

Helminth Associated Infections Among Residents of Karachi

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ABSTRACT

Background: Helminth parasite affects approximately 2 million individuals yearly throughout the world. These infections are extremely important while often receive inadequate consideration. Helminths are among the gastrointestinal parasites mainly involved in an increased ratio of inflammatory bowel disease, especially in underdeveloped and developed countries.

Objectives: To study the prevalence of helminth eggs in stool samples collected from five hospitals of Gulistan-e-Johar area of Karachi, Pakistan, among different age groups of male and female patients with the targeted age groups < 1-14, 15-40 and > 40 yrs.

Methodology: All the samples included in the study were collected according to ethical review board policy of the participating hospital. Stool samples were obtained from a total of 1042 patients, of which 198 samples were found to be positive for helminth eggs. The helminths included were *Ascaris lumbricoides*, *Ancylostoma duodenales* and *Hymenolepis nana*.

Results: The association between helminth infection (*A. lumbricoides*, *A. duodenale* and *H. nana*) and age group was found to be significant. Results are based on the chi-square test. Samples from males showed a noticeable prevalence of helminths than females samples. Single, double and triple infections were also recorded.

Conclusion: Present study could be very beneficial for developing programs not only for awareness in the urban and rural populations, but also for the control of infections due to helminths in Pakistan.

Keywords

Helminth infection, *A. lumbricoides*, *A. duodenale*, *H. nana*.

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INTRODUCTION

The helminth parasites affect more or less two million people worldwide every year¹. So far, 342 species of helminths are associated with humans, amongst those 197 are the inhabitant of the human gastrointestinal tract². A high rate of infection with helminth parasites may lead to severe anemia, malnutrition and loss of productivity in the workplace. It was reported that almost 819 million people are infected with *Ascaris*, 464 million with *Trichuris* and 438

million with Hookworms (*Ancylostoma* and *Necator*) amongst the rural population of the world especially, where sanitation facilities are improper³. In random samples of 1313 children aged 1 month to 12 years in villages, in nine rural districts of Southern Laos Peoples Democratic Republic was enrolled and examined for helminths prevalence using duplicate Kato-Katz thick smears. They recorded considerable morbidity among the surveyed

children which included hepatomegaly (13.7%), abdominal pain (13.2%), and anemia (60.4%) with significant signs of low body mass index and stunting. The most common worms were Hookworms and *Opisthorchis viverrini*⁴. This study summarized the clinical aspects, biology, diagnosis, treatment and epidemiology for the common and rarer human intestinal Cestodes⁵. The immunology of infections with helminths was also reported⁶.

Increased prevalence of intestinal helminths infection during pregnancy in the Sub-Saharan African community was reported. In this survey 105 pregnant women were recruited and found positive as compared to the same number of non-pregnant⁷.

In another study, intestinal helminth parasites with respect to nutritional status of children aged 6-14 yrs attending school in Waskiso District, Central Uganda was noted and found that the prevalence of stunting was 22.5%, underweight 5.3% and moderate acute malnutrition 18.5%, respectively. The prevalence of parasites namely *Trichuris trichiura* was 10.9%, *Schistosoma mansoni* was 1.9% and *Ascaris lumbricoides* was 0.2%⁸. It was reported that in studies conducted in Pakistan, the focus was mostly on school children, low-income group and rural populations⁹.

In southern Malawi, the urban/rural difference along with risk factors for intestinal helminth infection was studied. Surprisingly, the overall prevalence of helminth infection was higher in urban as compared to rural subjects¹⁰.

Relations of helminths with human allergy was studied and suggested that they are of significant importance to epidemiologist as well as immunologists¹¹. The relationship between the frequency distribution of *A. lumbricoides* and intensity of infection in human communities was reported. The factors responsible for this relationship in the human population required further study but may involve some combinations of (i) density-dependent reduction in worm number within individuals, (ii) density-dependent parasite-induced host motility or (iii) self-treatment by heavily infected host¹².

The prevalence of *Taenia saginata* and *Hymenolepis nana* infection amongst farmers, education concerned people, and shepherds of Swat were studied and found shepherds to be more prone to infection as compared to other groups¹³. The incidence of intestinal parasitic infections for in- and outpatient visiting King Fahd Medical City, Riyadh,

S. Arabia for a period of five years was reported. *T. trichiura* and *H. nana* were prevalent and further suggested that updating the epidemiological survey of parasites at regular intervals using statistical methods¹⁴.

Work on treatment and diagnosis of intestinal helminths including *Hymenolepis*, *Taenia*, *Diphyllobothrium latum* and *Dipylidium caninum* was carried out. Niclosamide and Praziquantel are the drugs for choice for tapeworm infections¹⁵. Studies on the intestinal helminths risk factors for developing active tuberculosis in patients were made¹⁶. The most prevalent helminths in humans were *A. lumbricoides*, *T. trichiura* and hookworms, and there are now approximately one billion infections with each of these worldwide¹⁷.

Since, the economic burden of helminths in humans along with their co-endemicity with Acquired Immunodeficiency Syndrome (AIDS) and malaria¹⁸, is also very obvious in many of the study groups, therefore, it is important to launch awareness for controlling human helminth infection in Karachi. The drugs currently being used as anti-helminth are albendazole, praziquantel, oxamniquine and ivermectin along with the drugs developed in the early twentieth century i.e. diethylcarbamazine and mebendazole, which are the only compound medicines being used around the world.

Moreover, scarcity of available anti-helminth drugs reflects the deprecating commercial markets for human helminth infections and shows how little we know about the metabolism and mechanisms of helminths by which these parasites avoid human defense against them.

As far as the soil-transmitted helminths are concerned, WHO has suggested the use of both prevalence and intensity of infection to explain communities into transmission categories¹⁹. The present study was carried out in age groups <1-14 yrs, 15-40 yrs and > 40 yrs, to study the prevalence in male and female patients of different age groups, and whether there was single, double or triple helminth ova in various age groups of *Ascaris lumbricoides*²⁰, *Ancylostoma duodenale*²¹ and *Hymenolepis nana*^{22,23} among individuals visiting five different hospitals in Gulistan-e-Johar area of Karachi, Pakistan.

MATERIAL AND METHODS

From Oct 2018 to Sep 2019, 198 samples were found to be positive from 1042 examined with helminths namely *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Hymenolepis nana* eggs in stool samples collected from Al-Shifa Medical Hospital, Family Care and Children Health Hospital, Darul-Sehat Hospital, Batool General Hospital and Darul Shifa Hospital, Gulistan-e-Johar, Karachi. The subject belonged to all age groups visiting these hospitals. The age groups were grouped < 1-14, 15-40 and > 40 yrs. The samples were collected in a sterile stool collection container carrying an identification number and a disposable wooden spatula. All samples were transported to the Parasitology Laboratory, Department of Zoology, University of Karachi where samples were immediately examined by direct smear technique for helminth eggs²⁴. Eggs were photographed using (Optiphot-2) photomicrographic camera. For quality control, all the slides were double read by an exchange between the parasitologists. For each data set chi-square (χ^2) contingency table was analyzed to test the association of age groups and helminth infection.

RESULTS

The three types of helminth eggs recorded in the present study were *A. lumbricoides*, *A. duodenale* and *H. nana* (Fig. 1a-c).

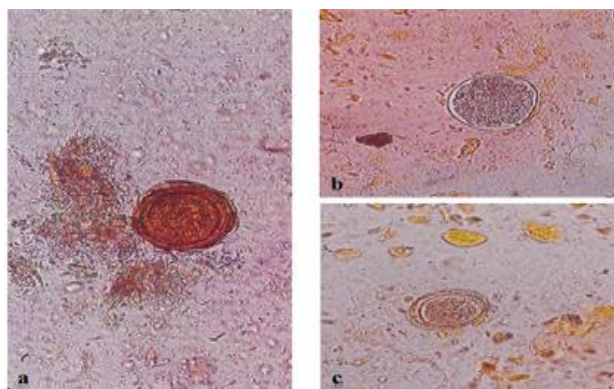


Fig. 1a-c. Eggs of **a**, *Ascaris lumbricoides*; **b**, *Ancylostoma duodenale* and **c**, *Hymenolepis nana* isolated from stool samples.

The chi-square between age groups and infection with three types of helminths eggs was found to be significant ($\chi^2 = 28.038$, with $df = 4$, $p < 0.001$) (Table. 1). *A. lumbricoides* and *A. duodenale* were most frequent in age group < 1-14 yrs, whereas *H. nana* prevalence was equally found in age groups < 1-14 yrs and 15-40 yrs. The chi-square between age groups in male/female individuals with helminth infection was found highly significant ($\chi^2 = 81.332$, $df = 10$, $p < 0.001$) (Table. 2). Male patients had more prevalence of helminths eggs in stool as compared to females.

The association tested by chi-square between age groups having single, double and triple infection with helminths was found to be significant ($\chi^2 = 58.205$, $df = 4$, $p < 0.001$) (Table. 3). In the age group, 0-14 yrs single infection was most common, while in the age group 15-40 yrs and > 40 yrs triple infection was most prevalent.

Table 1. Infection of Three Different Helminths in Various Age Groups. (Total Tested Samples; N=1042)

Age (Years)	Helminth Species		
	<i>Ascaris lumbricoides</i>	<i>Ancylostoma duodenale</i>	<i>Hymenolepis nana</i>
< 1-14	30	10	0
15-40	46	6	12
> 40	24	24	4

($p < 0.001$) $\chi^2 = 28.038$ $df = 4$

Table 2. Infection in Male and Female Individuals Showing Positive Helminth Infection. (Total Tested Samples; N=1042)

Age	Positive		Positive		Positive	
	Male	Female	Male	Female	Male	Female
< 1-14	32	16	24	0	0	0
15-40	36	10	4	2	10	2
> 40	24	24	16	32	8	8

(p < 0.001) chi-sq = $\chi^2 = 81.332$ df= 10

Table 3. Number of Individuals with Single, Double and Triple Helminth in Various Age Groups. (Total Tested Samples; N=1042)

Age	Total individuals positive	Single infection	Double infection	Triple infection
< 1-14	64	32	16	16
15-40	64	4	6	54
> 40	60	20	0	40

(p < 0.001) chi-sq = $\chi^2 = 58.205$ df= 4

DISCUSSION

Soil-transmitted human helminth infections occur in large parts of the world, including Pakistan. In the urban areas due to inappropriate sanitation, bad water quality and frequent use of open defecation locations in slum areas, there is no proper community education to prevent and control helminth infection^{9,25-29}.

Actual prevalence must have been higher than what was obtained in this study, because the majority of the urban population takes medicines prior to stool test simply because of diarrhea. At the same time, since only a single stool sample was collected, the actual number of parasites or their eggs/ova may vary from time-to-time and day-to-day. It was reported that collecting a single sample may not show the actual population of helminths^{30,31}, while three consequent samples are always considered more appropriate. It was stated that approximately one billion people are currently infected with the directly transmitted nematodes; *A. lumbricoides* and *A. duodenale*³². *H. nana* infection have been found to be more common as compared to *A. lumbricoides* in Konkor, Gadap District East, Karachi³³. *H. nana* was recorded 1.3% in medical students of Multan³¹, whereas approximately 0.95%

H. nana and 15.4% *A. lumbricoides* were reported in a study conducted in Sargodha³⁴. *H. nana* was found to be more common compared to *A. lumbricoides*, but did record *A. duodenale* in Islamabad and Rawalpindi areas³⁵. In another study, *A. lumbricoides* (11.5%), *A. duodenale* (4.95%) and *H. nana* (4.18%) were found in samples from food handlers³⁰. In Muzaffarabad District, *A. lumbricoides* (3.8%) and *H. nana* (1.7%) were found in tested samples, but *A. duodenale* was not reported⁹. A vast majority of infections are asymptomatic pathological manifestations and depend on metabolism, size, the activity of the worm. The most obvious forms of direct damage is blockage of internal organs or from the effects of pressure caused by growing parasites, thus, the mucosa of intestine reflects chemical and physical damage of tissue³⁶. It was found that *H. nana* and *Enterobius* remained relatively common parasites of humans in many parts of Iran. It was reported that *Hymenolepis nana* was found (19%) in children aged 2 to 15 years who were referred to the main pediatric health center of Lorestan province, Iran³⁷.

The changes occurring in climate plays an important role in determining the future viability of human helminth parasites³⁸. Similarly, the time distribution pattern of disease may alter as a result of changing lifestyle of the

people of a particular region³⁹. The most common drugs being prescribed by medical practitioners in these five medical centers were mebendazole and albendazole.

Determination of occurrence and intensity of human helminth infection is an important tool / method for selective use of preventive cytotoxic drugs and to develop comprehensive programs both in rural as well as urban population along with mass awareness programs and must be launched for the helminth control.

CONCLUSIONS

The direct damage of helminths is from the blockage of internal organs or the pressure caused by growing parasites. Contaminated food must be avoided, hands must be thoroughly washed before eating, after using the bathroom and in a direct contact with animals, faeces and pre-school aged children. Avoid eating improper washed salads and usage of water that may be contaminated with sewage, faeces or wastewater runoff near storm drains.

CONFLICTS OF INTEREST

None.

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None.

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None.

LIST OF ABBREVIATIONS

<i>A. lumbricoides</i>	<i>Ascaris lumbricoides</i>
<i>A. duodenale</i>	<i>Ancylostoma duodenale</i>
<i>H. nana</i>	<i>Hymenolepis nana</i>
Yrs	Years

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