to parasitic infection (n=214).

	Infected (%)	Not – Infected (%)	P-value Chi-square
Did you have medical examination			
Yes (106)	26 (24.5)	80 (75.5)	(0.533)
No (108)	26 (24.1)	82 (75.9)	
Special dressing during the work			
Yes (151)	36 (23.8)	115 (76.2)	(0.468)
No (63)	16 (25.4)	47 (74.6)	
Do you use gloves during the work			
Yes (43)	14 (32.6)	29 (67.4)	(0.114)
No (171)	38 (22.2)	133 (77.8)	
Washing hands before and after the work			
Yes (205)	50 (24.4)	155 (75.6)	(0.621)
No (9)	2 (22.2)	7 (77.8)	
Nail- cutting each week			
Yes (208)	52 (25.0)	156 (75.0)	(0.184)
No (6)	0	6 (100.0)	

In the present study (65.9%) of food handlers reported that a place for rest was available, they ate during work, the work place was ventilated (81.8%), they were involved in cleaning the working place (94.4%), they cleaned systems in the work place (94.9%), products were display in the open (14.0%), raw materials were covered during the process of production (82.2%), wastes were disposed directly and with healthy and proper methods (95.3%), the food handlers participated in health education sessions (87.4).

Discussion:

In the present study 24.3% of food handlers were positive for intestinal parasites. The occurrence of these parasites indicate the poor hygiene measures and health status of food handlers working in restaurants, bakeries, cafeterias, kitchens and slaughter houses in the Gaza Strip. The recorded prevalence (24.3%) of intestinal parasites in the stools of food handlers in our study was close to that reported (29.1%) by Andargie and co-workers [15]. A study of the catering staff of Shiraz University canteen in

Iran showed that 39 (26%) were infected with pathogenic parasites and 33.4% infected with non-pathogenic parasites [16].

The most common type of detected parasite in the present study was *Entamoeba histolytica/dispar* (19.2%) among other protozoan parasites. While *Ascaris* was not observed, we note that it has declined in the last few years due to improvements in the infrastructure. A study in various educational institutions in Amritsar city in India showed that 12.9% food handlers were suffering from intestinal parasitic infestation, out of which 42.81% were contributed by *Entamoeba histolytica* [17]. In the neighboring countries, the number of reported food borne diseases were 10 cases in Egypt, 10 in Jordan, 11 in Lebanon and 7 in Palestine [18].

Entamoeba histolytica/dispar prevalence is still high in the Gaza strip compared to the West Bank (8.2-18.2%) [19]. This may be due to the present contamination in the Gaza environment as 42.9% of food handlers are living near open sewers, sewage flooding and

consumption of contaminated vegetables (Personal communication, Isalmic University in Gaza , Al-Hind and Khalaf) and improper health practices. The present study indicated that all groups of food handlers susceptible to parasitic infection and a highly susceptible group were workers aging >36 years old, who had the highest prevalence (28.3%). This could be associated with the low educational level of those food-handlers, (31.4%). Also, intestinal parasitic disease among food-handlers was correlated to the area of work, where food-handlers in Gaza city were the most ones infected (29.6%), while Rafah was the lowest (11.1%).

A non-significant variation was found between the prevalence of intestinal parasitic infection and age, region, educational level, waste drainage, health education sessions. This may indicate a common source of exposure to intestinal parasitic infection.

The high prevalence of intestinal parasites among bakers (40.9%) is alarming, where the risk for transmission of parasitic stages to consumers is possible. This may be of more

importance in cafeterias, kitchens, and slaughterhouses, which recorded a prevalence of 25%, 25% and 20.7% respectively.

In the present study, we observed that in spite the availability of gloves in some work places, food handlers ignored using them and they were unwilling to use them. The absence of regular governmental inspection on restaurants and cafeterias may be a reason.

Incidents in which bare hand contact with food has led to hundreds and thousands of food-borne illnesses is well documented [20]. Many cases could have been avoided if food workers had used spoons, rather than hands, to mix foods [21].

Personal hygiene characters during the work such as special safety dressing, the use of gloves, washing hands and nail cutting are important risk factors for transmission of parasitic infections [22-23].

In spite of the regular medical examinations for some of the food handlers, it seems that this did not make any difference or

protection against parasitic infection. Similarly for the use of gloves, hand washing and cutting nails. Only the use of personal protective equipment provided some protection against parasitic infection. These contradictory results may indicate other sources of infection; water, equipment, personnel and others, which need more investigation.

From our observation at restaurants in Gaza, most restaurant food handlers have no commitment for hygiene measures.

Hand washing is one of the ways to stop the cycle of disease especially those spread through oral-fecal route. Proper hand washing can remove dirt, soil and some other contaminants like bacteria, viruses and parasites [24]. Hand hygiene practice among health care workers is considered to be the single most effective method of preventing nosocomial infection in hospital settings [25]. As reported by the health inspector in the Islamic University-Gaza; food workers in the university cafeteria are subjected to annual medical examination including, inspection samples of urine,

stool and sputum. Stool is investigated for *Salmonella* and *Shigella* only - but not for parasites.

The present study indicated that food-handlers in Gaza strip had high prevalence of parasitic infection 24.3%. The highest rate of infections was caused by *Entamoeba histolytica/dispar* (19.2%). Bakery workers had the highest prevalence of parasitic infection, 40.9%. Food workers coming from Gaza city had the highest prevalence of parasitic infection, 29.6%, compared to other regions. In light of the results of this study, it is recommended that - medical inspection for food handlers should be carried out at regular intervals. Medical inspection should include routine stool analysis for parasite detection. In addition, improvement of the work environment to assure high quality of prepared food and avoid of contamination.

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