

Epidemiological survey of the prevalence of parasites among children in Khan Younis governorate, Palestine

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Abstract

The prevalence of intestinal parasites was carried out among 1370 children in Khan Younis Governorate. The age of the children ranges from 6 to 11 years. For stool samples inspection, direct smear microscopy, flotation and sedimentation techniques were used. The general prevalence of intestinal parasites was 32.4%. Different types of intestinal parasites were detected during this survey, where, *Ascaris lumbricoides* seems to be the most common parasite (12.8%), whereas, *Giardia lamblia* was 8.0%, *Entamoeba histolytica* 7.0%, *Entamoeba coli* 3.6%, *Trichuris trichiura* 1.6% and *Hymenolepis nana* 1.0%. Enterobiasis was inspected by using scotch tape preparation, where 20.9% of the examined children were infected and there was sex variation in the prevalence of Enterobiasis.

الملخص

أجريت هذه الدراسة بغرض تحديد معدل انتشار الطفيليات المعوية عند 1370 طفلاً في محافظة خان يونس. حيث تراوحت أعمار المشاركين ما بين 6 سنوات إلى 11 سنة. ولقد تم فحص عينات البراز بعدة طرق منها طريقة المسحة وطريقة تقنية الطفو وطريقة تقنية الترسيب. وقد أظهرت النتائج أن نسبة انتشار الطفيليات المعوية بشكل عام كانت 32.4%. كما بينت الدراسة وجود أنواع مختلفة من الطفيليات المعوية بنسب متفاوتة بحيث شكلت الإسكارس لامبريكويد أعلاها (12.8%)، ثم تبعها الجارديا لامبليا (8.0%)، الإنتاميبا هستوليتيكا (7.0%)، الإنتاميبا كولاي (3.6%)، الترايكورس ترايكورا (1.6%) والهيمينوليس نانا (1.0%). أما الديدان الدبوسية فقد تم الكشف عنها باستخدام الشريط اللاصق، وسجلت نسبة انتشار 20.9%. وقد ظهر تنوعاً في انتشار هذا الطفيل بين الأطفال تبعاً للجنس.

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INTRODUCTION

Non-hygienic living conditions give rise to parasitic infection in children, with the prevalence of such infection, in fact, being one of the best indicators socioeconomic status (McClatchey, 1994). Intestinal parasites are transmitted either directly through the contamination of water, soil and food by feces or indirectly through poor hygiene and living conditions (Bauer, 1974 and Gamboa et al., 1998). Amoebiasis, caused by *Entamoeba* is believed to affect about 450 million people worldwide, and leads to about 40 000-110 000 deaths per year (Utzinger et al., 1999). It has long been known that, the majority of infected individuals are asymptomatic and that only about 10.0% develop disease (Utzinger et al., 1999). Giardiasis is common protozoan infection of the intestinal tract and occurs worldwide (McClatchey, 1994). Whereas, *Ascaris lumbricoides* parasitizes at least one-quarter of the world's children and deworming is widely advocated as a means of improving child health (Kighlinger et al., 1996).

The situation of intestinal parasitic infection in Gaza Strip, is still a problem, probably due to defect in health status, poor sanitation, population crowding, bad hygienic habits, and poor health education (Shubair *et al.*, 2000). Many studies have been carried out in Gaza Strip about the prevalence of parasitic diseases among children (Abed, 1979; Yassin *et al.*, 1999 and Shubair *et al.*, 2000). These studies indicated that, the most prevalent parasites among children was *Ascaris lumbricoides*, *Entamoeba histolytica*, *Giardia lamblia*, *Hymenolepis nana*, and *Enterobius vermicularis*. This study aims to investigate the prevalence of intestinal parasitic infection among children in Khan Younis area, where the sanitation conditions is very poor, and many of the studied children reside near pools of sewage.

MATERIALS AND METHODS

This study is a cross sectional survey, conducted from November 2002 to April 2003 in Khan Younis Governorate.

Khan Younis is located in the far south of Palestine. It is bordered with Deir Al-Balah from the north, Rafah from the south, the occupied territories (1948) from the east, and the Mediterranean Sea from the west. The area of Khan Younis is about 113 km², and the population is about 233 202 inhabitants. The sewer system is open one (Ministry of Health, 2002).

The sample comprised 1370 children subjects randomly chosen with age ranged from 6 to 11 years.

The process of sampling was designed to collect one stool sample from the selected children. It was taken into account to collect equal numbers of stool samples from both males and females. After collecting samples in the morning, they were immediately taken to the laboratory of Khan Younis hospital. Some stool samples were analyzed in the same day of collection, while the delayed ones were kept at 4°C. All stool samples were fixed and preserved in sodium acetate-acetic acid-formalin (SAF) for future diagnosis of samples as concentration techniques.

Cheesbrough (1987) stated that, the majority of intestinal parasites can be detected microscopically in un-stained or stained preparations either directly or following concentration technique, so both techniques were used in the study.

In this test, stool sample is diluted with 0.9% sodium chloride (normal saline). Also, each stool sample is stained by 1.0% lugol's iodine solution to clear the morphology of the infective parasite stage (cysts) (WHO, 1994). According to Desowitz (1980), the direct microscopy detects the motile forms (trophozoites) of *Entamoeba histolytica* and *Giardia lamblia*. It provides a rapid diagnostic method for ova and parasites when they are found in a sufficient density

The present study employed two methods of concentration; formal ether sedimentation technique to detect most helminthes eggs (Cheesbrough, 1987). On the other hand, all samples were examined by flotation technique using saturated solution of sodium chloride to detect protozoan cysts like *Giardia lamblia* and *Entamoeba histolytica* cysts.

Also, all children were submitted a scotch tape preparation. A written letter was sent with each one to show his family how to perform the test of Enterobius, by applying the scotch tape preparation (STP) on the anal region in the evening. The next morning each child brought the sample.

The collected data and results of the work were analyzed by using the SPSS. Chi-square test was used. P-value of ≤ 0.05 were considered statistically significant.

RESULTS

The present study included 1370 children. The overall prevalence among children, who were infected with different types of intestinal parasites was 32.4%. The fecal examination revealed six protozoal and helminthes parasites with the following prevalence: *Giardia lamblia* 8.0%, *Entamoeba histolytica* 7.0%, *Entamoeba coli* 3.6%, *Ascaris lumbricoides* 12.8%, *Trichuris trichiura* 1.6%, and *Hymenolepis nana* 1.0% (Table 1).

No *Strongyloides stercoralis* larvae were detected in the stool samples.

However, *Ascaris lumbricoides* was detected either singly (12.8%) or mixed with other parasites, since multiple parasites had been observed in 60 samples, where the most common combined ones were *Ascaris lumbricoides* and *Giardia lamblia* (23.3%)

Table (1): Prevalence of intestinal infections with protozoa and helminthes, as determined among 1370 children.

	General prevalence	
	No.*	%**
Single species of protozoa		
<i>Giardia lamblia</i>	110	8.0
<i>Entamoeba histolytica</i>	96	7.0
<i>Entamoeba coli</i>	50	3.6
Helminthes only		
<i>Ascaris lumbricoides</i>	176	12.8
<i>Trichuris trichiura</i>	22	1.6
<i>Hymenolepis nana</i>	14	1.0

*No. = Number of infected children

** % = Percentage

As represented in Table (2), the distribution of intestinal parasitic infection among boys (260) was 36.4% and among girls (208) was 31.7%, where there is no sex variation in this study ($P>0.05$).

Table (2): Distribution of infected and non-infected children according to sex.

<u>Result</u>	<u>Sex</u>			
	Male		Female	
	No.	%	No.	%
Infected	260	36.4	208	31.7
Non-infected	454	63.6	448	68.3
Total	714	100.0	656	100.0

$P>0.05$

In this study, the inspection of stool samples by direct smear microscopy detected no *Enterobius vermicularis* eggs or whole worms, while by using scotch tape preparation (STP), the results indicated that, 264 children were infected by *Enterobius vermicularis*. Table (3) indicates that, higher prevalence of Entrobiasis was reported among males' (22.6%) as compared to females (19.3%).

Table (3): The result of inspection of *Enterobius vermicularis* by STP.

Result	Inspected children by STP		Sex				Total	
	No.	%	Male		Female			
			No.	%	No.	%		
Infected	264	20.9	Infected	136	22.6	128	19.3	264
Non-infected	1000	79.1	Non-infected	466	77.4	534	80.7	1000
Total	1264	100	Total	602	100.0	662	100.0	1264

Regarding the age of the children included in the study, it was ranged between 6 and 11 years, and those children were classified into three age groups; 6-7 years, 8-9 years, and 10-11 years. It was clear that, the most dominate intestinal parasites tends to be higher in the middle age group 8-9 years and decrease in old age group 10-11 years, except the prevalence of *Hymenolepis nana* which was higher in young age group 6-7 years.

Table (4): Distribution of the seven intestinal parasites by age group.

The parasite	Age group						P-value
	6-7 years		8-9 years		10-11 years		
	No.	%	No.	%	No.	%	
Enterobius vermicularis (n=264)	104	39.4	108	40.9	52	19.7	P<0.02*
<i>Ascaris lumbricoides</i> (n=176)	66	37.5	70	39.8	40	22.7	P>0.05
Giardia lamblia (n=110)	30	27.3	48	43.6	32	29.1	P>0.05
Entamoeba histolytica (n=96)	22	22.	44	45.	3	31.3	P>0.05
<i>Entamoeba coli</i> (n=50)	12	24.	22	44.	1	32.0	P>0.05
<i>Trichuris trichiura</i> (n=22)	4	18.	12	54.	6	37.3	P>0.05
Hymenolepis nana (n=14)	6	42.	4	28.	4	28.6	P>0.05
		8		6			

*Significant at P-value of ≤ 0.05

The 1370 stool samples were examined with direct smear microscopy, flotation and sedimentation techniques. As shown in Table (5) the results revealed that, the most effective technique was the direct smear microscopy (20.3%), while the flotation technique gave 7.6% and sedimentation technique was 19.0%.

Table (5): Detection of the identified parasites by different techniques.

Result	The technique					
	Direct smear microscopy		Floatation technique		Sedimentation technique	
	No.	%	No.	%	No.	%
Infected	278	20.3	104	7.6	262	19.0
Non-Infected	1092	79.7	1266	92.4	1108	81.0
Total	1370	100.0	1370	100.0	1370	100.0

DISCUSSION

In this study, the data analysis showed that, 32.4% of the examined children were suffering from parasitic infection. It seems that, the parasitic infection with protozoa (18.6%) was higher than that of helminthes parasites (15.4%). This is only slightly higher than that found in a previous similar survey (27.6%) carried out in Gaza city by Yassin *et al.* (1999), and that reported by Shubair *et al.* (2000) in Gaza Strip (24.5%); Al-Hindi (2002), however, reported higher prevalence of parasitic infection among school children in Deir El-Balah city (36.3%). Thus, differences in prevalence may reflect a variation in the standard of living hygiene from one area to another and behavior of those children. However, most of the studies carried in Gaza Strip about parasitosis revealed the same intestinal parasites, but with different prevalence.

The results of this study indicated that, *Ascaris lumbricoides* infestation was found to be the commonest helminthic infection (12.8%) and *Giardia lamblia* was the commonest protozoal infection (8.0%). This may be due to the presence of the source of infection in the area studied and frequent fecal-oral spread of infection among children. Also, contamination of the soil by human feces (especially for *Ascaris* and *Trichuriasis*) which in combination with a high degree of overcrowding and a low income level increases the susceptibility to parasitosis.

For giardial infection, the results (8.0%) contradicted with that of Yassin *et al.* (1999) study, where the latter reported higher ratio (62.2%) of infection. It seems that, personal hygiene and the sanitary conditions play an important role in the increasing rate of parasitic infection in such area.

No *Strongyloides stercoralis* were detected during the study, which can be explained by that, the area have no sandy places between homes, where Khan Younis area is overcrowded and homes beneath each other.

For sex variation, boys tend to be more susceptible to parasitic infection (36.4%) compared with girls (31.7%). This difference may be attributed to that, boys are more active than girls and most of girls usually stay in homes in our society. Shubair *et al.* (2000) reported that, no considerable difference in the prevalence of infections by sex were found among different age groups.

In this study, all intestinal parasites tends to be higher in the middle age group 8-9 years and decrease in old age group 10-11 years, except the prevalence of *Hymenolepis nana* which was higher in young age group 6-7 years. This findings were similar with that reported by Shubair *et al.* (2000), This can be explained by that, the hygiene and behavior may be improved among old children, where older children probably have acquainted proper hygienic practices in their schools.

Our study findings showed that, direct smear microscopy is the most effective technique in detection of intestinal parasites, where 20.3% of the cases were found to be positive by this method. Flotation and sedimentation techniques are confirmatory method, especially for the negative samples and that of low infection.

In our study, the overall prevalence of *Enterobius vermicularis* infection was found to be 20.9%. A high prevalence (35.4%) of Enterobiasis was reported by Al-Hindi (2002) in Beit Lahia. While, Fan *et al.* (1998) reported less prevalence rate (11.0%).

The high prevalence of *Enterobius vermicularis* may be due to the reproducibility in humans without passing through an intermediary soil phase. Thus, it can be readily transmitted from person to person (Lohiya *et al.*, 2000).

Our findings indicated that, boys have high prevalence of *Enterobius vermicularis* (22.6%) than girls (19.3%) and a highly significant difference in the prevalence of Entrobiasis and sex was obtained ($P < 0.05$). This can be explained by the higher activity of the boys outdoors.

From this investigation it could be concluded that, 32.4% of the children infected with different types of intestinal parasites in Khan Younis governorate, and the most prevalent parasite is *Ascaris lumbricoides* (12.8%). Whereas, the higher prevalence of *Enterobius vermicularis* is clustered in the age group 8-9 years (40.9%) and was higher in males (22.6%) as compared to (19.3%) in females.

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