Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Medicine

journal homepage:www.elsevier.com/locate/apjtm

Document heading

Prevalence of intestinal parasitic infections in Jenin Governorate, Palestine: a 10-year retrospective study

Sami Bdir[1], Ghaleb Adwan[1*]

Department of Biology and Biotechnology, An-Najah N. University, P. O. Box (7)-Nablus, Palestine

ARTICLE INFO

Article history:
Received 13 July 2010
Received in revised form 27 July 2010
Accepted 15 August 2010
Available online 20 September 2010

Keywords:
Prevalence
Intestinal parasites
Entamoeba histolytica
Enterobius vermicularis
Palestine

ABSTRACT

Objective: To assess the prevalence of intestinal parasites among Jenin Governorate (Northern Palestine) population. **Methods:** A retrospective laboratory analysis of stool specimens was carried out for intestinal parasite examination in Jenin Governmental Hospital, Jenin Governorate, Northern Palestine. The records were collected from the clinical microbiology laboratory of the Jenin Governmental Hospital between January 2000 and December 2009. **Results:** Our retrospective study showed that the prevalence of intestinal parasite infection during 10 years ranged from 32.0-41.5%. There are at least 7 different parasites *encountered*. The most common pathogenic parasites identified were: *Entamoeba histolytica* (8.2-18.2%), *Enterobius vermicularis* (15.6-28.9%). The other parasites present were *Giardia lamblia*, *Ascaris lumbricoides*, *Strongyloides stercoralis*, *Taenia* species and *Ancylostoma duodenale* (Hookworms). **Conclusions:** Intestinal parasitic infection is an important public health problem in Jenin governorate, Palestine. It is necessary to develop effective prevention and control strategies including health education and environmental sanitation improvement.

1. Introduction

Intestinal parasites are frequently transmitted via contaminated food or drinking water, but may also be spread from person to person through fecal-oral contact. Intestinal protozoan and helminth parasites are widely prevalent causing considerable medical and public health problems in developing countries. Intestinal parasitic protozoal and helminthic infections are widely distributed throughout the world, especially in the developing countries. World Health Organization estimates that some 3.5 billion people worldwide are affected, and that 450 million are ill as a result of these infections[1]. The prevalence of these parasitic infections varies in different parts of the world. In developing countries, however, geographic and socioeconomic factors as well as unpredictable factors such as natural disasters contribute to the problem. In addition to that, these countries mainly have tropics or subtropics climates and relatively humid areas that, combined with poverty, malnutrition, personal and community hygiene, high population density, unavailability of potable water and low health status, poor sanitary facilities all provide optimum conditions for the growth, transmission of these parasites and increase the probability of exposure to intestinal parasites[2-4].

The situation of intestinal parasitic infection in Palestine, is still a problem, probably due to defect in health status, poor sanitation, population crowdedness, bad hygienic habits, and poor health education mainly in Palestinian Refugee Camps. In Palestine relatively few studies have been done on the gastrointestinal parasites. Most of these studies focused on Gaza Strip. According to the best of our knowledge no studies have been done on the intestinal parasites in Jenin Governorate. The aim of this study is to get a true idea about the existence of intestinal parasites and their prevalence among Jenin Governorate (Northern Palestine) populations by referring to records in Jenin Governmental Hospital.

2. Materials and methods

A retrospective laboratory analysis of stool specimens was carried out for intestinal parasite examination in Jenin Governmental Hospital, Jenin Governorate, Northern Palestine. The records were collected from the clinical microbiology laboratory of the Jenin Governmental Hospital, between January 2000 and December 2009. Specimens were normally examined by qualified medical technologists within 2 hours of collection, first grossly for the presence

*Corresponding author: Ghaleb Adwan, Department of Biology and Biotechnology, An-Najah N. University, P. O. Box (7)-Nablus, Palestine.
Fax: +970-9-2347488
E-mail: adwang@najah.edu

of adult parasites then by light microscopy. The stool specimens were examined using different microbiological analysis including direct and stool concentration techniques. The age, sex and other demographic information of the patients were recorded inconsistently and thus these parameters were not included in the data analysis. The stool samples were obtained from both inpatients (hospitalized patients) and outpatients (non-hospitalized patients). The cellophane tape technique has been used for recovery *Enterobius vermicularis* eggs from around the anus.

3. Results

Our retrospective study showed that prevalence of intestinal parasite infection ranged from 32.0-41.5%. There are at at least 7 different parasites encountered, and the most common pathogenic parasites identified were: *Entamoeba histolytica* (8.2-18.2%), *Enterobius vermicularis* (15.6-28.9%). The other parasites present were *Giardia lamblia*, *Ascaris lumbricoides, Strongyloides stercoralis, Taenia* species and *Ancylostoma duodenale* (Hookworms) (Table 1).

Table 1

Over all prevalence of intestinal protozoan and helminth parasites from 2000 to 2009 in Jenin governorate, Northern Palestine [*n*(%)].

Year	No. of samples/year	Infected cases							Infected samples /year
		Protozoa species		Helminth species					
		Entamoeba histolytica	*Giardia lamblia*	*Taenia* spp	Hookworms	*Ascaris lumbricoides*	*Strongyloides stercoralis*	*Enterobius vermicularis*	
2000	9 656	796 (8.24)	64 (0.66)	11 (0.11)	5 (0.05)	97 (1.00)	7 (0.07)	2 494 (25.80)	3 474 (36.00)
2001	14 441	1 531 (10.60)	41 (0.28)	27 (0.19)	1 (0.01)	188 (1.30)	34 (0.24)	4 174 (28.90)	5 996 (41.50)
2002	13 923	1 766 (12.70)	30 (0.22)	11 (0.08)	1 (0.01)	50 (0.36)	13 (0.09)	3 763 (27.00)	5 634 (40.50)
2003	14 096	1 546 (11.00)	25 (0.18)	15 (0.11)	7 (0.05)	9 (0.06)	3 (0.02)	3 699 (26.20)	5 304 (37.60)
2004	14 981	2 187 (14.50)	41 (0.27)	36 (0.24)	4 (0.03)	11 (0.07)	14 (0.09)	3 103 (20.70)	5 396 (36.00)
2005	12 688	1 765 (13.90)	30 (0.24)	17 (0.13)	3 (0.02)	2 (0.02)	10 (0.08)	2 984 (23.20)	4 811 (37.90)
2006	10 839	1 750 (16.20)	44 (0.41)	42 (0.39)	3 (0.03)	2 (0.02)	5 (0.05)	2 432 (22.40)	4 278 (39.50)
2007	11 022	2 004 (18.20)	38 (0.34)	36 (0.33)	1 (0.01)	15 (0.14)	5 (0.05)	1 856 (16.80)	3 955 (35.90)
2008	11 717	1 732 (14.80)	68 (0.58)	31 (0.26)	9 (0.08)	38 (0.32)	7 (0.06)	1 870 (16.80)	3 755 (32.00)
2009	9 927	1 727 (13.40)	50 (0.50)	52(0.52)	12 (0.12)	0 (0.00)	14 (0.14)	1 552 (15.60)	3 407 (34.30)

4. Discussion

This study shows that intestinal parasitic infection is a major public health problem in Palestine during last 10 years (2000-2009). These parasites have different prevalence in other Arabian countries or countries located in Middle East, for instance, reports on intestinal parasites have shown prevalence rates of 28.7% in Yemen[5], 19.3-27.3% in Iran[3,6,7], 12.4% in Lebanon[8], 16.6-74.6% in Gaza strip (Palestine)[9-14], 28.5% in Jordan[15], 42.5% in Syria[16], 31.4-32.2% in Saudi Arabia[17,18], 17.0-90.4% in Sudan[19,20], 33.9% in Qatar[21], 31.8-37.2% in Turkey[22,23], and 27% in Egypt[24]. The difference in prevalence of infections in these countries is due to different factors such as geographic, socioeconomic, climate, poverty, malnutrition, personal and community hygiene, population density, unavailability of potable water and poor sanitary facilities.

Different types of intestinal parasitic diseases were detected during this retrospective study. As regard to the infection, *Entamoeba histolytica,* was the commonest intestinal protozoa, while *Enterobious vermicularis* was the commonest helminth. In other studies, some found that *Giardia lamblia* and *Entamoeba histolytica* were the most common protozoa[4,9,10,20,24,25], others including *Giardia lamblia* and *Entamoeba coli*[7], *Entamoeba coli, Giardia lamblia* and *Entamoeba histolytica*[8], *Entamoeba histolytica/dispar*[14], *Giardia lamblia*[15,19,23], *Entamoeba histolytica*[12,26]. According to helminthes it was reported that *Ascaris lumbricoides* seemed to be the most common helminth[9-12,20,24], *Hymenolepis nana* and *Ascaris lumbricoides*[25], *Enterobious vermicularis*[4,15,23].

Amoebiasis, giardiasis, ascariasis, and hookworm infection are among the most common intestinal parasitic infections worldwide and are closely related to socio-economic status, poor sanitation, inadequate medical care and absence of safe drinking water supplies[27-29]. Variability in human behavior, through deeply instilled social practices and traditions can also be a major obstacle in attempts to control directly transmitted parasitic infections over different geographic areas. The high rate of infection with *Entamoeba histolytica* might be attributed to poor hygiene standard in this region. This parasite can be transmitted orally by drinking contaminated water. Both *Entamoeba histolytica* and *Giardia lamblia* are environmental contaminants of the water supply. The water supply is really an important risk factor for the amoebiasis and giardiasis, and several large outbreaks have resulted from the contamination of municipal water supplies with human waste[30]. The high rate of infection in this part of Palestine may be attributed to the habit of eating unwashed vegetables or ingestion of contaminated water, mainly in rural areas and refugee camps due to the lower quality of water and faulty sewage lines or do not have a municipal water network or sewage system. In view of the prevalence of intestinal parasitic infections in this study, preventive measures should be taken to prevent dissemination of infection and to reduce opportunities for exposure, by increasing level of knowledge about personal and community health and hygiene, sanitary control of water and waste disposal and reduction of the source of infection by therapeutic measures.

Ascaris lumbricoides, *Strongyloides stercoralis* and the hookworms are the causal agent of soil-transmitted helminthiasis. The prevalence of these helminthes was low, this may be due to the techniques employed in the examination of stool specimen searching for helminthes. In addition to that, Jenin is an agricultural area where most residents are working as farmers and some farmers use untreated organic fertilizers in their farms. Enterobiasis occurs worldwide, usually involving school-aged children[31]. In general *Enterobious vermicularis* infection is transmitted by hand to mouth and/or person to person directly. High prevalence of *Enterobious vermicularis* in this area might be due to improper hygiene including not washing hands with soap after defecation, before eating and preparing foods. The higher prevalence of *Enterobious vermicularis* could also be explained by the highly infectious nature of this parasite.

In conclusion, intestinal parasitic infection is an important public health problem in Jenin governorate, Palestine. It is necessary to develop effective prevention and control strategies including health education and improving environmental sanitation.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

We would like to acknowledge all the staff in Palestinian Health Ministry and Jenin Governmental Hospital for their cooperation to prepare this study. Special thanks to the director of the Jenin Governmental Hospital Dr. Abu-Ghalyoon. The first and the second author contributed the same to this work.

References

[1] WHO. Intestinal parasites. Available at: http://apps.who.int/ctd/intpara/burdens.htm. Accessed on July 7, 2010.

[2] Thapar N, Sanderson IR. Diarrhoea in children: an interface between developing and developed countries. *Lancet* 2004; **363**: 641-53.

[3] Sayyari AA, Imanzadeh F, Bagheri Yazdi SA, Karami H, Yaghoobi M. Prevalence of intestinal parasitic infections in the Islamic Republic of Iran. *East Mediterr Health J* 2005; **11**: 377-83.

[4] Raza HH, Sami RA. Epidemiological study on gastrointestinal parasites among different sexes, occupations, and age groups in Sulaimani district. *J Duhok Univ* 2009; **12**: 317-23.

[5] Baswaid SH, Al-Haddad AM. Parasitic infections among restaurant workers in Mukalla (Hadhramout/Yemen). *Iranian J Parasitol* 2008; **3**: 37-41.

[6] Nematian J, Nematian E, Gholamrezanezhad A, Asgari AA. Prevalence of intestinal parasitic infections and their relation with socio-economic factors and hygienic habits in Tehran primary school students. *Acta Trop* 2004; **92**: 179-86.

[7] Haghighi A, Khorashad AS, Mojarad EN, Kazemi B, Nejad MR, Rasti S. Frequency of enteric protozoan parasites among patients with gastrointestinal complaints in medical centers of Zahedan, Iran. *Trans R Soc Trop Med Hyg* 2009; **103**: 452-4.

[8] Saab BR, Musharrafieh U, Nassar NT, Khogali M, Araj GF. Intestinal parasites among presumably healthy individuals in Lebanon. *Saudi Med J* 2004; **25**: 34-7.

[9] Astal Z. Epidemiological survey of the prevalence of parasites among children in Khan Younis governorate, Palestine. *Parasitol Res* 2004; **94**: 449-51.

[10] El-Astal Z. Survey of intestinal parasites among children in Khan Younis Governorate, Gaza Strip, Palestinian Authority. *Comp Parasitol* 2005; **72**:116-7.

[11] AL-Zain B, Al-Hindi A. Distribution of *Strongyloides stercoralis* and other intestinal parasites in household in Beit-lahia city, Gaza Strip, Palestine. *Ann Alquds Med* 2005; **1**: 48-52.

[12] Alzain BF. 2006. Study on the status of prevalence of *Strongyloides sterocoralis* infection among children in agricultural areas in Beit Lahia, Gaza strip. *Islam Univ J* (Series of Natural Studies and Engineering) 2006; **14**: 67-73.

[13] Al-Hindi AI, El-Kichaoi. Occurrence of gastrointestinal parasites among pre-school children, Gaza, Palestine. *Islam Univ J* (Series of Natural Studies and Engineering) 2008; **16**: 125-30.

[14] Al-Hindi A. Diagnosis of gastrointestinal parasites among hospitalized patients attending Al-Nasser Paediatric Hospital, Gaza, Palestine. *J Public Health* 2009; **17**: 49-53.

[15] Ammoura AM. Impact of hygienic level on parasite infection. *Asia Pac JTrop Med* 2010; **3**: 148-9.

[16] Al-kafri A, Harba A. Intestinal parasites in basic education pupils in urban and rural Idlb. *J Lab Diag* 2009; 5.

[17] Al-Shammari S, Khoja T, El-Khwasky F, Gad A. Intestinal parasitic diseases in Riyadh, Saudi Arabia: prevalence, sociodemographic and environmental associates. *Trop Med Int Health* 2001; **6**: 184-9.

[18] Abahussain NA. Prevalence of intestinal parasites among expatriate workers in Al-Khobar, Saudi Arabia. *Mid E J Fam Med* 2005; **3**: 1-4.

[19] Mohamed MM, Ahmed AI, Salah ET. Frequency of intestinal parasitic infections among displaced children in Kassala Town. *Khartoum Med J* 2009; **2**: 175-7.

[20] Ahmed AM, Afifi AA, Malik EM, Adam I. Intestinal protozoa and intestinal helmintheic infections among schoolchildren in central Sudan. *Asia Pac J Trop Med* 2010; **4**: 292-3.

[21] Abu-Madi MA, Behnke JM, Ismail A. Patterns of infection with intestinal parasites in Qatar among food handlers and housemaids from different geographical regions of origin. *Acta Trop* 2008; **106**: 213-20.

[22] Okyay P, Ertug S, Gultekin B, Onen O, Beser E. Intestinal parasites prevalence and related factors in school children, a western city sample-Turkey. *BMC Public Health* 2004; **4**: 64.

[23] Çeliksöz A, Güler N, Güler G, Öztop AY, Degerli1 S. Prevalence of intestinal parasites in three socioeconomically-different regions of Sivas, Turkey. *J Health Popul Nutr* 2005; **23**: 184-91.

[24] Abou El-Soud FA, Salama RA, Taha NS. Predictors of the intestinal parasitic infection among pre-school children in rural lower, Egypt. *Egypt J Community Med* 2009; **27**: 17-34.

[25] Shaikh GS, Begum R, Hussain A, Shaikh R. Prevalence of intestinal protozoan and helminthes parasites in Sukkur, Sindh. *Sindh Univ Res J* (Sci. Ser.) 2009; **41**: 53-8.

[26] Stauffer W, Abd-Alla M, Jonathan I, Ravdin JI. Prevalence and incidence of *Entamoeba histolytica* infection in South Africa and Egypt. *Arch Med Res* 2006; **37**: 266-9.

[27] Merid, Y, Hegazy M, Kekete G, Teklemariam S. Intestinal helminthic infection among children at Lake Awassa Area, South Ethiopia. *Ethiopian J Health Dev* 2001; **15**: 31-8.

[28] Gamboa, MI, Basualdo JA, Cordoba MA, Pezzani BC, Minvielle MC, Lathitte HB. Distribution of intestinal parasitoses in relation to invironmental and sociocultural parameters in La Plata Argentina. *J Helminthol* 2003; **77**: 15-20.

[29] Rose JB. Water reclamation, reuse and public health. *Water Sci Technol* 2007; **55**: 275-82.

[30] Wilson ME. Giardiais. In: Wallace RB. *Public health and preventive medicine*. 14th ed. New York: Appleton and Lange; 1998, p. 252-4.

[31] Wallace RM, Putnam SD. Other intestinal nematods. In: Wallace RB. *Public health and preventive medicine*. 14th ed. New York: Appleton and Lange; 1998, p. 397-401.