

**Intestinal Parasitic Infection
of Refugee Children
in
Selected West Bank Localities**

**Sam'an Kaspari
Alison Condie**

December 1986

Acknowledgements

We would like to thank UNRWA Headquarters in Vienna and UNRWA Field Office/Jerusalem for giving us permission to carry out this study, as well as the staff and medical personnel in the refugee camps whose assistance in the field work was greatly appreciated. We would like in particular to extend our thanks to Khalid al-Nabris from the Community Health Unit for designing and producing the health education materials used in the schools, and Muna 'Odeh for her stimulating work in classrooms. Muhjeh Zreikat and Alex Pollock deserve special mention for the long hours spent typing and formatting the final report.

Table of Contents

	Page
1. Introduction	1
2. Methodology	2
3. Results	3
4. Discussion of Results	7
5. Conclusion	10
Appendix: Laboratory Methodology	11
References	12
Bibliography	13

1. Introduction

The objective of this study was to investigate the type and extent of intestinal parasitic infection in children of the first and sixth grade classes of four UNRWA elementary schools for Palestinian refugees in the West Bank. The two grades sampled corresponded to the 6-7 year and 11-12 year age groups and were selected in order to provide a measure of the variation in infection levels with age.

Three of the four schools studied are situated in the refugee camps of Deir 'Ammar, Jalazon and al-Am'ari, all within a 0.5-15km radius of Ramallah in the West Bank highlands. The total population of these three camps taken together was approximately 12,000 persons. UNRWA provides the residents of these camps with various services including clinics, supplementary feeding centres and schools. UNRWA also runs sanitation projects in the camps, and each camp has a potable water supply. The majority of children attending the schools were camp residents, although some lived in the surrounding area.

The fourth school selected served the village of al-'Awja, a rural community considered by UNRWA to be a service camp, 10km north of Jericho in the Jordan Valley. The village lacks both a potable water supply and sewage disposal facilities. Open irrigation canals provide the major source of water used for drinking, domestic, and agricultural purposes.

2. Methodology

Sampling was conducted in April 1985 in al-'Awja, in May 1985 in Deir 'Ammar and Jalazon, and during October in al-Am'ari. The following steps were carried out in each school:

- 1) Lists of grade 1 and grade 6 pupils were obtained and age, sex, and place of residence were recorded.
- 2) During a one-hour-class, the researchers discussed with the children the aims of the study, and issues of health, personal and domestic hygiene. A series of seven posters and booklets on parasitosis -designed specifically for children- were distributed to each class.
- 3) The researchers explained to the children how to take a sample of their own stool the following morning, and distributed collection containers to each child. A circular to parents was given to each child, requesting the parents' assistance in the collection procedure.
- 4) The next morning all specimens delivered were transported to the laboratory for analysis. Upon reception in the laboratory, samples were at least 3-5 hours old. As no preservative was used, and as there was no assurance that the children had taken the sample that morning, results indicate minimum infection levels.
- 5) Stool samples were examined using the simplified Formalin-Ether concentration technique suggested by Allen and Ridley (1). All liquid stools were also examined by direct smear to ensure detection of vegetative protozoan forms.
- 6) Laboratory results were recorded, and a list of children requiring treatment was delivered to the UNRWA doctor responsible for each camp.

3. Results

Of the 548 children registered in grades 1 and 6 of the schools, a total of 455 children submitted stool samples for examination. Table 1 summarises the results, showing that 48% of the children examined were found to be infected with one or more intestinal parasites.

Table 1. Total Number of Children, Participation Rate and Infection Level by Locality

	al-'Awja	Deir 'Ammar	Jalazon	al-Am'ari	Total
Total no. of children registered	86	148	142	180	548
No. of delivered samples	80	126	116	133	455
% delivery rate	93.0%	90.0%	81.7%	73.9%	83.0%
No. of positive samples	49	73	48	48	218
% positive samples (prevalence rate)	61.3%	57.9%	41.4%	36.1%	47.9%

The level of parasitosis varied with locality, the highest prevalence levels were found among children attending al-'Awja school (61%), and the lowest in al-Am'ari children (36%).

Table 2 summarises the prevalence levels in relation to gender and grade. The results show higher infection levels in boys than in girls overall, and in both grades 1 and 6. Interestingly, the disparity between the sexes was most pronounced in older children.

Table 2. Prevalence of Parasitosis by Gender and Grade

	Grade 1		Grade 6		Total	
	Male	Female	Male	Female	Male	Female
No. of samples examined	110	124	124	97	234	221
% positive stools	55%	48%	51%	36%	53%	43%

The results also suggest an inverse relationship between age and parasitosis, as the prevalence of infection was found to be higher in grade 1 (51%) than in grade 6 children (44%). This trend was more pronounced in female than in male children.

Of the 218 children with positive stool samples, 75% were infected with one parasite species, and 25% had more than one parasite species identified in their stools (17% two species, 7% three species). A total of ten intestinal parasite species were identified in the faecal samples collected. The overall prevalence is shown in Table 3.

Although Trichomonas hominis is not fully confirmed as being an intestinal parasite, it is included in this study due to its acknowledged association with diarrhoea. While not established as pathogenic parasites, Endolimax nana and Entamoeba coli are included, as they are valuable indicators of faecal-oral contamination. Since it was not possible to carry out the scotch tape method for the accurate estimation of Enterobius vermicularis prevalence, it is likely that the actual prevalence is higher than demonstrated in this survey. A number of the parasitised children complained of stomach upsets, and the three children infected with Trichostrongylus sp. complained of considerable abdominal pain.

Table 3. Prevalence of Each Parasite Species

Species	No. of incidences	Prevalence (%)
<u>Entamoeba coli</u>	96	21%
<u>Giardia lamblia</u>	73	16%
<u>Hymenolepis nana</u>	50	11%
<u>Trichuris trichiura</u>	27	6%
<u>Entamoeba histolytica</u>	20	4%
<u>Ascaris lumbricoides</u>	8	2%
<u>Enterobius vermicularis</u>	6	1%
<u>Trichomonas hominis</u>	4	0.8%
<u>Trichostrongylus sp.</u>	3	0.6%
<u>Endolimax nana</u>	1	0.2%

The two most prevalent pathogenic parasites, Giardia lamblia and Hymenolepis nana, did not show large regional variations. Trichuris trichiura and Ascaris lumbricoides were most prevalent in Deir 'Ammar and al-Am'ari, but were absent in al-'Awja children. Entamoeba histolytica, the causative agent of amoebic dysentery, was most prevalent in al-'Awja (Table 4).

Table 5 demonstrates differences in species prevalence by gender and grade.

The most noteworthy features of these results are that the prevalence of G. lamblia was much higher in Grade 1 than in Grade 6 children, and that the prevalence of T. trichiura was higher in boys than in girls.

Table 4. Prevalence of Parasite Species by Locality

Species	Prevalence of each parasite as % of children examined in each locality			
	al-'Awja	Deir 'Ammar	Jalazon	al-Am'ari
<u>E. coli</u>	34	32	16	8
<u>G. lamblia</u>	18	17	13	17
<u>H. nana</u>	10	13	9	12
<u>T. trichiura</u>	-	10	10	2
<u>E. histolytica</u>	11	2	3	3
<u>A. lumbricoides</u>	-	2	4	-
<u>E. vermicularis</u>	-	2	2	0.8
<u>T. hominis</u>	-	0.8	2	0.8
<u>Trichostrongylus sp.</u>	3	-	-	0.8
<u>E. nana</u>	-	-	-	0.8

Table 5. Percentage Prevalence by Gender and Grade

Species	Grade 1	Grade 6	Male	Female
<u>E. coli</u>	22	20	24	19
<u>G. lamblia</u>	24	8	15	17
<u>H. nana</u>	13	9	11	11
<u>T. trichiura</u>	4	8	9	3
<u>E. histolytica</u>	4	5	4	5
<u>A. lumbricoides</u>	3	0.5	2	1
Other	-	-	-	4
No. of children examined	234	221	234	221

4. Discussion of Results

A total of 48% of all the children examined were found to be infected with one or more intestinal parasites. Children attending the school in al-'Awja village showed the highest infection levels, as 61% of children examined were found to be parasitised. The school children examined in the three refugee camps in the Ramallah area also showed substantial infection levels, with 58% of the children in Deir 'Ammar, 41% of the children in Jalazon, and 36% of the children in al-Am'ari school found to be infected with intestinal parasites.

The combined results from all four localities showed an inverse relationship between grade (age) and parasitosis, with higher infection levels found in younger than in older children. This difference was most pronounced in children attending al-Am'ari school, and, to a lesser extent, in children attending Deir 'Ammar and Jalazon schools. Only in al-'Awja children was this trend found to be reversed.

This general trend may be explained by the play habits of young children, which could result in their greater exposure to infection sources. Correlated with their lack of hygiene awareness due to age, this factor may contribute to higher infection levels in younger children, irrespective of gender. Older children, and especially older female children, may be more hygienic, which could account for their lower infection levels. In view of the results of this survey, this appeared to be the case in Deir 'Ammar, Jalazon, and al-Am'ari school children. In al-'Awja, the only community studied without a potable water supply (2), children were found to be more commonly infected at an older age; this suggests that the factors determining the level of infection may be environmental rather than predominantly behavioural.

In general, infection levels were higher in male than in female children, both in grade 1 and grade 6, which, in accordance with the general pattern of greater mobility of male children in Palestinian society, may reflect the more extensive exposure of boys to the environment. The disparity in infection levels between the sexes in the same grade was much more pronounced in older children. It was observed during field work that teachers of girls stressed hygienic measures much more than with boys, which suggests that role model conditioning may be operative at school as well as at home. As boys in al-Am'ari school stressed, they were aware of domestic and personal hygiene measures, but their play area and work places, where they spent much of their time outside school hours, lacked sanitary facilities. This made the practice of hygienic measures very difficult. This may

support the notion that a major factor which determines infection levels is the practice of personal and domestic hygiene.

It must be noted, however, that parasitosis levels in girls were found to be substantial. At home, girls are responsible for household duties, which may expose them to a high risk of person-to-person contamination. It was interesting that in the three camps in the Ramallah area parasitosis levels in older girls were found to be lower than in younger girls, yet in al-'Awja, despite the assumed greater hygiene awareness of older girls, the infection level was found to increase with age. This would, again, suggest that in al-'Awja the environmental conditions may be the overriding factors determining infection levels.

A total of 10 parasite species were detected in the stools examined in this survey. The results showed some interesting differences in prevalence of parasite species by locality and gender:

- a. In all four areas, the two major pathogenic parasites isolated were Giardia lamblia and Hymenolepis nana, and both were found in all four schools.
- b. Trichuris trichiura and Entamoeba histolytica were found to be the next most commonly isolated pathogens, but their prevalence showed a less even distribution by region.
- c. Giardia lamblia was found to be much more common in younger than older children.

Of the 10 species of intestinal parasites detected in the stool of the school children examined, the most commonly occurring species fall into two categories distinguished by Feachem et al. (3):

- a. Non-latent: low infective dose (E. coli, G. lamblia, H. nana).
- b. Latent and persistent (A. lumbricoides, T. trichiura).

The basic difference between these two categories is that upon excretion, the first category of parasites are immediately infective to another host, whereas the latter category of parasites require a latent period in the external environment before reaching the infective stage. Feachem et al. argue that category (a) diseases are primarily spread by person-to-person contact, whereas category (b) diseases are primarily related to excreta disposal, as the helminths are environmentally transmitted.

The results of this survey suggest that in all four areas conditions are conducive for direct person-to-person transmission of intestinal parasites. Interestingly, the highest prevalences of category (a) parasites were found in children living in the village which lacked a potable water supply (al-'Awja). The environmentally transmitted helminths were found to be most common in the Deir 'Ammar and Jalazon school children, which may suggest a problem of excreta disposal in these two camps. The most common category (b) helminth, T. trichiura, was found to be more common in older children and in boys rather than girls, which may reflect their more frequent contact with contaminated soil areas, possibly through their outdoor playing activities.

5. Conclusion

This study was designed to investigate the prevalence of intestinal parasitic infection in selected age groups of school children in four localities of the West Bank. The survey design did not allow for rigorous analysis of the relationship between the prevalence of parasites and social or environmental factors. The results, however, do suggest some interesting patterns and trends in parasitosis levels in relation to locality, age and gender. The findings of this study identify various areas which warrant further research in order for the epidemiology of parasites in the localities studied to be investigated more thoroughly. Such research may facilitate the development of appropriate measures designed to reduce levels of intestinal parasitic infection.

Appendix

Laboratory Methodology

Simplified Formol-Ether Concentration (5 minutes)

1. Take about one gram of faeces, emulsify with about 7ml of Formol-Saline.
2. Strain through wire gauze (40 mesh per inch) into centrifuge tube.
3. Add 3ml of ether and shake vigorously for one minute.
4. Centrifuge, accelerate slowly and gradually over a period of 2 minutes to 2000 rpm, allow to rest.
5. Loosen the debris on the surface and between the two liquids with a stick, and decant the supernatant fluid.
6. Allow the last drop or two to run back.
7. Wipe the upper part from the fatty debris.
8. Shake the small deposit and examine under the microscope.

References

- (1) Allen, A.H.V. and Ridley, D.S., Further Observations on the Formol-Ether Concentration Technique for Faecal Parasites, Journal of Clinical Pathology, 23 (1970), 545.
- (2) Smith, C., Bacterial Quality of Drinking-Water in Eight Villages in the Northern Jordan Valley, Community Health Unit, Birzeit University, Bir Zeit, September 1984, p.23.
- (3) Feachem, R.G. et al., Sanitation and Disease: Health Aspects of Excreta and Wastewater Management, Chichester: John Wiley and Sons, 1983, p. 33.

Bibliography

- Allen, A.H.V. and Ridley, D.S. Further Observations on the Formol-Ether Concentration Technique for Faecal Parasites. Journal of Clinical Pathology, 23 (1970), 545-546.
- Feachem, R.G. et al. Sanitation and Disease: Health Aspects of Excreta and Wastewater Management. Chichester: John Wiley and Sons, 1983.
- Smith, C. Bacterial Quality of Drinking-Water in Eight Villages in the Jordan Valley. Community Health Unit, Birzeit University. Bir Zeit, September 1984.