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Prevalence and Seasonal Fluctuations of Common Intestinal Parasites in Khan Younes, 1996-2000

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مدى انتشار وتأثير الاختلافات الموسمية على الطفيليات المعوية الشائعة في محافظة خانيونس 1996-2000

ملخص أجريت هذه الدراسة بهدف مراقبة مدى انتشار وتأثير الاختلافات الموسمية على الطفيليات المعوية الشائعة في محافظة خانيونس، ولهذا الغرض تم مراجعة ودراسة 17,746 عينة براز للمرضى المسجلين بمستشفى ناصر في خانيونس في الفترة ما بين 1996-2000 وقد وجد أن 5,704 (23.14%) من هذه العينات موجبة للطفيليات المعوية.

وجد أن معدلات انتشار الطفيليات الشائعة كانت كالتالي: أنتاميبا هستوليتيكا 54.08%، جارديا لامبليا 22.84%، واسكارس لامبريكويدس 20.21 %، كما كان هناك تأثير ملموس للموسم على مدى انتشار الطفيليات بحيث كانت أكثر انتشاراً في فصل الصيف (يوليو حتى أغسطس) وأقل حدوثاً في فصل الشتاء (ديسمبر حتى فبراير).

كما لوحظ تناقص ملموس ($p<0.01$) في معدل انتشار الطفيليات المعوية حيث تناقص من 42.87% للعام 1996إلى 23.96% للعام 2000، ولوحظ أيضاً تناقص في معدل انتشار طفيل الاسكارس لامبريكويدس من 28.38% إلى 7.46% بينما كان هناك زيادة في معدل انتشار كل من الأنتاميبا هستوليتيكا (من 43.87% إلى 63.69%) والجارديا لامبليا (من 20.84% إلى 28.68%) خلال سنوات الدراسة.

ABSTRACT **In order to monitor changes in the prevalence and the seasonal fluctuations of common intestinal parasites, the records of 17,746 stool specimens of patients attending Nasser Hospital in Khan Younes governorate in the period 1996-2000 were reviewed and analyzed. Of these 5,704 (32.14%) were found to be positive.**
The overall prevalence of the common parasites were: *Entamoeba histolytica* (54.08%), *Giardia lamblia* (22.84%), and *Ascaris lumbricoides* (20.21%). The overall monthly incidence of parasites showed significant seasonal fluctuations. Peak incidence of intestinal parasites occurred during the summer season (June to

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August), and the lowest was during the winter season (December to February).
The prevalence of intestinal parasites has dropped significantly over the reviewed years from 42.87% in 1996 to 23.96% in 2000 ($p < 0.01$). Prevalence of *A. lumbricoides* decreased from 28.38% to 7.64%, while that of *G. lamblia* and *E. histolytica* consistently increased from 20.84% to 28.68% and 43.87% to 63.69%, respectively.

INTRODUCTION

Khan Younes is the largest governorate of Gaza Strip with a total area of about 112 km^2. It consists of Khan Younes city and its camp, and five villages (El-Qarara, Bani Suhaila, Abasan El-Saghira, Abasan El-Kabira and Khuza'a). The governorate is bordered on the south by Rafah, on the west by the Mediterranean, on the east by the green line and on the north by Deir El-Balah. Over 180 thousand inhabitants live in Khan Younes governorate. About 30% of the governorate area is occupied by Israeli settlements.

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 (Farag, 1985), 27.6%-32.3% in Palestine (Yassin et al., 1999; Ali-Shtayeh et al., 1989), 18% in Lebanon (Araj et al., 1996), 18.4%-27.8% in Saudi Arabia (Qadri et al., 1987; Al-Ballaa et al. 1983), 68.5 % in Iraq (Mahdi et al, 1994), 74%-93% in Ethiopia (Berger et al., 1989), 14.3% in Bahrain (Musaiger et al., 1990) and 23.1% in United Arab Emirates (Ibrahim et al., 1993).

Pathogenic intestinal parasites have long been regarded as an important health due to their relationship with childhood under-nutrition, iron-deficiency anemia, reduced physical fitness, cognitive performance and mental development (Persson et al., 2000; Hall, 1993; Shubair et al., 2000).

Several contributing factors affect the prevalence of intestinal parasites in certain geographic locations such as, socioeconomic status, shortage of clean drinking water, inadequate solid waste removal, lack of care in preparing raw foods, and poor hygienic conditions (Dorea et al., 1996). Moreover, occurrence of intestinal parasites is affected by climatic or seasonal changes (Ali-Shtayeh et al., 1989; Nzeako, 1992).

An understanding of the type, prevalence, and seasonal changes of parasitic pathogens is essential to public health authorities to take proper measures in order to alleviate this problem.

MATERIALS AND METHODS

Records of stool specimens submitted for parasite examination from January 1st, 1996 through December 30th, 2000 were reviewed and analyzed. For the

study of seasonal fluctuations of parasites, the twelve months of the year were divided into four seasons as follows: June to August, summer; September to November, Autumn; December to February, winter; and March to May, spring.

The records were collected from the laboratory of Nasser Hospital-Khan Younes, Palestine. Nasser Hospital is a 277-bed hospital providing secondary care mainly to the residents of Khan Younes governorate.

Specimens were normally examined, by qualified medical technologists, within 2 hours of collection, first grossly for the presence of adult parasites then by light microscopy. The latter is routinely conducted by direct saline mount according to established procedures (Koneman et al., 1988).

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 0.05.

RESULTS

In this report the hospital records of 17,746 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 32.14%. As shown in the table the overall prevalence of parasites has persistently decreased from 42.87% in the year 1996 to 23.96% in the year 2000, with the decrease being statistically significant ($p<0.01$).

Table 1. Overall distribution of tested stool specimens and positive cases of intestinal parasites at Nasser hospital.

Study years	Number of tested specimens	Number of positives	% of positives
1996	4455	1910	42.87
1997	4535	1452	32.02
1998	3889	978	25.15
1999	2626	827	31.49
2000	2241	537	23.96
All	17,746	5704	32.14

Chi square = 391.72, $p<0.01$

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

E. histolytica was the most commonly isolated parasite and represented around half of all parasites throughout the investigated years. Moreover, *E. histolytica* showed consistent and significant ($p<0.01$) annual increase. Likewise, *G. lamblia* showed a significant rise from 20.84% in 1996 to 28.68% in the year 2000.

Table 2. Frequency, prevalence and types of encountered parasites (1996-2000)

Parasite	1996	1997	1998	1999	2000	Total
Ascaris lumbricoides	542 (28.4%)	361 (24.9%)	143 (14.6%)	66 (7.9%)	41 (7.6%)	1153
Gardia lmblia	398 (20.8%)	324 (22.3%)	221 (22.6%)	206 (24.9%)	154 (28.7%)	1303
Entamoeba histolytica	838 (43.9%)	751 (51.7%)	599 (61.2%)	555 (67.1%)	342 (63.7%)	3085
Others	132 (6.9%)	16 (1.1%)	15 (1.5%)	0 (0%)	0 (0%)	163
Total	1910 (100%)	1452 (100%)	978 (100%)	827 (100%)	537 (100%)	5704

Chi square = 463.13, $p<0.01$

A. lumbricoides was responsible for 28.38% of parasitosis in the year 1996. This parasite became numerically less in the year 2000 and represented only 7.64% of the positive specimens.

The occurrence of intestinal parasites showed significant fluctuations (Table 3). Generally, the lowest incidence of parasites was observed in the winter season (December to February) and the highest incidence occurred in the summer season (June to August).

Table 3. Seasonal distribution of intestinal parasites **"1996"**

Parasite	Spring	Summer	Autumn	Winter	Total
A. lumbricoides	137	169	112	124	542
G. lamblia	90	139	93	76	398
E. histolytica	167	260	250	161	838
Others	37	24	38	33	132
Total	431	592	493	394	1910

Chi square=31.09, $p<0.01$

Prevalence and Seasonal Fluctuations

"1997"

Parasite	Spring	Summer	Autumn	Winter	Total
A. lumbricoides	116	109	44	92	361
G. lamblia	86	98	77	63	324
E. histolytica	173	268	166	144	751
Others	6	2	2	6	16
Total	381	477	289	305	1452

Chi square=36.39, p<0.01

"1998"

Parasite	Spring	Summer	Autumn	Winter	Total
A. lumbricoides	29	67	15	32	143
G. lamblia	56	71	55	39	221
E. histolytica	119	203	158	119	599
Others	14	0	0	1	15
Total	218	341	228	191	978

Chi square=67.02, p<0.01

"1999"

Parasite	Spring	Summer	Autumn	Winter	Total
A. lumbricoides	17	18	15	16	66
G. lamblia	70	56	35	45	206
E. histolytica	125	172	153	105	555
Total	212	246	203	166	827

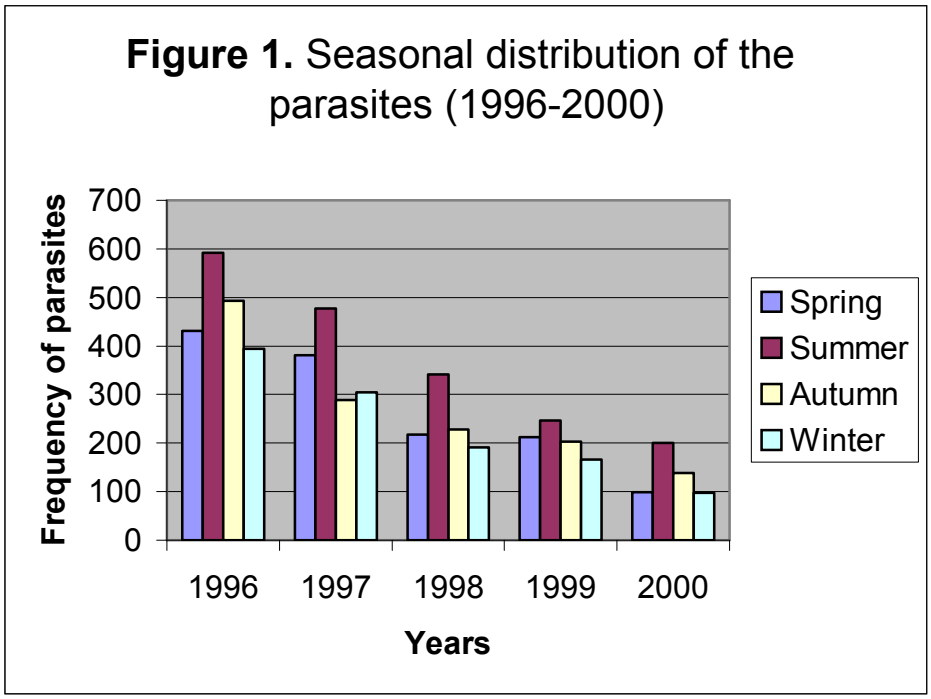
Chi square=16.78, p=0.01

"2000"

Parasite	Spring	Summer	Autumn	Winter	Total
A. lumbricoides	14	6	5	16	41
G. lamblia	30	50	40	34	154
E. histolytica	55	145	94	48	342
Total	99	201	139	98	537

Chi square=33.14, p<0.01

The seasonal distribution of the reported parasites over the five years is illustrated in figure 1.



DISCUSSION

The present work describes the changes observed in the prevalence and the seasonal fluctuations of intestinal parasites in a single geographic area over 5 years. The observed 32.14% overall prevalence of intestinal parasites is consistent with those reported from different regions of Palestine and other neighboring countries (Yassin et al., 1999; Ali-Shtayeh et al., 1989; Qadri et al., 1987, Al-Ballaa, 1983).

The three common parasites, *E. histolytica*, *G. lamblia* and *A. lumbricoides*, encountered in this study are similar to those identified by other investigators (Yassin et al., 1999; Shubair et al., 2000; Savioli et al., 1993) except that the proportion of *E. histolytica*, with an overall frequency of 54.08%, was considerably higher than other estimates of 13.3-22.9% (Yassin et al., 1999; Ali-Shtayeh et al., 1989). The ubiquitous nature of *E. histolytica* apparent in this study may be attributed to a high incidence of this parasite in certain locations of Khan Younes, especially the camps and villages 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 (Flanagan,

1992). The wide diversity of economic and social characteristics of inhabitants supports 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 (Krogstad, 1978).

Additionally, this study revealed that both *E. histolytica* and *G. lamblia* have shown persistent and significant annual increase (Table 2). The alarming rise of these two parasites 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 (Wassmann et al., 1999 ; Land et al., 1999; Nash et al., 2001). At present time, the link between the continuous and significant rise of *E. histolytica* and *G. lamblia* 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 (Farag, 1985), Kuwait (Al-Karmi et al. 1990) and Lebanon (Araj et al., 1996) 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 hygienic and alimentary habits of the different nations on the endemicity and transmission of intestinal parasites.

Despite individual variations in the prevalence of parasites, the three common intestinal parasites observed in this study are similar to those reported by other investigators (Ali-Shtayeh et al., 1989; Yassin et al., 1999; Savioli et al., 1993; Saygi et al., 1995). Though it is difficult to associate the exact factors contributing to the spread of these intestinal parasites among people served by Nasser Hospital, several factors such as; lack of sanitation, shortage of clean drinking water, contaminated vegetables, poor standards of public and personal hygiene, and inadequate health education are among factors that may increase the spread of such infections.

Regarding the seasonal effect on the prevalence of parasites, remarkable seasonal fluctuations were observed (Table 3 and Figure 1). The highest incidence of parasites occurred in the summer season while, the lowest occurrence of parasites was evident in the winter season. Similar findings

were reported by Ali-Shtayeh et al., (1989) who showed that the peak incidence of parasitosis in Nablus area occurred during the summer and early autumn. Ogunba, (1977) and Nzeako, (1992) have also shown high prevalences of intestinal protozoa in the dry months (July and August) of the year. The peak incidence of intestinal parasites in the summer may be attributed to the increase in contamination of drinking and swimming waters and irrigation of vegetables by wastewater. This is in addition to poor hygienic practices of children, especially during the summer vacation. The effect of climate on survival and persistence of parasites in the environment may also be a contributing factor.

An important lesson to be learned from this preliminary analysis is that the recording system and the identification of parasitic infections at Nasser Hospital and all other hospitals in Gaza Strip should be 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 responsibles in monitoring the changes of intestinal parasites, identification of the target group(s) and the endemic pockets. For proper identification of intestinal parasites additional techniques such as stained smears of feces and concentrated stool preparations should be employed.

In the last five to six years Gaza Strip has witnessed some improvement in water supply services, sanitation, garbage disposal and health care. This may be the reason behind the significant decrease in the overall prevalence of parasitic infections. However, an overall prevalence of 32.14% in intestinal parasites is still a high figure when compared, for example, to the 8.47% prevalence reported in Beirut (Araj et al., 1996). This implies that more coordinated efforts should be paid to further improve sanitation (primarily in the deprived locations), chemotherapy and health care (Curtale et al., 1998; 1999). 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 (Curtale et al., 1998).

In conclusion, this retrospective study shows that despite some improvement, Khan Younes area is still suffering from a high prevalence and a diverse spectrum of intestinal parasites. Contaminated waters and vegetables and poor hygienic practices are suggested to be the main contributing factors to the transmission of these parasites. The use of community treatment (especially infected children) and improvement of personal hygiene by health education are effective and affordable short-term measures for combating parasitic infections. Improved recording system and

improved identification of parasites are necessary in order to detail and confirm the epidemiology of intestinal parasitic infections in Khan Younes.

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