

## CHANGING TRENDS IN FREQUENCY OF INTESTINAL PARASITES IN GAZA, 1995-2000

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### التغيرات في مدى انتشار الطفيليات المعوية في مدينة غزة بين 1995-2000

**ملخص:** من أجل استكشاف نوعية و مدى انتشار الطفيليات المعوية في مدينة غزة تم دراسة وتحليل 8417 عينة براز لمرضى تردوا على مستشفى الأهلي في مدينة غزة خلال الأعوام من 1995 وحتى 2000. من مجموع العينات التي حلت وجد أن هناك 2506 عينة كانت مصابة أي بنسبة 29.77%. وجد أيضا أن هناك 9 أنواع من الطفيليات منتشرة في المدينة أكثرها انتشارا كانت الأنتاميبيا هوستولوتيكيا *Entamoeba histolytica* بنسبة 70.19% والإسكارس لامبريكويدز *Ascaris lumbricoides* بنسبة 14.64% والجارديا لامبليا *Giardia lamblia* بنسبة 10.34%. أما الطفيليات الأخرى فهي تريكورس تريكورا *Trichuris trichiura*، هيمينوليس نانا *Hymenolepis nana*، أنتروبيوس فيرميكولارس *Enterobius vermicularis*، سترونجيلويدز ستيروكولارس *Strongyloides stercoralis*، تينيا ساجيناتا *Taenia saginata* و أكينوكوكس جرانيلوسوس *Echinococcus granulosus*. دراسة الأثر الموسمي اعتمادا على الأشهر لم يعط نتيجة واضحة ومقبولة. أما نسبة الانتشار السنوية فقد أظهرت أن هناك انخفاضا واضحا ومقبولا خلال السنوات وذلك حسب التحليل الإحصائي بحيث أن نسبة الانتشار كانت 36.35% في عام 1995 وهبطت إلى 21.20% في عام 2000 ( $p < 0.001$ ). هذا الانخفاض في نسبة الانتشار يعكس الجهود التي تقوم بها السلطات الصحية لتحسين الوضع فيما يخص النظافة والصحة العامة.

**Abstract:** In order to monitor changes in the frequency of intestinal parasites, the records of 8,417 stool specimens of patients attending the Ahli Arab Hospital in the Gaza city in the period 1995-2000 were reviewed and analyzed. Of these 2,506 (29.77%) were positive.

Although 9 different parasites were encountered, the most common pathogenic parasites identified were: *Entamoeba histolytica* (70.19%), *Ascaris lumbricoides* (14.64%), and *Giardia lamblia* (10.34%). The other parasites present were: *Trichuris trichiura*, *Hymenolepis nana*, *Enterobius vermicularis*, *Strongyloides stercoralis*, *Taenia saginata*, and *Echinococcus granulosus*. The overall monthly incidence of parasites did not show clear seasonal patterns.

The prevalence of intestinal parasites has dropped significantly over the reviewed years from 36.35% in 1995 to 21.20% in 2000 ( $p < 0.001$ ). This decline in prevalence reflects the continuing efforts of the public health authorities to improve primary health care, water supply services and sanitation conditions.

## **Introduction :**

Gaza Strip is a narrow zone of land (360 km<sup>2</sup>) situated on the southeastern corner of the Mediterranean Sea. It is bordered on the south by Egypt, on the west by the Mediterranean, on the east by Negev desert and on the north by the green line. Over one million inhabitants live in Gaza Strip.

Intestinal parasitic protozoal and helminthic infections are widely distributed throughout the world and especially prominent in the developing countries for instance, reports on intestinal parasites have shown prevalence rates of 53% in Yemen [1], 27.6%-32.3% in Palestine [2,3], 18% in Lebanon [4], 18.4%-27.8% in Saudi Arabia [5,6], 68.5 % in Iraq [7], 74%-93% in Ethiopia [8], 14.3% in Bahrain [9], and 23.1% in United Arab Emirates [10].

Several contributing factors affect the prevalence of intestinal parasites in a geographic location, like socioeconomic status, climatic changes, and poor standards of public and personal hygiene [11].

Pathogenic intestinal parasites have long been regarded as an important health problem for their relationship with childhood mal-nutrition, iron-deficiency anemia, reduced physical fitness, cognitive performance and mental development [12,13,14].

An understanding of the type, frequency, and annual changes of parasitic pathogens is essential to public health authorities to help in taking proper measures in order to alleviate this problem. The continuing efforts of the authorities to improve primary health care, water supply services, sanitation conditions and the living standards urged us to conduct this analysis.

## **Materials and Methods**

Records of stool specimens submitted for parasite examination from January 1<sup>st</sup>, 1995 through December 30<sup>th</sup>, 2000 were reviewed and analyzed.

The records were collected from the clinical microbiology laboratory of the Ahli Arab Hospital-Gaza, Palestine. The laboratory serves annually about 16,000 outpatients and 5,300 inpatients from the whole Gaza Strip.

Specimens were normally examined, by a qualified medical technologist, within 2 hours of collection, first grossly for the presence of adult parasites

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then by light microscopy. The latter is routinely conducted by direct saline mount according to established procedures [15].

The age, sex and other demographic information of the patients were recorded inconsistently and thus these parameters were not included in the data analysis. Statistical analyses were performed by the Chi-square test with a significant cut-off value of 0.01.

### Results

The hospital records of 8,417 stool specimens were analyzed. The annual distribution of the specimens and the percentage of specimens containing parasites are presented in Table 1. The overall prevalence of parasites was 29.77%. As can be seen from the table the overall frequency of parasites has decreased from 36.35% in the year 1995 to 21.20% in the year 2000.

**Table 1.** Overall distribution of tested stool specimens and positive cases of intestinal parasites at the Ahli Arab hospital.

Study years	Number of tested specimens	Number of positives	% of positives
1995	1700	618	36.35 %
1996	1415	476	33.64 %
1997	1396	444	31.81 %
1998	1379	387	28.06 %
1999	1192	298	25.0 %
2000	1335	283	21.20 %
All	8417	2506	29.77 %

Chi square = 109.9,  $p < 0.0001$

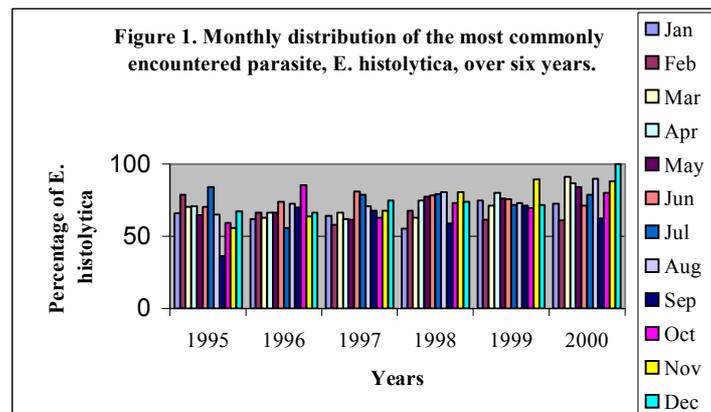
The numbers and types of parasites seen over the six years are shown in Table 2. The most common parasites identified were; *E. histolytica*, *A. lumbricoides* and *G. lamblia*. The same table also shows that changes have occurred in the types of parasites over the reviewed years. In general, *E.*

*histolytica* was the most commonly isolated parasite and represented around three quarters of all parasites throughout the investigated years. Moreover, *E. histolytica* was the only parasite that showed consistent and significant ( $p \leq 0.001$ ) annual increase.

Most of the remaining identified parasites, however, showed a significant decrease. For instance, *A. lumbricoides* and *G. lamblia* which were respectively responsible for 14.56% and 12.30% of parasitosis in the year 1995 became numerically less in the year 2000 and represented only 9.22% and 8.53% of the positive specimens, respectively. *T. saginata* and *E. garanulosus* remained uncommon parasites in Gaza and only 2 cases of each were recorded in the whole study period.

Generally the percentage of positive specimens per month did not deviate from the yearly overall percentage. Additionally, there was no apparent seasonal variation for any of the recorded parasites. The monthly distribution of the recovered parasites over the six years is illustrated in Figure 1.

**Figure 1.** Monthly distribution of all the encountered parasites over the years 1995-2000.



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**Table 2.** Annual distribution and types of encountered parasites

Parasite	1995		1996		1997		1998		1999		2000		Total no	P-value
	no	%												
E. histolytica	407	65.86	323	67.86	306	68.92	279	72.09	221	74.16	223	79.52	1759	<0.001*
A. lumbricoides	90	14.56	79	16.60	71	16.0	56	14.47	44	14.77	27	9.22	367	<0.001*
G. lamblia	76	12.30	47	9.87	46	10.36	41	10.59	24	8.05	25	8.53	259	<0.001*
T. trichiura	14	2.27	4	0.84	7	1.58	1	0.26	4	1.34	3	1.02	33	0.018
H.nana	14	2.27	4	0.84	5	1.13	4	1.03	2	0.67	3	1.02	32	0.038
E. vermicularis	9	1.46	10	2.10	4	0.90	3	0.76	3	1.01	0	0.68	29	0.025
S. stercolaris	7	1.13	7	1.47	5	1.13	2	0.52	0	0	2	0	23	ND
Taenia saginata	1	0.16	1	0.21	0	0	0	0	0	0	0	0	2	ND
Echinococcus granulosus	0	0	1	0.21	0	0	1	0.26	0	0	0	0	2	ND
<b>Total</b>	618	100	476	100	444	100	387	100	298	100	283	100	2506	

ND: Not determinated

\*: Highly Significant

## Discussion

The present work describes the changes observed in the frequency of intestinal parasites in a single geographic area over 6 years. The observed 29.77% overall prevalence of intestinal parasites is consistent with those reported from different regions of Palestine and other neighboring countries [2,3,5,6].

The three common parasites, *E. histolytica*, *G. lamblia* and *A. lumbricoides*, encountered in this study are similar to those identified by other investigators [3,14,16] except that the proportion of *E. histolytica*, with an overall frequency of 70.19%, was considerably higher than other estimates of 13.3-22.9% [2,3]. The ubiquitous nature of *E. histolytica* apparent in this study may be attributed to a high incidence of this parasite in certain locations of Gaza Strip, especially the ones deprived of clean drinking water, which is the major potential source of infection. Pockets of high or low prevalence, in contrast with the general population rates have been described in certain countries [17]. The wide diversity of economic and social characteristics of Gaza Strip potentiates this idea but demographic data of patients is needed in order to confirm this point.

Meanwhile, the overly high incidence of *E. histolytica*, observed in this study, may not be a true reflection of the prevalence of this parasite, since examination of saline mounts of stool specimens is not the most sensitive method for establishing diagnosis. Therefore, stained smears of feces and stool preparations should be examined to differentiate suspicious amoebic forms from interfering cells such as segmented neutrophils [18].

Additionally, this study revealed that *E. histolytica* has shown persistent annual increase (Table 2). This alarming rise of the parasite could be due to emergence of resistance to the currently employed antiprotozoal drug, metronidazole. Metronidazole resistance is a well-documented phenomenon for various protozoan species [19]. At present time, the link between the continuous and significant rise of *E. histolytica* and drug resistance remains speculative, and further work is necessary to elucidate details.

Comparison of results from the present study with those from other developing countries in the region, such as Yemen [1], Kuwait [20] and Lebanon [21] shows that considerable differences can be found both in the incidence of individual parasites and in the overall prevalence of parasites. These differences can be explained by the influence of environmental factors and habits of the different nations on the endemicity and transmission of intestinal parasites. Several examples can be given to illustrate the association between habits and incidence of parasites. The very low incidence of *T. saginata* in the present study can be attributed to the lack of raw meat-eating habit in our society and the two observed cases probably occurred through consumption of undercooked meat. Similarly, few people, farmers in particular, raise dogs in their farms and the two cases of *E. granulosus* may be due to ingesting improperly washed vegetation materials (or even soil) infested with egg-contaminated dog feces. Children barefoot walking, especially in the rural areas are a common habit and this may explain the incidence

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of the 21 cases of *S. stercoraris* infections. Again, demographic information are needed in order to confirm this speculation.

Despite individual variations in the prevalence of parasites, the common protozoal (*E. histolytica* and *G. lamblia*) and helminthic (*A. lumbricoides*, *T. tichiura*, *H. nana* and *E. vermicularis*) parasites observed in this study are similar to those reported by other investigators [2,3,21]. Though it is difficult to associate the exact factors contributing to the spread of these intestinal parasites among populations served by the Ahli Arab Hospital, several factors such as; lack of sanitation, shortage of clean drinking water, poor standards of public and personal hygiene, and inadequate health education serve to promote the spread of such infections.

Regarding the seasonal effect on the prevalence of parasites, no marked seasonal variation was observed (Figure 1), although some increase toward the summer months (June-September) was noticed. The absence of seasonal influence on incidence of parasites is probably due to the minimal changes in weather among seasons in our coastal area. This finding correlate well with a study conducted in a neighboring country, Lebanon [4].

An important lesson to be learned from this preliminary analysis is that the recording system of parasitic infections of the Ahli Arab Hospital and all other hospitals in Gaza Strip should be utterly improved. The records should include adequate patient information such as; age, gender, educational level, socioeconomic status, mono- vs. multiple parasitism, and necessary demographic data in order to help both researchers and public health responsables in monitoring the changes of intestinal parasites, identification of the target group(s) and the endemic pockets.

In the last five to six years, Gaza Strip has witnessed some improvement in water supply services, sanitation, garbage disposal and health care. This fact is grounded on the significant decrease in the overall prevalence of parasitic infections and the decline in all, but *E. histolytica*, individual parasites (Tables 1&2).

However, an overall prevalence of 29.77% in intestinal parasites is still a high figure when compared, for example, to the 8.47% prevalence reported in Beirut [4]. This implies that more coordinated efforts should be paid to further improve sanitation (primarily in the deprived locations), chemotherapy and health care [22,23]. An overall improvement of sanitation represents the most effective way of preventing intestinal parasitic infections though this may take several years and extensive financial resources. Until this can be achieved, the use of community treatment (especially infected children) and improvement of personal hygiene by health education are advocated as effective and affordable short-term measures for combating parasitic infections [22].

In conclusion, this retrospective study shows that despite of some improvement, Gaza Strip is still suffering from a high prevalence and a diverse spectrum of intestinal parasites. Further coordinated efforts are needed to further alleviate this problem. Improved recording system is badly needed to enable researchers and public health authorities to detail and confirm the epidemiology of intestinal parasitic infections in Gaza Strip.

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