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ORIGINAL ARTICLEAL-Zain Basam[¶] and Al-Hindi Adnan*[§]✉

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Distribution of *Strongyloides stercoralis* and other intestinal parasites in household in Beit-lahia city, Gaza Strip, Palestine.

Abstract

A house hold survey included 1000 individuals from all ages was conducted in Biet-lahia, Palestine. Wet mount using saline and iodine and sedimentation techniques were used in detection of helminthes eggs and protozoan parasites. It was found that (72.9%) of examined individuals infected with different types of intestinal parasites. The highest helminth detected was *Ascaris lumbricoides* (56%), followed by *Strongyloides stercoralis* (15.5%). Age and prevalence of intestinal parasites was found statistically significant. Level of education was found also to be correlated significantly with decreasing the infection. It is recommended to do annual campaigns for parasitological surveys searching for contaminated soils with *Ascaris lumbricoides* and *Strongyloides stercoralis*.

Key words *Strongyloides stercoralis*, *Ascaris lumbricoides*, prevalence, household, contamination of soil.

Introduction

Intestinal parasites still constitute a public health problem in Gaza especially among children as reported by many studies carried out in the last decade. Most data on the prevalence of intestinal parasites were obtained from school and pre-school children in Gaza. Intestinal parasites detected through these studies were, *Giardia lamblia*, *Entamoeba histolytica/dispar*, *Ascaris lumbricoides*, *Trichuris trichiura*, *Enterobius vermicularis* and *Strongyloides stercoralis* [1, 3, 4, 5]. The infective stage of *Strongyloides stercoralis* is a filariform larvae that can penetrate the human host skin to initiate the parasitic cycle (10). The larvae then enter the alveoli, ascend the tracheobronchial tree, and are swallowed., then it reside and mature in the small intestine. *S. stercoralis* may persist indefinitely due to its unusual ability for multiplication and autoinfection within the same host (11). The prevalence of intestinal parasites in neighbouring countries may vary from area to area in Saudi Arabia it was reported a prevalence of 9.5% among school children (12). In children from Iraq (53.2%) (13); in Lebanon (12.4%) (14).

The reported prevalence's of *S. stercoralis* were low [1, 5] this may be due to that no

different techniques were employed in the examination of stool specimen searching for *S. stercoralis*. Also, Beit-lahia is an agricultural area where most residents are working as farmers in addition to women sharing in such works to help husbands. This study focused mainly on the prevalence and distribution of *S. stercoralis* and other intestinal parasites within families at Beit-lahia city to get a true idea on their existence.

Materials and Methods

Study allocation and background of study area

This study was carried out in Beit-lahia city, which is one of Gaza Strip cities between 2001 and 2002. The most obvious feature of Beit-lahia is the presence of farms and agricultural regions, where strawberry, lemon and vegetables are planted. Beit-lahia is bordered from the west by the Mediterranean Sea from the east Beit-Hanoon village from North the Israeli settlements from South Jabalia refugee camp. The estimated population is 55,000 people where 60% are children under 12 years old [6].

Sampling procedure

The study was a base-line house to house survey. where one thousand stool specimens

were collected from eleven sub locality in Beit-lahia. Random sampling was followed for collection from each house hold one by one. All inhabitants of these households at the time of visit from all ages were requested to participate in the study and to give a stool specimen in a clean container.

Diagnosis of stool specimens

One stool specimen was collected from each person and was examined by a qualified technician using normal saline and lugole's iodine. Formal-ether sedimentation techniques was applied for each specimen and the sediment was examined. All individuals infected with *Strongyloides stercoralis* were treated with (Thiabendazole, Dar AL-Shefaa, Rammal, Palestine). While those were found infected with protozoa were offered metronidazole and those infected with other helminthes were offered albendazole. Information on education of the father and mother, animal breeding, source of drinking water, sewage, age, sex of individuals were collected by questionnaire.

Statistical analysis

Data were entered to computer system and analyzed using SPSS programme for frequencies, cross-tabulation and chi-square test. P-value under 0.05 was considered a significant.

Results

Using base-line house to house survey may reflect clearer situation about the distribution of *Strongyloides stercoralis*, and the other intestinal parasites detected during this study. The overall prevalence of intestinal parasites was found to be 72.9%

(927/1000). Helminth parasites recorded in this study were (803/1000) (80.3%), while protozoa constituted 197/1000) (19.7%). The distribution of helminth and protozoa is indicated in table 1. The other results regarding sub locality age distribution and education are represented in tables, (2, 3, and 4). *Strongyloides stercoralis* was significantly highest in age group 13-16 years ($p=0.02$). While *Ascaris lumbricoides* was found significantly highest in both age groups 5-8 years and 9-12 years with a significant difference ($p<0.05$) respectively Table 2. *Hymenolepis nana* was high in age group 13-16 years ($p=0.01$), in the same time *Entamoeba histolytica/dispar* was highest in age group 13-16 years (14.6%) with a significant difference ($p=0.002$).

In the present study it was found that the prevalence of parasitic infection was (68.7%) for individuals who had homes connected to sewers, while (74.6%) of infected individuals had cesspools ($p<0.05$) Table 4. For level of education and parasitic infection it seems that infection decrease when the level of education elevated ($p=0.001$) Table 4. Also, it was noticed that infection decreasing when family size increased, no significant difference was found ($p>0.05$).

Discussion

This study is the first as a community based study for the estimation and distribution of *Strongyloides stercoralis* and other intestinal parasites among individuals of Beit Lahia. From the results of the study it was clear that the area suffer from high prevalence of parasitic infection 72.9%. The nature of the study region as agricultural area may contributed in such high prevalence. Al-

Table 1. Distribution of helminth and protozoa species (n=1000)

	No.	%
Helminth species		
- <i>Strongyloides stercoralis</i>	155	15.5
- <i>Ascaris lumbricoides</i>	560	56.0
- <i>Hymenolepis nana</i>	61	6.1
- <i>Trichuris trichiura</i>	27	2.7
Protozoa species		
- <i>Giardia lamblia</i>	84	8.4
- <i>Entamoeba histolytica/dispar</i>	113	11.3

Hindi [2] (unpublished data recorded a prevalence of (33.9 %) among school children in the same area. This finding is in consistency with some studies reported in different localities of Gaza strip 48% and Jabalia as a rural area in Gaza Strip (53%) respectively [7, 8]. In the same time this finding may differ from other results reported by some authors [1, 3, 4] who reported that the general prevalence parasitic infection was (27.6%), (24.5%) and (36.3%) respectively among school children aged (6-11 years) in Gaza City. This variation may be explain that Beit Lahia is a rural region,

while Gaza city is an urban area with more proper sewage system, a good hygiene and more urbanization facilities. It is important to mention that each stool specimen was examined by two coprological techniques, whose scope was broad enough to detect all cysts of protozoan and most helminthes eggs and larvae that are frequently discharged in human stools. Our study findings showed that direct smear method is the most reliable test in detection of intestinal parasites. No sex difference was found in the prevalence of general parasitic infection or even any type detected.

Table2. Prevalence of parasite ova and cyst by age

Parasite	Age group								P-value
	n=176		n=355		n=373		n=96		
	<4 years		5-8 years		9-12 years		13-16 years		
	No.	%	No.	%	No.	%	No.	%	
<i>Strongyloides stercoralis</i>	34	(19.3)	52	(14.6)	45	(12.1)	24	(25)	0.02
<i>Ascaris lumbricoides</i>	90	(51.1)	212	(59.7)	219	(58.7)	39	(40.6)	>0.05
<i>Hymenolepis nana</i>	6	(3.4)	19	(5.4)	26	(7)	10	(10.4)	0.01
<i>Trichuris trichiura</i>	5	(2.8)	9	(2.5)	12	(3.2)	1	(1)	>0.05
<i>Giardia lamblia</i>	21	(11.9)	26	(7.3)	29	(7.8)	8	(8.3)	>0.05
<i>Entamoeba histolytica/dispar</i>	20	(11.4)	37	(10.4)	42	(11.3)	14	(14.6)	0.002

Ascaris lumbricoides had the highest prevalence among children (56%) followed by *Strongyloides stercoralis* (15.5%). Where these two helminthes need a period of maturation the soil to complete their life cycle. Also, the high prevalence of *A. lumbricoides* may be attributed to nature of the sandy yards inside the streets of Beit-lahia and the viability of eggs for a long period in the external environment [9]. *Strongyloides stercoralis* was found to be high in 13-16 age groups (25%) (p=0.02) this may be explained by that those individuals tend to walk bare foot inside farms during planting vegetables with their families. The prevalence of *Ascaris lumbricoides* showed a high prevalence in all age groups, where this can be explained that those individuals had high activity and may play in sands, houses are crowded in addition all of them under risk of infection. No significance difference was found for the prevalence of *Giardia lamblia* according age. The prevalence rate of *Giardia lamblia* in our study (8.4%) is low comparison to other studies reported (64%; 62.2%; 53%;

64%; and 38% respectively [1, 3, 4, 7]. The prevalence of parasitic infection seems to be high among the children whom father is uneducated (84.2%) compared to the educated father (university level) 56% with a significant difference p=0.001. The parasitic infection was found high for individuals with cesspool sewage system in their houses (74.6%) compared to the sewers housed (68.7%) with a significant difference p=0.05. This may be attributed that cesspool are susceptible to flooding and contamination of the soil The noticed high prevalence for both *Strongyloides stercoralis* (27.1%) and *Ascaris lumbricoides* (25.4%) in Sakanat marouf is due to that this sub-locality is very high crowded and a major agricultural area. The unexpected results were the decreasing of parasitic infection with increasing family size (members), this may have no explanation. The breeding of animals in Beit-lahia was very high as a part of the Beit-lahia economy and the contact of those animals with the residents constitute a risk.

Table 3. Distribution of the detected intestinal parasites according sub-locality

The sub-locality of the individuals residence										
Parasite	Al-Atatra	Sakanat Marouf	Al-Nuzha street	Fadous	AL-Barouy and AL-Manshia	Al-Sharea Alaam	Aslan	Al-Hatabia	Al-Khazan	Al-Salateen
	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
<i>Strongyloides stercoralis</i>	13 (8.4)	42 (27.1)	13 (8.4)	6 (3.9)	29 (18.7)	20 (12.9)	21(13.5)	3 (1.9)	3 (1.9)	5 (3.2)
<i>Ascaris lumbricoides</i>	81 (14.5)	142(25.4)	59 (10.5)	42 (7.5)	63 (11.3)	55 (9.8)	54 (9.6)	12 (2.1)	13 (2.3)	39 (7)
<i>Hymenolepis nana</i>	5 (8.2)	15 (24.6)	8 (13.1)	9 (14.8)	10 (16.4)	6 (9.8)	3 (4.9)	2 (3.3)	2 (3.3)	1 (1.6)
<i>Trichuris trichiura</i>	1 (3.7)	4 (14.8)	6 (22.2)	3 (11.1)	7 (25.9)	3 (11.1)	2 (7.4)	1 (3.7)	0	0
<i>Giardia lamblia</i>	9 (10.7)	12 (14.3)	14 (16.7)	3 (3.6)	12 (14.3)	13 (15.5)	12(14.3)	4 (4.8)	3 (3.6)	2 (1.8)
<i>Entamoeba histolytica/dispar</i>	8 (7.1)	25 (22.1)	20 (17.7)	8 (7.1)	16 (14.2)	21 (18.6)	9 (8)	2 (1.8)	2 (1.8)	2 (1.6)

P=0.006

Table 4. Distribution of different variables according the parasiticinfection.

Variable	Infected		No-infected		P-value
	No.	%	No.	%	
Sewage system					<0.05
-Sewers	202	(68.7)	92	(31.3)	
-Cesspool	527	(74.6)	179	(25.4)	
Source of drinking water					>0.05
-Municipality	660	(72.5)	250	(27.5)	
-Wells	69	(76.7)	21	(23.3)	
Level of education of father					0.001
-un-educated					
-Primers	128	(84.2)	24	(15.8)	
-Elementary	298	(77)	89	(23)	
-Secondary	123	(70.3)	52	(29.7)	
-University	114	(66.7)	57	(33.3)	
	66	(57.4)	49	(42.6)	
Level of education of mother					0.001
-un-educated					
-Primers	205	(81.3)	47	(18.7)	
-Elementary	262	(77.1)	78	(22.9)	
-Secondary	158	(67.8)	75	(32.2)	
-University	95	(61.7)	59	(38.3)	
	9	(42.9)	12	(57.1)	
Family size					0.08
0-5 members	115	(66.5)	58	(33.5)	
6-10 members	379	(73.2)	139	(26.8)	
11-15 members	178	(74.5)	61	(25.5)	
16-200 members	57	(81.4)	13	(18.6)	
Breeding of animals					0.01
-Who breed animals	305	(77.2)	90	(22.8)	
-Who don't breed animals	424	(70.1)	181	(29.9)	

The importance of parent's education and its level seems to help in decreasing the prevalence of parasitic infection and play an important role in protection of the resident. Because education of parents make them and their children aware from walking bare foot in the farms. Also, Islamic hygiene education is very important in this regard if we followed the Islamic recommendations that were related in Sunnah such as not to urinate or defecate underneath a fruitful tree or in still water used for bathing, in the shade or in the road, to bury faeces with soil if defecating in the field. It is concluded that *Strongyloides stercoralis* and *Ascaris lumbricoides* constituted a considerable health problem. Beside that the soil is highly contaminated and reliable source of infection. It is recommended to dress the special shoes during planting in the farms and doing more research regarding the diagnosis of *Strongyloides stercoralis* to obtain a real estimate about the prevalence of this nematode parasite. Also the starting with control programmers towards this parasite is a crucial request.

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