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Research Article

PREVALENCE OF PARASITIC INFECTIONS AMONG PRIMARY SCHOOL CHILDREN IN BANGALORE

***Saroj Golia[1], Sangeetha K.T[2] and Vasudha C.L[3]**
Department of Microbiology, Dr B R Ambedkar Medical College, Bangalore
**Author for Correspondence*

ABSTRACT
Intestinal parasitic infections continue to be a major threat to the health and socioeconomic wellbeing of infected people especially children in developing countries and have been an important cause of morbidity especially in children. The present study attempted to assess the prevalence of different intestinal parasitic infections in primary school children aged 6–12 years in a government primary school. It was a cross-sectional study including 258 primary school children, out of which 152 were boys and 106 were females. The stool samples were examined using normal saline, iodine preparation and formalin-ether sedimentation concentration technique. Out of the 258 subjects examined 69 (26.74%) had intestinal parasite infection. The prevalence of infection peaked in the age group of 6-8 years. Among the helminths, the prevalence of *Ascaris lumbricoides* was highest (27.63%), followed by *Trichuris trichiura* (18.42%), *Hymenolepsis nana* (15.8%) and among the protozoans *E. histolytica* was the highest followed by *Giardia*. There is an urgent need to promote mass scale deworming programmes and health education about hygienic habits in schools to create awareness about health and hygiene.

Keywords: *Intestinal Parasitic Infections, School Children, Ascaris Lumbricoides, Trichuris Trichiura*

INTRODUCTION
Intestinal parasitic infections (IPI's) of humans are important threats to healthy living in developing countries (Kia *et al.,* 2008). Intestinal parasitic infections are responsible for considerable morbidity and occasional mortality among the infected population throughout the world. It is estimated that around 2 billion people are infected with intestinal parasites globally (Mehraj *et al.,* 2008).
The environment and the socio-cultural habits of the people could be attributable for the high prevalence of intestinal parasitic infections in the developing countries (Mbanugo *et al.,* 2002). In addition poverty, malnutrition, high population density, the unavailability of potable water, low health status and a lack of personal hygiene provide optimal conditions for the growth and transmission of intestinal parasites (Sayyari *et al.,* 2005).
Children are the most affected due to the heavy infections they harbour and because of their vulnerability to nutritional deficiencies (Luka *et al.,* 2000). As a result of morbidity they are at increased risk for detrimental effects like poor growth, reduced physical activity, impaired cognitive function and learning ability (Nokes *et al.,* 1992). The most important drawback of IPI's is that about 90% of infected individuals remain asymptomatic (Reed *et al.,* 2001).
Other barriers to decreasing the rates of parasitic infections include insufficient parasitic disease research, neglect of the problem in developing countries and a lack of follow-up treatments (Sayyari *et al.,* 2005). Therefore this study aimed at identifying the prevalence and the type of pathogenic intestinal parasites infesting the primary school children which will help in identifying the high risk group and in formulating appropriate control strategies.

MATERIALS AND METHODS
Study Area, Design and Period:
A cross-sectional study was conducted among primary school children studying at a government school in Kavalbyrasandra, Bangalore from June-September 2013. The study population consisted of primary school children between 6-12 years old (n=258) [Boys: 152 and girls: 106]. With a view of maintaining age stratification, the study population was divided into three age groups, i.e., 6-8, 8-10 and 10-12 years.

Research Article

Stool Sample Collection

For the collection of sample, a clean, dry, screw capped and properly labelled plastic container was distributed to 258 school children. Informed consent was obtained from teachers, parents and the students. 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. It was made sure that the study subjects were not on any therapy e.g. antibiotic, anthelminthic, antidiarrheal agent, antacid and hypertonic salts. The specimens were collected and then transferred to the laboratory.

Laboratory Processing

A macroscopic examination of the stool was first performed to find evidence of blood, mucus, parasitic segments or whole parasites. Saline and iodine wet mounts were prepared by adding a drop of saline and lugol's iodine to clean glass slides and then mixed with a small amount of stool. A coverslip was placed and the slide was visualized microscopically first at low power to detect trophozoites and eggs and then at higher power for morphological details. All stool samples were then processed by formalin-ether sedim-entation concentration to increase yield of helminth eggs (Chatterjee *et al.*, 1995). The saline and iodine preparations from each concentrated sample were examined similarly under 10× and 40× magnifications.

***Statistical Analysis*:**

Numerical data obtained from the sample was organized and summarized from the sample with the help of descriptive statistics, like percentage and frequency. Microsoft excel was used for the interpretation of these results and graphical representation.

RESULTS

Stool samples of 258 primary school children were examined, out of which 69 samples were positive. The prevalence rate was 26.74%. The study included 152 male and 106 female children. The parasite isolation rate was higher in males (36.18%) compared to females (13.20%). Higher prevalence of parasitic infections was found in the age group of 6-8 years. [Table 1]

Table 1: Parasitic infestation in relation to age and sex

Characteristics	Total no. of cases investigated (n=258)	No. of positive cases (n=69)	Percentage (%)
SEX			
Male	152	55	36.18%
Female	106	14	13.20%
AGE			
6-8yrs	107	41	38.32%
8-10yrs	97	21	21.65%
10-12yrs	54	7	12.96%

Single parasitic infections were reported in 62 (89.86%) cases and dual infections in 7 (10.14%) cases, accounting for a total of 76 isolates. Overall prevalence of helminth was 78.95% and of protozoan was 21.05% [Table 2 & Chart 1]

The most common helminthic eggs isolated were of *Ascaris lumbricoides*, followed by *Trichuris trichura, Hymenolepsis nana, Enterobius vermicularis, Hookworm and Taenia.* Among the protozoan cysts, *Entamoeba histolytica* was isolated in 14.47% followed by *Giardia intestinalis* in 6.58% of case (Table 3)

Table 2: Distribution of protozoan and helminthic infections

Parasites	No. of parasites (n=76)	Percentage
Helminthic eggs	60	78.95%
Protozoan cysts	16	21.05%
Total	76	100

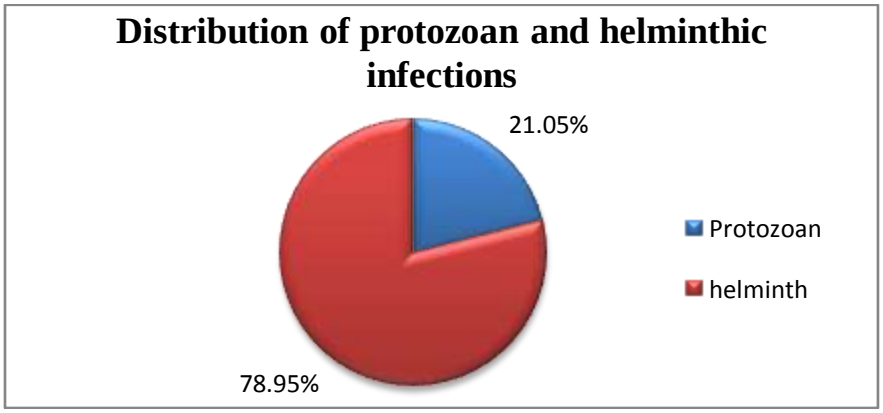

Chart 1: Distribution of protozoan and helminthic infections

Table 3: Parasitic distribution in stool specimen (n = 76)

PARASITES ISOLATED	No. of parasites isolated (n = 76)	Percentage
Eggs of Helminths :		
Ascaris lumbricoides,	21	27.63%
Trichuris trichura	14	18.42%
Hymenolepsis nana	12	15.8%
Enterobius vermicularis	8	10.53%
Ancylostoma duodenale	3	3.94%
Taenia	2	2.63%
Protozoan cysts:		
Entamoeba histolytica	11	14.47%
Giardia intestinalis	5	6.58%

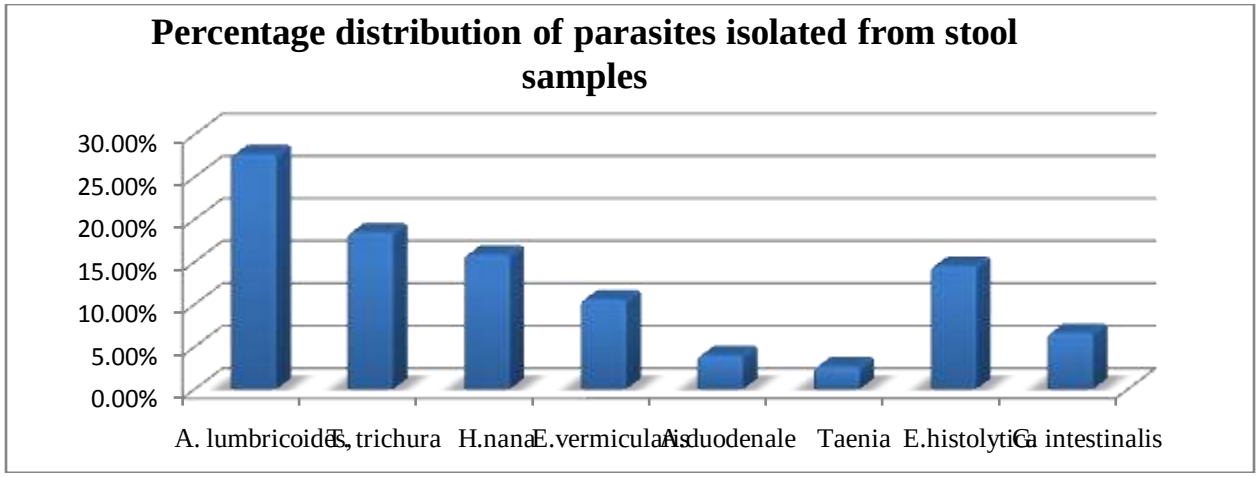

Chart 2: Percentage distribution of parasites isolated from stool samples

Table 4: Distribution of double parasitic infection:

Parasites	No. of children with double infections (n=7)	Percentage of children with double infection
A lumbricoides+ T trichura	2	28.57%
T trichura + E.vermicularis	2	28.57%
A lumbricoides+ H.nana	1	14.29%
A lumbricoides+ A duodenale	1	14.29%
E histolytica + Giardia	1	14.29%

DISCUSSION

Parasitic infections caused by protozoa and helminths are major global health problems. Globally two billion individuals were infected with intestinal parasites; out of these majorities were children in resource-poor settings (WHO, 2002).

The prevalence of intestinal parasitic infections varies considerably from place to place in relation to the pattern of transmission of disease (Luka *et al.,* 2000). The present study showed a prevalence rate of 26.74%. Similar rates have been observed by Rashid *et al.,* (2011) and Shrihari *et al.,* (2011). Studies carried out in various parts of India have reported a prevalence of intestinal parasites from 30 to 50 % among school going children (Ministry of Rural development, 2004) (Climate and Rainfall in Wadha District).

Even higher parasitic prevalence rates were reported by Fernadez *et al.,* (2002) in Chennai (91%). These variable results in the prevalence were reflection of the local endemicity, sanitary standard, environmental conditions, timing and seasonal differences in the design of the survey work and personal hygiene (Chiaozie *et al.,* 2007).

Age is an important risk factor for IPIs and preschool and school going children have been reported to be at highest risk for IPIs (Chatterjee *et al.,* 1995). In this study, children aged between 6-8 yrs were heavily infected (38.32%) compared to other age group children. Khanal *et al.,* 2011 and Dongre *et al.,* 2007 also showed an increased prevalence in 6-8 years age group. Children in these age groups often spend more of their leisure time outdoors and are more often in contact with sand and eat indiscriminately with unwashed hands. Whereas the decreased infestation rate in older children may be attributed to the better hygienic practises amongst them. In this study the parasitic infection rate was higher in males compared to the female children which are in correlation with studies done by Bisht *et al.,* 2011.

The most prevalent intestinal parasite in this study was *Ascaris lumbricoides* (27.63%), followed by *Trichuris trichura* (18.42%) and *H.nana (*15.8%).This finding is consistent with previous reports (Khanal *et al.,* 2011; Singh *et al.,* 2004). Among the parasitic infections detected, overall prevalence of helminths was 78.95% and of protozoan was 21.05%. This is in concordance with studies done by Sharma and colleagues (Sharma *et al.,* 2004). It has been stated that the soil-transmitted helminths (*Ascaris, Trichuris*, and the two hookworms –*Ancylostoma duodenale* and *Necator americanus*) have a harmful effect on children's growth and cognitive development (Bethony *et al.,* 2006). *E.histolytica/dispar/moshkovskii (*14.47%) was the commonest protozoan isolated in this study which is in correlation with other studies (Gelaw *et al.,* 2013)**.** However, there is one limitation for stool microscopic diagnosis, as microscopic morphology of cyst of *E.histolytica* is similar to other non-pathogenic species like *E. dispar* or *E.moshkovskii*. Few researchers recommend the use of the term *E.histolytica/dispar/moshkovskii* for reporting all diagnosis of amoebiasis (Ackers *et al.,* 2011). The occurrence of parasitic infections at high rates is indicative of faecal pollution of soil and domestic water supply around homes due to poor sanitation and improper sewage disposal in this area.

The double parasitic infection rates in this study were 10.14% which correlates with other studies (Abahussain, 2005). Whereas studies done in India quote a higher infestation rate with double parasites (30-40%) (Bisht *et al.,* 2011; Wani *et al.,* 2010). Among the dual infection, the combination of *A lumbricoides+ T trichura* and *T. trichura + E. vermicularis (*28.57% each) had the highest prevalence. Other researchers have also reported the same (Singh *et al.,* 2004).

Limitations of the study: Larger sample size needs to be examined to validate the findings of the present study. The trophozoites could not be examined in this study due to delay in transportation and other technical issues. The study also could not investigate other associated socio-demographic parameters associated with parasitic infestation so as to obtain an accurate understanding of the burden and cause of parasitic infestation in this area.

Conclusion

The study forecasts an increasing prevalence of intestinal parasitic infections among children in this area and emphasizes on the need to promote health education programmes about hygienic habits in schools to create awareness about health and hygiene.

Effective control measures such as use of proper sewage disposal methods, good sanitation and personal hygiene, proper cooking of food and use of safe drinking water should be adopted to combat the high parasitic infestation. Mass deworming programs for school children are highly recommended in this area. Similar prevalence surveys with more socio-demographic characteristics need to be carried out in this area in order to develop more intensive and effective control strategies.

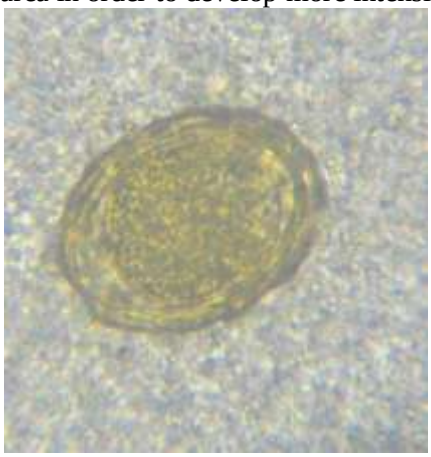

Figure 1: Fertilized egg of *Ascaris lumbricoides*

Figure 3: Egg of *Trichuris trichura*

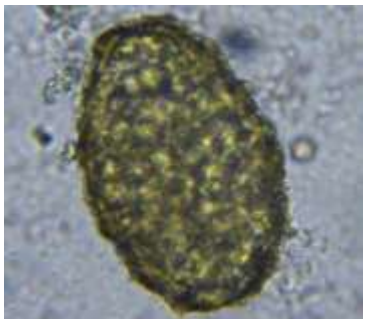

Figure 2: Unfertilized egg of *Ascaris lumbricoides*

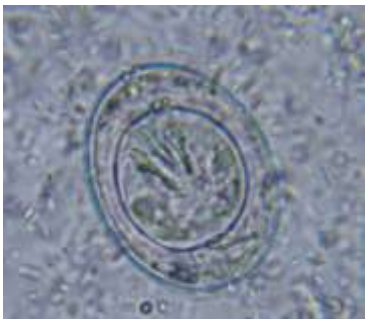

Figure 4: Egg of *Hymenolepsis nana*

Figure 5: Egg of *Enterobius vermicularis*

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