Prevalence of Parasitic Infections in a rural area of Karachi, Pakistan

M. I. Siddiqui,F. M. Bilqees,M. Iliyas,S. Perveen (Faculty of Health Sciences, Baqai Medical University, Karachi.)

Abstract

Objective: To find the prevalence of human intestinal pathogenic parasites.
Setting: The study was conducted in Konkor, Gadap, District East, Karachi.
Methods: After taking the verbal consent, all the villagers, selected by area sampling technique were interviewed by a structured questionnaire and then each person in the house was provided with a clean, plastic container to collect the stool samples. Samples were examined using normal saline, iodine preparation and zinc floatation techniqe where appropriate.
Results: Out of 263 residents 185 tested for intestinal parasites and 88 (47.5%) had pathogenic parasites. The distributions of parasites were Giardia lamblia 50% and Entamoeba histolytica 48.86%. Statistically none of the socio-demographic variables were associated except education and age group.
Conclusion: In the light of the study result it is concluded that there is a high prevalence of parasitic infection in the community and an intervention strategy including health education program should be designed and implemented to control parasitic infections (JPMA 52:31 5:2002).

Introduction

Role of human intestinal pathogenic parasites (HIPP) on the health of the community is significant[1-4]. Some work was done regarding the prevalence of HIPP in Pakistan[5-8] but most of these studies were either hospital based or school based[9-12]. There was no specific denominator and the results did not reflect the true prevalence of the parasitic infections in the community and the burden of disease on the health resources, both by direct impact through health services utilization and the Disability Associated Life Lost Years (DALYS). Moreover, studies indicated that a large majority of intestinal parasitic infections were asymptomatic[12,13] and these cases did not report to the laboratory hence true prevalence could not be determined. The true prevalence cannot be calculated and a large number of subjects being carriers, they are a serious threat for epidemics.
Furthermore, presence of parasitic infection resulted in poor physical, social and mental health and poor job performance and loss of employment[3]. Some studies have shown a significant association between parasitic infection, anemia, mental illness, cancer, AIDS, organic brain syndrome and even tendency to kill[14-19].
The prevalence of pathogenic parasitic infections were reported in various surveys, for the developing countries which ranged from 1l%1 through 14%[20] to 82%[21] with intermediate figures of 35.39%[4] and 8l%[8]. For developed countries the reported prevalence was between 7.3% to 23%[16,22,23]. Societies where only 20% population has access to safe water supply and sanitation[24] which is still less in the rural areas, the prevalence of parasitic infection is a common problem. Hence there was a need to conduct a community-based study in this part of the world to find out the prevalence of the parasitic infection in the community.

This study was designed to find out the prevalence of human intestinal, pathogenic parasites in the community through a carefully planned community based survey[25].

Patients and Methods

A cross-sectional study was conducted to achieve the objectives. There are 12 villages in the catchment area of primary care health center, Konkor, part of town Gadap, Karachi. People residing in this area have low literacy rate and poor socioeconomic status. They do not have access to safe water supply and no arrangement for safe disposal of excreta or refuse. The area sampling technique was adopted and four of the villages thus selected were surveyed to obtain the required informations[26].
All people irrespective of age or sex, residing since one year in the sampling areas, were included in the study. All who came to visit their relatives and friends and were not residents were excluded.
The residents were explained the purpose and benefit of the study and were assured privacy. Verbal consent was taken before the interview.
After selecting the villages the community leaders were contacted and informed the details of the survey. A questionnaire was prepared to record the social and demographic data of the population. The questionnaire was pretested in the adjacent village having a similar social and demographic back ground but not included in the sampling. Necessary changes were made in the questionnaire.
The survey was started from July 1998. Every family member in all four villages was given a clean, wide mouthed container having tight lid, that allowed ready access and visualization of the stool specimen. The specimens were adequately identified by labels indicating code number, name, age and sex. The container was provided a day earlier and the subjects advised to defecate in it the next morning. Precautions were to be taken in not diluting it with urine or water. No purgatives were to be used to obtain samples. The donors were apparently healthy subjects except a few who had any present or past, specific, definite gastrointestinal complaints which was mentioned in the questionnaire.
It was made sure that the study subjects were not on any therapy e.g. antibiotic, anthelminthic, antidiarrheal agent, antacid and hypertonic salts[27]. The specimens were collected by the principal investigator and his team and transferred as soon as possible to the laboratory to avoid loss of trophozoites. The specimenas were examined immediately in the laboratory by well-trained, qualified technicians.
Macroscopically stool samples were examined for colour, consistency, reaction, presence of mucus, presence of blood, presence of abnormal matter, presence of undigested food and presence of parasites.
Microscopically each specimen was examined as under:

1. One fresh normal saline preparation
2. One fresh Lugol's iodine preparation
3. Zinc sulfate floatation preparation2,27
4. Formalin in Ether Sedimentation Method was used for examinations of stools containing fatty substances that interfere with zinc sulfate centrifuged floatation method.

Procedure for Stool Examination
A small quantity of the selected fresh material was
placed on a warm slide with a toothpick applicator, or platinum wire, thoroughly emulsified in one or two drops of warm physiologic sodium chloride solution and mounted with a cover glass. In fluid and semi fluid stools the bloody mucous or tiny specks of tissue were selected and in formed feces the material was scraped from surface in several parts of fecal mass. The preparation was made such that it was slightly opaque but thin enough to allow newspaper print to be legible through it. The specimens were examined first by the low power 16-mm objective and then suspicious objects or selected fields were studied with the high power 4-mm objective. Trophozoites and cysts of protozoa and helminthic eggs and larvae appeared in their natural shapes and colours.

Iodine and supravital staining

The treatment of fresh glass mounts with iodine or supravital staining aids in the differentiation of protozoa. The iodine mount, which was made on the same slide as the plain mount was used for the identification of eggs and cysts.

Concentration Methods for protozoan Cysts and Helminthic Eggs and Larvae

Concentration methods fall into two main classes-sedimentation and floatation each with a number of techniques. Sedimentation is less effective than flotation technique[27]. Hence we used flotation technique. This technique is based on the difference of specific gravity of certain chemical solutions. Sugar sodium chloride or zinc sulphate were employed chiefly. The eggs and cysts float to the surface in the heavier solutions while fecal matter sinks to the bottom gradually. Zinc sulphate is a preferable solution so we used the same[2]. The optimal timings were 5-20 minutes, since the cysts tend to disintegrate after 30 minutes.

Zinc sulfate centrifugal flotation technic

This valuable method of concentrating cysts and eggs employs a zinc sulphate solution of S.G 1.180, which was made by dissolving 33 Igram of granular zinc sulphate technical grade in 1000 ml of water and adjusting to exact S.G. using a hydrometer; filtered through glass wool. For formalized feces a solution of higher S.G. 1.200 was used. It is considered to detect about 80% of eggs and cyst in light infections. It destroys trophozoite but does not impair the morphology of cyst for about an hour.

Procedure

A fine suspension was made by comminuting Igram of freshly passed feces in about 10 ml of luke warm tap water. In order to remove the coarse particles, the suspension was strained through one layer of wet cheesecloth in a funnel into a small test tube, 100 by 13mm. The suspension was centrifuged for 1 minute at 2300. The supematant fluid was poured off, about 2 ml of water was added, the sediment was broken up by shaking or tapping and additional water was added to fill the tube. The washing and centrifuging was repeated until the supernatant was fairly clear. Usually it was necessary to do it three times. The last supematant fluid was poured off, about 2 ml of zinc sulfate of specific gravity 1.180 was added, the sediment was broken up and sufficient additional zinc sulfate to fill the tube to the rim was added. A cover glass was placed over the top of the tube, which was centrifuged again for I minute at 2300 cycles/minute. The cover glass was removed and mounted on a clean slide in a drop of Lugol's iodine solution for microscopic examination. The data was entered, cleaned and analysed in Epi info version 6.4 (CDC Atlanta, USA).

Results

Of the total 263 residents in the four villages, 185 consented to give stool for examination. Rest of the persons either refused directly or did not comply even after four to five repeated visits. Hence the response rate was 70%. Regarding socio-economic and demographic variables the study population had the similar picture as in other rural parts of Pakistan (Table 1).

Table 1. Demographic and Socio-economic characteristics of the studied population.

Age	Below 18	18 and above			
	114 (61.6%)	71 (38.4%)			
Sex	Female	Male			
	96 (51.9%)	89 (48.1%)			
Ethnic Group	Sindhi	Balochi	Mixed		
	98 (53%)	81 (43.8%)	6 (3.2%)		
Type of Houses	Mud House	Half Cemented	Full Cemented		
	62 (33.5%)	100 (54.1%)	23 (12.4%)		
Memebers per Family	<5	5-8	>8		
	67 (36.2%)	93 (50.3%)	25 (13.5%)		
Family Income	<1000	1000-1999	2000-2999	>3000	
	10 (22.2%)	26 (57.8%)	5 (11.1%)	4 (8.9%)	
Education Status	Illiterate	Primary	Secondary	Higher	N.A.
	78 (42.2%)	62 (33.5%)	15 (8.1%)	4 (2.2%)	26 (14.1%)

Out of those who gave their samples, 87 had no infection of any kind and were declared as clean. Ten had only commensals; 76 had only pathogens while 12 had both commensals as well as pathogens. The present study showed a prevalence of human intestinal pathogenic parasites (HIPP) to be 47.5%. Out of 88 infected with HIPP, 35 (39.8%) were suffering from 0. lamblia while 38 (43.2%) were harboriwg E. histolytica. The ratio of subjects with cystic, pre-cystic and vegetative form and those with both of E. histolytica and Gardia lamblia are shown in Table 2.

Table 2. Relative proportion of cases for cystic and non-cystic (vegetative; precystic) form of E. histolytica and Giardia lamblia among the residents of Konkor, Karachi.

	E.histolytica		G. lamblia	
Group	No.	%	No.	%
1. Positive for precyst and vegetative form only	18	46.5	7	16.0
2. Positive for cyst only	20	41.9	24	54.5
3 Positive for both	5	11.6	13	29.5
Total	43	100.0	44	100.0

The prevalence of infection in the different age groups and association with gender, ethnic groups, nature of residence, socioeconomic status and education are shown in Table 3.

Table 3. Association of various socioeconomic and demographic variables with the prevalence of infection.

Variables	Categories					Chi-Square	P-value	Difference
	Infection / No Infection							
Sex	Female		Male			0.01	0.92	
	46/50		42/47					
Age	Adult		Child			4.18	0.0408	
	27/44		61/53					Significant
Ethnic	Sindhi		Balochi		Mixed	1.10	0.57	
Group	50/48		35/46		3/3			
Members	<5		5-8		>8			
Per	35/32		43/50		10/15	1.23	0.541	
Family								
Type of	Mud house		Half cemented		Full cemented	0.62	0.73	
Houses	29/36		45/44		14/17			
Income	<1000	1000-1999		2000-2999	>3000	1.03	0.769	
in rupees	22/18	50/60		10/12	6/7			
Education	Illiterate	Primary	Matric	Higher	NA			
	40/38	24/38	4/11	2/2	18/8	11.74	0.019	Significant

*Fisher exact test.
First figure in each cell shows "infection" and second "no infection".

The statistical assessment was made by utilizing the Chi square test and p value.

Table 4. Distribution of pathogenic parasites by age and sex.

Age Group	Male			Female			Grand Total
	Protozoa	Helminths	Total	Protozoa	Helminths	Total	
0-9	15	1	16	18	5	23	39
10-19	17	1	18	9	1	10	28
20-29	2	0	2	8	2	10	12
30-39	4	0	4	3	1	4	8
40-49	1	0	1	3	0	3	4
50-59	1	0	1	2	0	2	3
60-69	2	0	2	1	0	1	3

Table 4 projects the distribution of pathogenic parasites by age and sex. It was observed that more protozoa than helminths were detected in this study, all were found in larger number in subjects below 18 years age.

Discussion

The role of human intestinal pathogenic parasites (HIP?) on the health of the community has been highlighted by many authors both at national[1-7] and international levels[15-19]. The studies conducted in Pakistan were either school based[11,15] or hospital based[2,4,9], while many community based studies were mostly conducted at international level to find out the true prevalence of the parasitic infections in the community[3,28]. It is important to conduct a community based study because you cannot find the denominator i.e., the population, in the hospital based/school based studies. Moreover, the cyst passers are always a threat to community as they keep on spreading the disease silently.

Results of our study showed that ninety eight individuals (53%) had parasitic infection either pathogenic or commensals and 88 (47.54%) were suffering from pathogenic parasitic infestation. This is a much higher figure compared to that reported by others[4,12,16,20,22,23]. It is less than results of studies published earlier[12,29,30].This difference could be due to poor living conditions, use of unsafe water supply, improper disposal of waste and poor sanitaiy conditions. These factors were reported by other authors as well along with a climatic difference and temperature and humidity[2,3,4,9,20].

The distribution of parasites in the community in our study was 87 (47.02%) had no infestation of any kind, 10 (5.4%) only commensals, 76 (41.08%) had only pathogens and 12 (6.5%) both commensals and pathogens. This is a much higher figure as compared to Farooki[12] who reported 29.3% having no infection, 47.3% only commensals, 17% only pathogens and 6.2% both pathogens and commensals. True prevalence must have been higher than what was obtained in the survey because repeated examinations are more revealing and passage of parasites varies from day to day. However from the published literature, it becomes evident that in most surveys carried out in various parts of the globe, only one stool specimen was examined[1-4,12,15] Skill and interest of the individual worker is a great factor in detecting the parasites and 75% of infections may be found by examining a single specimen[12].

The distribution of pathogenic parasites in our study was G. lamblia 23.78% and E. histolytica 23.2%, H. nana (5.4%) and A. lumbricoides (1.1%).

Farooki12 (n=224) showed almost the same type of organism with the same ratio i.e., E. histolytica 11.6%, Giardia lamblia 12.1%, H. nana 1.3% and thread worms 0.4%. No other parasites were detected in the 224 medical students of Multan while in children of Multan (n=3 15) Farooki 1964 1 found 13 (4.1%) E. histolytica, 58 (18.4%) Giardia, 19 (6.1%) H. nana 3 (.95%) hookworm and 3 (.95%) thread worms. Ghauri and Alam[9] (n=8894) found Giardia 25.9%, followed by H. nana 16.7%, E. histolytica 16.2%, Ascaris lumbricoides 15.4%, hookworm 15%, T. trichuria 5.0%, Taenia spp 3.2% and E. vermicularis 2.0%. Qureshi et al[20] (n=12640) found Giardia as 5.99%, Taenia 5.92%, H. nana 2.13%, Ascaris lumbricoides 2.92%, hookworm 1.95%, T. trichuria 15%, E. Histolytica .07% and E. vermicularis .01%. While Rajper[4] (n=5210) reported E. histolytica 43.85%, Giardia 27.25%, Ascaris lumbricoides 11.5%, Ankylostoma duodenale 4.95%, H. nana 4.18%, E. vermicularis 4.04%, T. trichuria 2.84% and Taenia 1.59%.

Varied percentage of helminthic infection were found in different studies as compared to present one in which the helminths were found to a lesser percentage. But in most of the studies conducted in Pakistan including the present study, it was observed that the three top ranking parasites were two protozoan (Giardia lamblia and E. histolytica) and one helminth parasite (H. nana). Regarding the cystic and precystic forms of E. histolytica we found 41.9% cases with cystic forms only and 46.5% with precystic

forms. There were only 11.6% cases who had both.

Our results were significantly different from Farooki[12] who found 31% precystic, 31% of cystic and 38% of both. A high ratio of cystic form 46.5% signifies the potential risk of epidemic.

With respect to Giardia we found 16% positive for vegetative forms only, 54.5% for cysts and 29.5% for both. Bilqees and Ali[12] found 100% of cysts and no flagellate, while Farooki[12] reported 25 (92.6%) cysts, 1(3.7%) flagellate and 1(3.7%) both. Our results were significantly different from other studies.

Studies from developed countries have a different result. Giacometti[16] found T. Trichuria as the dominant parasite in Italian institution followed by Giardia, Cryptosporidium parvum oocyst and Balantidium coli cysts, while no E. histolytica was reported. Schupf et al[22] found the two most prevalent parasites, among the dwellers of New York, as Enterobius vermicularis (4.5%) and Strongyloides stercoralis (1.2%), with a total prevalence of HIPP as 7.3%.

Esfandiari et al[17] reported a high prevalence of Giardia (55%) in the AIDS Clinic of Los Angeles followed by 10% for sospora belli and 6% for Cryptosporidium. Mohamed et al[28] found T. trichuria in 56% cases followed by A. lumbricoides in 40.6% and A. duodenale in 2 1.33%.

None of the studies conducted at national level ever reported Cyclospora cayetanensis as reported by David et al[31], the most frequently found parasite in his study (11.5%) along with E. histolytica (6.3%), E. disper (2.8%) and Giardia (3.5%).

Ratio of protozoal to helminthic infection in present study was 6.4:1 while Qureshi et al[20] found a ratio of 0.7:1, Ghouri and Alam[9] 0.79:1, Farooki1 1.4:1, Rajper[4] 2.46:1, Bilqees and Ali8 3.5:1 while Farooqi[12] reported a ratio of 12.4:1 in medical students of Multan. None of the studies reported the ratio, close to present study. It was either very low (0.7-3.5%) or very high (12.4%). It was observed that while moving from plain to coastal area the ratio of protozoal to helminthic infestation keeps on changing 0.7:1 in Islamabad (Qureshi et al[20]), 0.79:1 in Sargodha (Ghauri and Alam[9]), 1.4:1 in Multan (Farooki1) 2.46:1 in Nawabshah (Rajper[4]) and 3.5:1 in Karachi (Bilqees and All[2]) and the present study in Karachi showed the ratio of 6.4 :1 towards a more dominance of protozoal infection.

Another observation was a high ratio of protozoa to helminthic infection in community based surveys as evident by present series 6.4:1 and Farooki[12] 12.4:1. This could be due to the reason that a large number of protozoal infection are cyst passers and remain asymptomatic and only could be detected through surveys.

There was significant association observed between the two age groups i.e., “child and adult” and the “presence of infestation” (chi-square 4.18 and p value =0.0408) with a ratio of child to adult as 2.26:1 . Gouzaga et al[3] also report a high prevalence in the age group 15 or less (Chi-< 0.05. Child specificity was also reported by Bilqees and All[2]. The ratio of children to elder age group was 3:1. There was no significant association found between the infection and the type of other variable.

It is concluded that not only a high rate of intestinal parasitic infections exists in the community but many of them are cyst passers which could be a potential threat of epidemic to the community. This high rate of infection could possibly be due to impoverished sanitary conditions, lack of safe water supply and poor maintenance of personal hygiene.

It is recommended that there is an urgent need of identification and confirmation of the factors responsible for the spread of the disease in our community through a prospective study designed and development of a comprehensive health education program and treatment of the infected persons to eliminate this menace from the community.

Acknowledgement

The author would like to thank Prof. Ghulam Mustafa Qureshi, for providing the laboratory support.

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