Annals of Tropical Medicine and Parasitology, Vol. 83, No. 1, 67–72 (1989)

Prevalence and seasonal fluctuations of intestinal parasitic infections in the Nablus area, West Bank of Jordan

By M.S. ALI-SHTAYEH, A-H. Y. HAMDAN

Department of Biological Sciences, The University, Nablus, P.O.B. 696, West Bank of Jordan

S. F. SHAHEEN, I. ABU-ZEID

Department of Public Health, Central Medical Laboratory, Nablus, West Bank of Jordan

AND Y. R. FAIDY

Department of Medical Laboratory Sciences, The University, Nablus, West Bank of Jordan

Received 6 August 1987

A total of 22 970 stool specimens collected from patients attending the Central Medical Laboratory in the city of Nablus in the period of 1981–1986 were examined for intestinal parasites. Of these 7412 (32·3%) were positive.

Entamoeba histolytica (22·9%), *Giardia lamblia* (7·3%), and *Ascaris lumbricoides* (5·7%) were the most prevalent intestinal parasites found. Other intestinal parasites present included *Hymenolepis nana*, *Trichomonas hominis*, *Trichuris trichiura*, *Taenia saginata*, *Enterobius vermicularis* and *Strongyloides stercoralis*.

Seasonal occurrence of intestinal parasites in the West Bank of Jordan was also studied in the period January 1981–August 1987. Lower prevalence rates of intestinal parasites generally occurred during winter and early spring. Peak incidence occurred during summer and early autumn. The reasons for these seasonal variations are discussed.

Intestinal parasites have received a great deal of attention in recent years (World Health Organization, 1981, 1985; Croll *et al.*, 1982; Korman *et al.*, 1986; Arene and Akabogu, 1986), but information on the prevalence and seasonal occurrence of intestinal parasites in the West Bank of Jordan is lacking. Currently there has been an increase in the rate of infection by these parasites. This present work was therefore aimed at determining the intestinal parasites found in this part of the world, their seasonal occurrence, and their prevalence amongst the population of this area.

MATERIALS AND METHODS

Fresh stool specimens from patients attending the Central Medical Laboratory in Nablus were examined for intestinal parasites using standard procedures (Lennette *et al.*, 1980) during the period 1981–1986. These specimens were first examined macroscopically for parasitic worms, then microscopically by direct wet mount in normal saline and by concentration. In the latter method each specimen was sedimented in normal saline and centrifuged at 2000 rpm for three minutes, and the sediment was examined under the microscope. Smears were also stained with Lugol's iodine for the identification of cysts. Monthly and annual counts, mean seasonal counts, and percentages of prevalence of infection of each intestinal parasite were calculated.

0003–4983/89/010067+06 $03.00/0

TABLE 1

Percentages of incidence of different intestinal parasites in the Nablus area in the period 1981–1986

Year	*Total number examined*	*Number of positive cases*	*%*	*Percentages and numbers (in parentheses) of positive cases of individual parasites*								
				Entamoeba histolytica	Giardia lamblia	Ascaris lumbricoides	Hymenolepis nana	Trichomonas hominis	Trichuris trichiura	Taenia saginata	Enterobius vermicularis	Strongyloides stercotalis
1981	3769	929	24·6	68	31·1	13·2	1·2	3·7	2·8	0·4	0	0
				(632)	(289)	(123)	(11)	(34)	(26)	(4)	(0)	(0)
1982	2921	801	27·4	70·2	29·8	8·6	1·4	2·4	2·9	0·6	0·4	0·1
				(562)	(239)	(69)	(11)	(19)	(23)	(5)	(3)	(1)
1983	3467	1046	30·2	72·7	22·3	15·3	2·7	2·0	1·9	0·7	0·2	0
				(760)	(233)	(160)	(28)	(21)	(20)	(7)	(2)	(0)
1984	3859	1290	33·4	66·5	25·3	21·8	2·9	0·5	1·0	0·6	0·4	0
				(858)	(327)	(281)	(37)	(6)	(17)	(8)	(5)	(0)
1985	4150	1532	36·9	68·3	20·8	17·5	2·9	0·4	0·6	0·7	0·5	0
				(1046)	(319)	(268)	(45)	(6)	(9)	(11)	(8)	(0)
1986	4804	1814	37·8	77·2	15·3	22·6	2·5	1·4	0	0·7	0·7	0
				(1400)	(278)	(410)	(45)	(25)	(0)	(13)	(13)	(0)
Total	22 970	7412	32·3	70·9	22·7	17·7	2·4	1·5	1·3	0·7	0·4	0·01
				(5258)	(1685)	(1311)	(177)	(111)	(95)	(48)	(31)	(1)

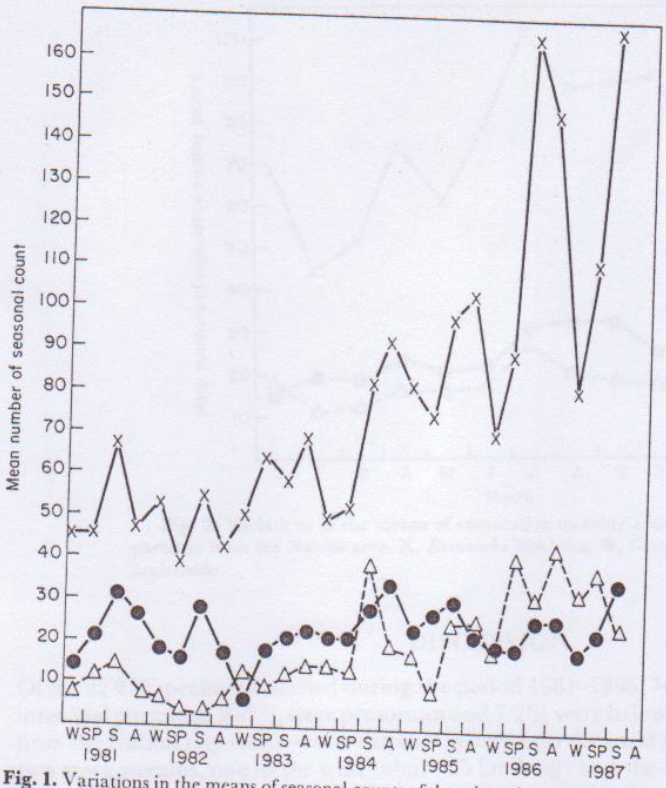

Fig. 1. Variations in the means of seasonal counts of three intestinal parasites in the Nablus area. X, *Entamoeba histolytica*; ●, *Giardia lamblia*; △, *Ascaris lumbricoides*. W, Winter; SP, spring; S, summer; A, autumn.

RESULTS

A total of 22 970 patients were examined in the period from 1981–1986. Of these 7412 (32·3%) were positive for intestinal parasites (Table 1). Nine parasites were identified.

Entamoeba histolytica had the highest percentage of positive cases (70·9%), followed by *Giardia lamblia* (22·7%) and *Ascaris lumbricoides* (17·7%). Other parasites were much less prevalent (Table 1). Protozoan infections occurred in 95·5% of all positive cases, and helminthic infections in 22·4%. Percentages of positive cases increased gradually from 24·6% in 1981 to 37·8% in 1986. A further 3342 patients were examined in the period from January to August 1987, and 1435 of these were positive for intestinal parasites (42·9%).

Figures 1 and 2 and Table 2 show the seasonal occurrence of the three main intestinal parasites (*E. histolytica, G. lamblia* and *A. lumbricoides*). Highest incidence of these parasites occurred generally in the summer and early autumn; lowest incidence occurred in winter followed by spring. Figure 1 also shows the gradual increase in these parasitic infections between 1981 and 1987. Other parasitic infections were also generally commoner in summer and autumn.

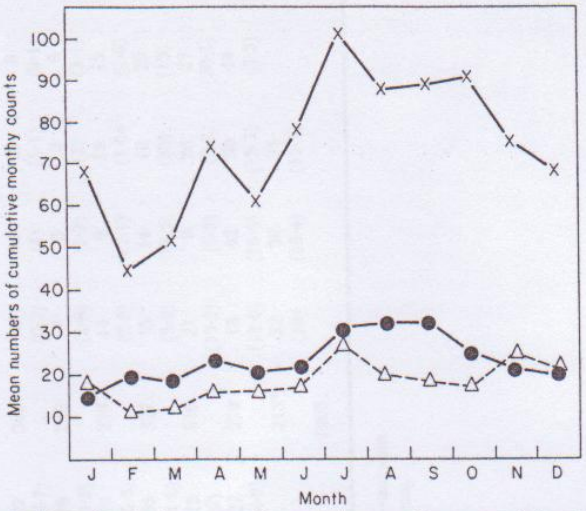

Fig. 2. Variations in the means of cumulative monthly counts of three intestinal parasites from the Nablus area. X, *Entamoeba histolytica*; ●, *Giardia lamblia*; △, *Ascaris lumbricoides*.

DISCUSSION

Of the 22 970 specimens studied during the period 1981–1986, 7412 (32·3%) were positive for intestinal parasites; 30·7% were protozoan and 7·2% were helminthic. Raw waste-water flows from the Nablus city waste-water disposal system into the rural areas around the city forming two main streams, one in the west (about 25 km long) and the other in the east (about 5 km long). This waste-water is used by farmers for the irrigation of various plants, especially vegetables and salad crops, and the usage of raw waste-water has increased immensely in the last three years. The agricultural products of these farmers are mainly consumed by people living in the city or the rural areas around it. The gradual increase in the prevalence of intestinal parasitic infections (24·6% in 1981 to 37·8% in 1986) in the Nablus area coincided with the increase in the use of raw waste-water in irrigation. A health risk is obviously involved in the application of such waste-water to the land (Burge and Marsh, 1978; Arene and Akabogu, 1986). It was clear from our data (Table 1) that the increase in intestinal parasitic infections was due mainly to the increase in the prevalence of *E. histolytica*, *G. lamblia* and *A. lumbricoides*. These are known to infect humans through polluted water, soil, vegetables or other polluted food.

Infections with *E. histolytica* and *G. lamblia* comprised 93·7% of all positive cases. The prevalence rate of intestinal amoebiasis is one of the highest in the world. It is interesting to note that the prevalence of *A. lumbricoides* (a soil-transmitted helminth) almost doubled in six years (from 13·2% of positive cases in 1981 to 22·6% in 1986). The *Hymenolepis* infections also increased, but the *Trichuris* infections decreased to zero in the same period.

The incidence of intestinal parasites is seasonal (Figs. 1 and 2). The lowest prevalence rates occurred in the winter months, and this coincides with low temperatures, the rainy season, and less use of waste-water in irrigation. The rate of incidence increases gradually in spring, with the rise in temperatures, continues to increase in the summer months, and reaches a maximum in July. The peak incidence in the summer months and early autumn coincides with high temperatures and the intensive use of raw waste-water in irrigation.

TABLE 2

Mean seasonal counts (s.d. in parentheses) and annual counts for the major intestinal parasites in the Nablus area

	Entamoeba histolytica					Giardia					Ascaris lumbricoides				
Year	*W*	*SP*	*S*	*A*	*Total*	*W*	*SP*	*S*	*A*	*Total*	*W*	*SP*	*S*	*A*	*Total*
1981	46 (3·5)	46 (13·2)	68 (24)	47 (36·8)	632	15 (4·9)	22 (4·2)	32 (10·1)	27 (16·7)	289	8 (0·7)	12 (4)	15 (5·1)	8 (6·1)	123
1982	54 (10·7)	39 (10·7)	56 (6·7)	43 (9·1)	562	19 (3·1)	17 (7)	29 (11·7)	18 (11·5)	239	7 (2·6)	3 (1·2)	3 (1)	6 (3·1)	69
1983	51 (11·6)	65 (13·3)	59 (6·4)	70 (6·9)	760	7 (6·5)	19 (7·6)	22 (5·6)	24 (5·5)	233	14 (2·3)	9 (2·1)	13 (1·5)	15 (2·6)	160
1984	50 (13·8)	53 (5·7)	83 (18)	93 (14·2)	858	22 (3·8)	22 (8)	29 (14)	35 (11·8)	327	15 (8·2)	14 (3·5)	40 (20)	20 (13)	281
1985	82 (31)	75 (13·6)	98 (31·2)	104 (4·9)	1046	24 (2·1)	28 (2·1)	31 (5·8)	23 (7)	319	21 (13·1)	8 (6·5)	26 (9·8)	27 (20·1)	268
1986	71 (32·7)	90 (20·9)	165 (36·3)	147 (48)	1400	20 (5·1)	20 (6)	27 (6·6)	27 (4·2)	278	18 (11·6)	42 (16·6)	30 (13·7)	44 (3·5)	410
1987	81 (13·1)	111 (44·2)	167 (29·4)		1009*	19 (6)	24 (9·7)	36 (1·2)		218*	32 (10)	38 (13·4)	24 (11·5)		250*
Total					6267					1903					1561

W—winter; SP—spring; S—summer; A—autumn.

*Totals for the first eight months of the year.

The prevalence of intestinal infections in the West Bank is higher than that in some other Arab countries. In a similar study conducted in Saudi Arabia (Abdel-Hafez *et al.*, 1986) 24·4% of patients were positive for intestinal parasites, 32·3% of the patients in our study. The prevalences of the main intestinal parasites in Saudi Arabia were *E. histolytica* 8·8, *G. lamblia* 6·3, *A. lumbricoides* 3·0, *Hymenolepis nana* 0·8, *Enterobius vermicularis* 0·2, *Taenia saginata* 0·2 and *Strongyloides stercoralis* 0·1. The prevalences of these parasites in the West Bank of Jordan were 22·9, 7·3, 5·7, 0·8, 0·4, 0·1, 0·2 and 0·004 respectively. Species of *Schistosoma, Ancylostoma, Dicrocoelium, Trichostrongylus* and *Fasciola* were among the intestinal parasites in Saudi Arabia but were absent in the West Bank of Jordan. *Trichomonas hominis*, on the other hand, was found in 0·5% of the stool specimens examined in our work but was not found in the Saudi specimens.

It can be concluded from this study that health measures should be taken in the West Bank of Jordan in order to reduce these infections. These measures may include proper treatment and disposal of waste-water, a ban on the use of raw waste-water in irrigation, and a mass campaign for the treatment of these infections and the supply of clean water.

REFERENCES

Abdel-Hafez, M. M. A., El-Kady, N., Bolbol, A. S. & Baknina, M. H. (1986). Prevalence of intestinal parasitic infections in Riyadh district, Saudi Arabia. *Annals of Tropical Medicine and Parasitology*, **80,** 631–634.

Arene, F. O. I. & Akabogu, O. A. (1986). Intestinal parasitic infections in pre-school children in the Niger delta. *Journal of Hygiene, Epidemiology, Microbiology and Immunology*, **30,** 99–102.

Burge, W. D. & Marsh, P. B. (1978). Infectious disease hazards of landspreading sewage waters. *Journal of Environmental Quality*, **7,** 1–9.

Croll, N. A., Anderson, R. M., Gyorkos, T. W. & Ghadirian, E. (1982). The population biology and control of *Ascaris lumbricoides* in a rural community in Iran. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **76,** 187–197.

Korman, S. H., Le Blancq, S. M., Spira, D. T., Elon, J., Reifen, R. M. & Deckelbaum, R. J. (1986). *Giardia lamblia*: identification of different strains from man. *Zeitschrift für Parasitenkunde*, **72,** 173–180.

Lennette, E. H., Balows, A., Hausler, W., Jr & Shadomy, H. J. (Eds). (1980). *Manual of Clinical Microbiology*, 3rd Edn. Washington: American Society for Microbiology.

World Health Organization (1981). Intestinal protozoan and helminthic infections. Report of a WHO Scientific Group. *Technical Report Series, No. 666, Geneva.*

World Health Organization. (1985). General strategies for prevention and control of intestinal parasitic infections with primary health care (PHC). *Informal PDP document PDP/85.1, Geneva.*