ORIGINAL ARTICLE

Demographics of Intestinal Parasitic Infections in Karachi: An Insight from Positive Stool Samples

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ABSTRACT

Objective: The objective of this study was to study the demographics of intestinal parasitic infections and find out the relative frequency of different intestinal parasites in clinical samples received for routine stool examination from symptomatic patients with diarrhea and/or dysentery.

Study Design: A Retrospective cross sectional study.

Place and Duration of Study: The study was conducted at Dow Diagnostics Research and Reference Laboratory, Karachi, Pakistan from January 2008 to December 2013 of stool analysis from the patients with symptoms of diarrhea and/or dysentery.

Materials and Methods: Microscopic stool examination was performed using direct samples by wet mount under low as well as high power bright field magnification. Tabulations were performed using Microsoft Excel while Chi-square test was applied using Open-epi software.

Results: Among the 1815 positive cases infected with single parasites, *Entamoebahistolytica* was the most commonly found parasite, followed by *Giardia labmlia*, *Blastocystishominis*, *Ascarislumbricoides* and *Hymenolepis nana*. Among these patients, 1081 (59.6%) were males and 734 (40.4%) were females. Chi-square test was applied using open-episoftware, which showed significant differences among males and females (p=0.03).

Conclusion: Protozoal intestinal parasites *Entamoebahistolytica* and *Giardia lambliaare* the commonest among all age groups followed by the helminths *Ascaris lmbricoides* and *Hymenolepis nana*. Other notable parasites include Entamoeba coli and Taenia species.

Key Words: *Intestinal Parasites, Parasitic Infections, Entamoeba Histolytica, Giardia Lamblia.*

Introduction

Parasitic infections are a major public health issue in developing world, which affects around 3.5 billion peopledirectly[1] and indirectly.[2] They are mostly endemic and specific parasites are prevalent in particular areas, therefore disease pattern is different in different geographical settings. These diseases are associated with climatic conditions, poor sanitation, unsafe drinking water and lack of personal hygiene in tropical and sub-tropical countries.[1,3] They are a major cause of morbidity and mortality and are responsible for chronic diseases such as iron deficiency anemia,[4] growth retardation in children,[5] physical and mental health problems and diarrheal diseases,[6] which are a major cause of death in Pakistan India, Bangladesh and other developing countries.[7]

Previous population based reports from Pakistan show Giardia lamblia to be the most common parasite in Karachi followed by *Ascaris lumbricoides*[8] and *Entamoeba histolytica*[9], though the reports from Bannu and Peshawar (cities situated in Northern Pakistan with a comparatively cold climate) showed Ascaristo be the commonest parasite infecting the school children followed by *Enterobiusvermicularis* and *Hymenolepis nana*.[10,11] Reports from Muzaffarabad, a city located further North showed Giardia to be the commonest followed by *E. histolytica*.[12] Karachi has a semi-arid warm and humid climate and it is home to a number of infectious parasites. Most common parasites reported up to date are *Entamoeba species*, *Ascaris, H. nana, Giardia*, *T. trichura* and *Taenia species*.[8,9,13] However, the present studies are either old[9] or do not cover the age groups other than children,[8,13] which is also affected by the parasitic infections and add a considerable bulk to the disease

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burden. Therefore, a retrospective study was performed to assess the relative disease burden of different parasites across different demographic groups, so that a snapshot can be generated regarding relative frequency of different parasites in symptomatic patients. To study the relative frequency of these parasites in samples from patients coming with diarrhea and/or dysentery results from laboratory records were analyzed for the period of 2008-2013 and were stratified according to age and gender.

Materials and Methods

The retrospective cross-sectional study based on the laboratory records was carried out in the Dow Diagnostic Research and Reference Laboratory of Health Sciences Karachi from January 2008 to December 2013.

All positive stool samples received for routine stool examinations were included in the study, while those which were negative for parasites, ova or cysts were excluded. A total of 1873 positive samples were included in data analysis.

Stool samples were collected in sterilized leak proof containers from patients after detailed informed consent. Departmental approval was taken for the study,diagnostic data were de-identified and tabulated without patients' particulars.

Each sample was initially examined physically for consistency, color, odor, blood and mucus. Slides were then prepared directly for wet mount by placing a drop of fresh physiological saline at one end of the clean side, while a drop of iodine was placed at the other end. Stool samples were mixed with wooden stick and a small amount was then taken for saline and iodine and covered with cover slip. These were microscopically examined under low (10× = 100 times magnification) and high (40× = 400 times magnification) power bright field for worms, ova, larvae, trophozoites, cyst, erythrocytes, leukocytes and any intestinal mucosal sloughing.

Diagnosis was made by observing the differentiating morphological features of protozoal cysts and trophozoites and parasitic ova and larvae. For *Entamoeba histolytica*, cyts were identified on the basis of presence of four or lesser number of nuclei, while trophozoites were identified as having ingested RBCs and differentiated from *Entamoeba coli* on the basis of more than five nuclei in cysts and trophozoites without RBCs. *Iodamoeba butschlii* was identified on the basis of cellular morphology and presence of a single nucleus in Iodine preparation.

Blastocystis hominis was identified on the basis of cyst-like forms having a large central body resembling like a large vacuole surrounded by small, multiple nuclei. Ova of *Hymenolepis nana* were identified on the basis of appearance as they are round to oval with two distinct walls and having 4-8 hair-like processes at each pole on the inner aspect along with three pairs of hookletswithin the inner wall. Ova of *Ascaris* were identified the basis of yellow brown color with thick shells having an albuminous outer coat and thick transparent wall under the shell.

Tabulations were performed using Microsoft Excel[14] while Chi-square test was applied using Open-epi software.[15]

Table I: Gender-wise proportion of infections in patients detected using stool examination

Parasite	Male (n=1081)	Female(n=734)	X^2	Degree of Freedom (Df)	p-value
Entamoeba histolytica	400	321			
Entamoeba coli	66	30			
Giardia lamblia	369	211			
Ascarislumbricoides	56	34			
Iodamoeba butchii	14	13	15.74	7	0.03
Hymenolepis nana	46	24			
Taenia species	9	5			
Blastocystis hominis	120	95			
Trichuristrichura	1	1			
Total	1081	734			

Table II: Gender-wise proportion of infections in patients using stool examination stratified by age

	<3		3-18		>18	
Parasite	Male	Female	Male	Female	Male	Female
Entamoebahistolytica	15	10	114	88	271	223
Entamoeba coli	2	0	13	4	51	26
Giardia lamblia	47	39	157	88	165	84
Ascarislumbricoides	3	5	20	11	33	18
Iodamoebabutchii	0	0	2	3	12	10
Hymenolepis nana	2	3	38	15	6	6
Trichuristrichura	0	0	0	0	1	1
Taenia species	2	1	0	1	7	3
Blastocystishominis	1	4	44	30	75	61
Total	72	62	388	240	621	432

Results

Among the 1815 positive cases infected with single parasites, 1081 (59.6%) were males and 734 (40.4%) were females. *E. histolytica* was the most commonly found parasite in these patients, followed by *G. labmlia, B.hominis, A. lumbricoidesand H. nana*. A chi-square test was appliedusing Open-episoftware, which showed significant differences among the two groups (p=0.03).

Data were stratified according to age groups and gender. It was observed that most commonly affected group was adult males, and altogether 1081 males were found to be mono-infected, most commonly with *E. histolytica*(n=400) followed by *G. lamblia*(n=369) and *B.hominis* (n=120). Similar pattern was observed in females and E. *histolytica*(n=321) *G. lamblia*(n=211) and *B. hominis* (n=95) were found to be the most common parasites infecting adult females.

However in patients, who were three years of age, *G. lamblia* was found to be the most common parasite, in both males (n=47) and females (n=39). In children, the most common parasites were again *Giardia* and *E. histolytica*, though trends were different in males and females as in males *Giardia*(n=157) infection rate was detected to be higher than *E. histolytica*(n=114), though in females both infections were found in equal frequency (n=88).

Some of the patients were found to be infected with two parasites (n=52), while very few were triply infected (n=6). Organisms found in these cases were mostly *G.iardialamblia, E. histolytica, H. nana, E. coli, I. butschlii* and *A. lumbricoides.*

Discussion

The study found a number of parasitic agents more common in the clinical samples received in Karachi. In our results protozoans like *E. histolytica* and *G. lamblia* are among the commonest finding in the local population, with a higher proportion in males as compared to females. Though these protozoal parasites are present in all ages, their high prevalence among children is particularly of concern as amoebiasis can lead to liver abscess, resulting in severe morbidity and mortality. These two parasites have also been reported to be among the commonest in other studies performed in Karachi, which shows that the pattern has not changed over the years.[8,13,16] Though the two studies performed earlier found *Giardia* to be more common than Entamoeba[8,9] the difference in our findings could simply be explained by the fact that these two studies were population based studies, while our study was mainly performed upon clinical samples. Since both these organisms are spread by contaminated food and water. It is unfortunate that the sanitation and water supply conditions have not improved over the years and is the major contributing factor towards parasitic spread. The lack of hygienic living, inadequate health literacy and poor health-related practices among the uneducated and low-socioeconomic classes could also be considered important contributing factors towards this situation. An improved water surveillance system and health advocacy activities among the affected population may help in reduction of the burden of these diseases. *Giardia* infections should be of particular concern in infants and toddlers because they may be related to malnutrition resulting in growth problems.[17]

These findings are somewhat slightly different from the Northern Parts of the country as reports published from Bannu and Peshawar showed *Ascaristo* be the commonest parasite infecting the school children followed by *E. vermicularis* and *H. nana*[10,11] which may be attributed to different climatic conditions or other unknown factors.

Presence of helminths such as *A. lumbricoides* and *H. nana* must be considered important as faecooral transmission of cysts and ova is common and untreated cases in the population may keep on passing the pathogens to those at risk.[3] Since, these parasites along with others have been related to malnutrition in children, their testing and eradication should be a priority for the community.[18,19]

Since our study is based on clinical samples, it has its limitations and it may not reflect the exact picture in the community, however it clearly shows the type of intestinal parasites present in the population and highlights the need to develop a strategy to deal with the issues associated with them. A detailed community based survey is necessary to get the exact prevalence measures of intestinal parasitic infection in the local population.

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