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Original Research Article

An analytical study of intestinal parasitosis in children

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ABSTRACT

Background: Intestinal parasitosis (IP) is an important public health problem worldwide, most commonly seen in school age children and lead to nutritional deficiency, anemia and impaired cognition. Dearth of data regarding parasitic prevalence in the pediatric population triggered such a retrospective study planned by the Departments of Pediatrics and Microbiology, of two Medical Colleges whereby all the symptomatic children (>1 year and <12 years, divided into less than 5 year and 5-12 year groups) were examined for IP.
Methods: Total 1000 parasite positive stool samples were collected for a period of two years and included for the study. Routine macroscopic and microscopic (saline and Lugol's iodine wet mounts) examinations were carried out for the presence of ova, cysts and parasites.
Results: Out of the 1000 positive samples, *Enterobius vermicularis* was predominant with 287 (28.7%) of all cases. The next in order were *Giardia lamblia* 243 (24.3%), *Entamoeba histolytica* 219 (21.9%), *Ascaris lumbricoides* 143 (14.3%), *Ancylostoma duodenale* 39 (3.9%), *Taenia* 27 (2.7%) and others 42 (4.2%). The distribution of parasites were heavier among the 5 to 12 year group (74.6%) than the below 5 year one (25.4%), with single parasitic isolate. Lack of hygienic practices like open field defecation, faecal contamination of water and improper hand washing aggravate infestation.
Conclusions: Thus our study revealed that steps are to be taken by both the government and society to promote healthcare awareness in mothers, and mass scale deworming through school campaigns in order to lower the parasitic burden in children.

Keywords: Intestinal parasitosis, Analytical study, Children

INTRODUCTION

Intestinal parasitic infections are believed to be the most common and important public health problem worldwide. They constitute the greatest universal cause of morbidity and mortality. It is estimated that 60% of the world population is infested with enteric parasites.[1] The parasitic diseases continue to be a significant health problem in both developed and developing countries. The WHO estimates that one person in every four harbors parasitic worms. The parasitic infestations prevalent in the developing tropical countries are spreading to the developed non-tropical countries by the tourists, soldiers, or immigrants.[2] These infestations are most common in school age children and lead to nutritional deficiency, anemia, growth retardation and impaired learning ability.[3]

The commonest parasitic infestations reported globally are *Ascaris* (20%), *Ancylostoma duodenale* (18%), *Trichuris trichiura* (10%), and *Entamoeba histolytica*

(10%). The prevalence of parasitic diseases depends upon a variety of socio-economic and environmental factors. Poverty, low literacy rate, poor hygiene, lack of access to potable water and hot, humid tropical climate are the factors associated with high prevalence of intestinal parasitic infestations in developing countries.[4] Most of the people are illiterate belonging to low socio-economic class and lack awareness about importance of sanitation, personal and environmental hygiene with respect to health. The intestinal parasitic infestations are acquired by ingestion, inhalation or penetration of skin by infective forms and their high incidence is closely correlated to poverty and poor environmental hygiene.[3] Such factors have a direct bearing on the frequency of parasitic infestations, and consequently the prevalence of infestation varies in different states of India.[5]

In the recent past, there is dearth of data regarding the overall intestinal parasitic prevalence trend among the pediatric age group in India. Therefore, such a retrospective study was planned by the Departments of Pediatrics and Microbiology, of two Medical Colleges whereby all the symptomatic patients from the Pediatrics Department were referred to the Microbiology Department for routine stool examination in order to detect the intestinal parasites in that population.

METHODS

The study conducted is a retrospective one undertaken at two Medical colleges and Hospital, one situated at West Bengal and the other at Bihar. The study was conducted for a period of two years from April 2015 to March 2017. Total 1000 stool samples of children (more than 1 year and less than 12 years) which were positive for intestinal parasites were included in the study. The age range of the patient population was sub-divided into two groups: below 5 years age group and 5 to 12 year age group.

Routine macroscopic examination was carried out for colour, consistency, presence of blood and mucus and also the presence of adult worms, scolices and proglottids. Scotch tape preparation using cellophane tape cuts were carried out for the detection of pinworms.

Under microscopic examination, saline wet mount and Lugol's iodine wet mount were prepared as per standard protocol. Each sample was then examined under the microscope for the presence of ova, cysts and parasites. Simple statistical methods were used to analyze the data.

RESULTS

Out of the 1000 positive samples, *Enterobius vermicularis* was predominant with 287 (28.7%) of all cases. The next in order were *Giardia lamblia* 243(24.3%), *Entamoeba histolytica* 219(21.9%), *Ascaris lumbricoides* 143(14.3%), *Ancylostoma duodenale* 39 (3.9%), *Taenia* 27 (2.7%) and others 42 (4.2%).The distribution of parasites were heavier among the 5 to 12 year group (74.6%) than the below 5 year one (25.4%), with single parasitic isolate. Lack of hygienic practices like open field defaecation, faecal contamination of water and improper handwashing aggravate infestations.

Table 1: Distribution of parasites present in the stool samples of children.

Results	*E.vermicularis*	*G. Lamblia*	*E. Histolytica*	*A. Lumbricoides*	*A. Duodenale*	*Taenia* spp.	Others	Total cases
Total	287	243	219	143	39	27	42	1000
Below 5 years	69	49	67	38	11	8	12	254
5 to 12 years	218	194	152	105	28	19	30	746

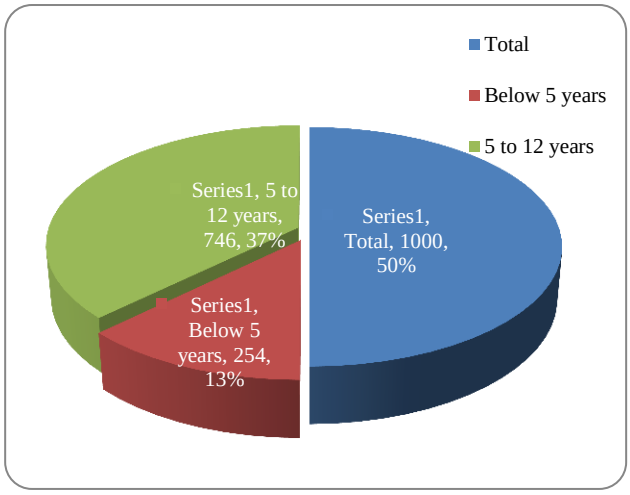

Figure 1: Pie chart showing the ratio of distribution of parasites in children (below 5 years and 5 to 12 years).

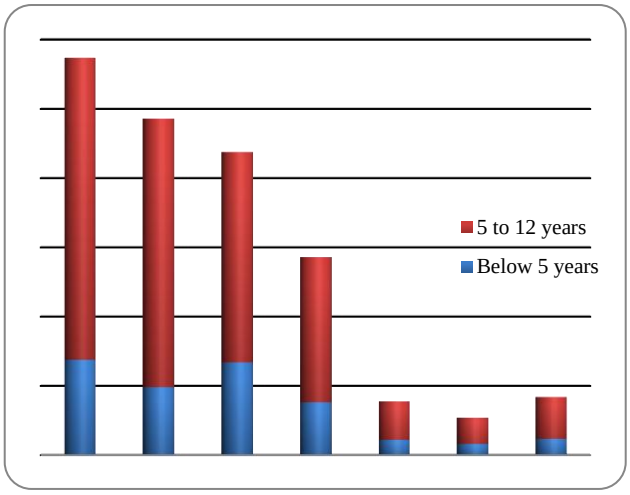

Figure 2: Column diagram showing the distribution of parasites (below 5 years and 5 to 12 years) in children.

DISCUSSION

This study included stool specimen examination of 1000 parasite positive patients, including the age groups of below 5 year and above 5 to 12 years respectively. All the patients showed certain clinical signs and symptoms hinting the occurrence of gastrointestinal parasitic infestation. They attended the paediatric out-patient-department of the medical colleges for clinical examination and were referred from there to microbiology department for the examination of stool, detection of ova, cysts and adult parasitic forms. Out of the 1000 stool specimens examined, only 254 persons belonged to the 5 year age group while the rest 746 were from the 5 to 12 year age group. The parasite-positive patients had only one parasite in their stool specimens.

Among all, *Enterobius vermicularis* was found to lead covering 287 (28.7%) of all parasitosis cases. The second most common parasite was *Giardia lamblia* with 243 (24.3%) cases. The next in order were *Entamoeba histolytica* (21.9%), *Ascaris lumbricoides* (14.3%), *Ancylostoma duodenale* (3.9%), and *Taenia* (2.7%). The others group (4.2%) included less common parasites isolated from children.

Among the parasite infestations of the below 5 year age group, *Enterobius vermicularis* occupied the most, with 69 (27.1%) of cases. The next in order of priority were *Entamoeba histolytica* with 67 (26.3%) cases, *Giardia lamblia* with 49 (19.3%), *Ascaris lumbricoides* with 38 (14.9%), others with 12 (4.72%), *Ancylostoma duodenale* with 11 (4.3%) and *Taenia* spp. with 8 (3.1%) of cases. In the 5 to 12 year age group, the greatest again was *Enterobius vermicularis* with 218 (29.2%), followed by *Giardia lamblia* with 194 (26%), *Entamoeba histolytica* with 152 (20.4%), *Ascaris lumbricoides* with 105 (14.1%), others with 30 (4.02%), *Ancylostoma duodenale* with 28 (3.75%) and *Taenia* spp. with 19 (2.54%) of cases. Thus, the distribution of parasites in children were heavier among the 5 to 12 year group compared to the below 5 year one, with *Enterobius vermicularis* predominating in both the groups.

A study was conducted in a Tertiary care center from rural Bihar taking only adult patients.[6] In the 2 year retrospective study, a total of 3343 samples were examined, of which only 1346 (40.26%) were parasite positive. Out of them, 1113 samples had single parasite infestation, 221 had two, and 12 had three-parasite infestations respectively. Their isolation included *Entamoeba histolytica*, *Giardia lamblia* and *Ascaris lumbricoides* in the said order. Another study by the same group in Bihar conducted over three years showed the seasonal variations in parasitosis cases. Out of a total of 2672 parasite positive cases, the monsoon season bore the highest, i.e. 698 (26.12%) cases. Next to monsoon, was summer with 601 (22.47%) cases. Winter was reported to have the lowest rate of isolation, i.e. 251 (9.39%) of cases. In this study we did not analyze the seasonal variation in the parasitic isolation. A similar retrospective study done in JIPMER, done for a five year period, showed certain differences in the pattern of parasites isolated compared to our study.[1] *Entamoeba histolytica* was cited as the commonest parasite (39.7%); *Blastocystis* spp. being the second common. They also observed some parasite species like *Entamoeba moshkovskii*, and some coccidian parasites like *Cystoisospora*, *Cyclospora* and *Cryptosporidium*, unlike our report.

However, ours being a small centric pediatric study involving 1000 patients, we noted *Enterobius vermicularis* as the leading parasite with a small prevalence of only 28.7% cases, followed by *Giardia lamblia* in 5-12 year children only. On the other hand, the second common parasite changed to *Entamoeba histolytica* among the below 5 year age group. Further, our study showed only single parasite isolated from the study population. This could be due to our limitation in sample size and diagnostic methods. This is in contrast to an Egyptian study where they observed polyparasitism in children, with *Entamoeba histolytica* and *Enterobius vermicularis* as the commonest double infection.[7] A second study from India showed *Trichuris trichiura* and *Enterobius vermicularis* to be the commonest multiple parasitic infection.[8] Interestingly, the second commonest single parasite is Blastocystis in South India, compared to that being *Giardia lamblia* in Bihar. Also noted here is a gender bias in parasitosis i.e. 56% females and only 44% of the affected persons were males in a study.[1] Adamu *et al* performed a study at Ethiopia and found that there were almost equal numbers of infected cases among both sexes.[9] However, we did not include this parameter in our study.

Age is an important factor for internal parasitic infections and pre-school and school going children had been reported to be at high risk.[10] The most commonly affected age group is 6-10 yrs, followed by 1-5 years and lastly 11-15 years. In one study children below 8 years were heavily infected (60%) compared to other age groups.[8] Khanal et al and Dongre et al also showed increased prevalence in 6-8 years age group.[11,12]. Naguib et al included the children less than 5 years of age group and they observed that infection is most commonly seen in the age group less than 2 years as compared to more than 2 years.[13] Our study, for example, have reported parasitic infestation to be greater in 5 to 12 year age group than the below 5 year group. This could be due to the reason that children in this age are most active; they remain outdoors constantly playing in the soil with poor hygiene conditions and eat with unwashed hands.

Regarding prevalence, the Puducherry study showed a prevalence rate of 22.21%, one previously mentioned study in Bihar showed 40.26% and in another study in Vellore it ranged from as low as 12.5% to as high as 67%.[14] Our study, on the other hand, showed a prevalence of 28.7% of a single common helminthic isolate.

Among the protozoan genera- *Cryptosporidium*, *Cyclospora*, *Isospora* and *Microsporidia* are the opportunistic parasites which causes diarrhoeal diseases in children.[15] Even if we did not get any of these protozoans in our study, the study indicates the incidence of Cryptosporidiasis to be significant in the Middle East (1.6% - 10%).[16] In Tanzania, 1.8% of children with acute diarrhea were found to have *C. cayetanensis* while 5.6% of the children under 8 years of age in Peru and 2.3% of children in Guatemala were found to be infested with the same.[9] Among the parasitic infestations detected, the overall prevalence of helminths was 53.8% and of protozoan was 46.2%. This is consistent with other studies done by various authors.[17,18] In some western countries as well as studies from other parts of India showed high prevalence of *Blastocystis.*[19-22] It has been suggested that *Blastocystis* is common in coastal areas; hence the absence of *Blastocystis* in our study might be due to our techniques, but also could be due to non-infestation with *Blastocystis* in Bihar, the latter being quite far from the sea coast.[14]

Among the soil-transmitted helminthes (STH), *Ancylostoma duodenale (*hookworm) is by far very common in India, as reported in our study (3.9%). It is stated that the soil-transmitted helminths (*Ascaris, Trichuris*, and the hookworms –*Ancylostoma duodenale* and *Necator americanus*) have detrimental effect on children's growth and cognitive development.[23] However, the prevalence of hookworm infestation is on the decline (8.7% - 10.5%) in adults in our country as compared to 1980s, as shown by various studies.[1,24] This may be due to greater footwear use among farmers, labourers and improvement of sanitation with a commendable use of sanitary latrines among villages and the people of poor socioeconomic status due to vigorous health campaigning.

In a study in Thailand, *Enterobius vermicularis* was the most frequent parasite (19.9%) isolated by Scotch-tape method.[25] This is in consistence with our study, and several other reports from countries like Thailand and Turkey.[26,27] *Enterobius vermicularis* infestation is prevalent in areas with low socio-economic development; it is easily transmitted among children in a class. Disease transmission is facilitated by inhalation, ingestion of eggs from soil and contact with contaminated hands/fomites.

In a guideline by the World Health Organization (www.who.int/factsheets, 2017) to control soil-transmitted helminths it is suggested that the children from developing countries of Asia, Africa and other endemic areas are to be treated with periodic de-worming using anti-helminthic medicines in school health program.

CONCLUSION

The present study forecasts a gross burden of parasites in the gastrointestinal tract of children that leads to a range of co-morbidities. Infestation was highest in the 5 to 12 year group (74.6%). This study shows that intestinal parasitosis is a major public health problem in rural parts of India. Lack of hygienic practices due to poverty and lack of education are instrumental in increasing parasitic infestations. Faecal contamination of water in homes/schools, open defecation practices, washing of anal area using hand and lack of proper hand washing are some of the findings associated with disease. Our study suggests that steps need to be taken to promote health education and large scale deworming through campaigns in schools and environment in order to trigger sanitary awareness in society. Healthcare interventions are required, especially for the mothers. Farmers should be made aware about using sanitary latrines issued by the Government.

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