

Original Research Article

Prevalence of intestinal parasitic infections in cases of diarrhoea among school children attending a tertiary care hospital: a two year study

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Received: 06 April 2018

Accepted: 16 April 2018

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ABSTRACT

Background: Globally every year 1.7 billion cases of diarrhoea are registered as per the WHO report 2017. Intestinal parasitic infections [IPI] are one of the top ten major public health problems in developing countries with an estimated prevalence of 30-60% in developing countries compared to 3% in developed countries. School age children are the common vulnerable group with the highest prevalence and infection intensities. The objective of the present study is to study the prevalence of parasitic infections in school children as a causative factor for diarrhoea and associated risk factors involved with relation to their hygiene and socio demographic characters.

Methods: A cross sectional study was conducted for a period of two years from January 2015 to December 2016 and stool specimens from the children aged 5-18 years suffering from diarrhoea were screened for parasitic infections following standard guidelines and as per the ethical committee guidelines. The socio demographic characters, risk factors and hygienic characters of the cases were noted from the parents or guardians or children in a separate predesigned questionnaire sheet. Data was analyzed using SPSS software version 13 and P value<0.05 was considered significant.

Results: The prevalence of parasitic infections in the Present study was 22.95% and males were more common. 8-11 years was the most common age group and mean age was 11.6±1.8 years. Statistically significant association was found with hand washing before meals, socio economic status, and method of hand washing after defecation. *Entamoeba histolytica* was the major parasitic pathogen followed by *Ascaris lumbricoides*. Other parasites were *Giardia lamblia*, *Ancylostoma duodenale*, *Cryptosporidium*, *Isospora*, *Enterobius* and *Trichuris trichura*.

Conclusions: There is lack of awareness regarding dog bite and its management among the rural population.

Keywords: *Ascaris lumbricoides*, *Cryptosporidium*, *Entamoeba histolytica*, *Isospora*, Intestinal parasitic infections

INTRODUCTION

Globally every year 1.7 billion cases of diarrhoea are registered as per the WHO report 2017. It's represented as one of the most common cause of malnutrition in children less than five years of age. An estimated 525000 deaths occur due to diarrhoea every year around the world with more prevalence in developing countries than developed countries.¹ Diarrhoea is usually a symptom of gastrointestinal tract infection which results from

bacterial, viral and parasitic organisms. Intestinal parasitic infections [IPI] are one of the top ten major public health problems in developing countries with an estimated prevalence of 30-60% in developing countries compared to 3% in developed countries.²

In India, the prevalence rates are variable ranging from 11.5%-97.40% based on different epidemiological surveys. School children are the most common victims and affect their physical development, nutritional status,

school attendance and ability to learn. The common identified causes for parasitic infections are lack of proper sanitary conditions, poor socio-economic status and environmental factors.

The most common presentation in case of IPI is diarrhoea and dysentery or a mixture of both which cannot be clearly defined by children.³ However the data of prevalence of parasitic infections as a causative agent of diarrhoea in school children are limited and scarce. The information regarding the pattern of distribution of parasites are clearly defined and depends upon multiple factors like climatic conditions, movement of the population, sanitary conditions prevailing in the locality, provision of good drinking water and more important is socioeconomic and educational status.

These parasitic infections distribution are variable from place to place, region to region depending upon the degree of personal and community hygiene participation and climatic factors. School age children are the common vulnerable group with the highest prevalence and infection intensities. The effects of the infection are also clearly observed very early which may reflect their nutritional deficiencies and aggravate malnutrition related disorders like anemia etc. The most common parasitic infections reported in school going children globally are *Entamoeba histolytica*, *Giardia intestinalis*, *Ascaris lumbricoides*, *Ancylostoma duodenale* are responsible for diarrhoea and dysentery.⁴

The objective of the present study is to study the prevalence of parasitic infections in school children as a causative factor for diarrhoea and associated risk factors involved with relation to their hygiene and socio demographic characters.

METHODS

A prospective observational study was conducted at a tertiary care hospital by Department of Pediatrics in association with Department of Microbiology. The study was conducted for a period of two years from January 2015 to December 2016. All the children between 5-18 years of age who attended the OPD and emergency of Department of pediatrics with diarrhoea were enrolled in the study and written and informed consent was obtained from all the parents or guardians of the cases in the study.

The case was examined clinically by a pediatrician and all the clinical history, socio demographic factors, hygienic habits of the child and parents, risk factors were asked by interviewing the child and parents and noted in a separate pretested questionnaire.

The questionnaire was first prepared in English and then translated in local language. The study was approved by the institutional ethical committee and all the guidelines were followed in the study.

Inclusion criteria

- Children between 5-18 years of age.
- History of diarrhoea (Minimum passage of three loose watery stools/24 hours).
- Children or parents /Guardians who consented for the study.

Exclusion criteria

- Children < five years of age.
- Not willing to participate in the study.
- History of anti parasitic medications in past four weeks.

Collection and processing of stool specimen

Single spot specimen of stool was collected in a plastic container from the cases enrolled in the study and clearly labeled. The collected stool was transported immediately to central microbiology laboratory, prepared wet mount and iodine mounts. The slide was observed under low power (10X) and high power (40X) objective of the microscope. Stool specimen was performed modified formalin ethyl acetate sedimentation technique. Modified Zn staining technique was used for demonstration of protozoal parasites *Cryptosporidium*, *Isospora* and *Cyclospora*. All the slides were examined by a single technician to avoid inter observer bias and a single microbiologist to maintain internal validity. For accurate identification of parasite species, the WHO documents entitled 'Training manual on diagnosis of intestinal parasites' (WHO/CTD/SIP/98.2 CD-Rom-2004) was used.⁵

Statistical analysis

All the collected data was entered in a Microsoft excel spread sheet and checked for corrections. Corrected data was entered into SPSS software version 13 for Windows 8. Descriptive statistics were used to summarize the socio demographic characteristics of the study population. P-values less than 0.05 were considered significant.

All the children who were found positive were given free treatment and parents or guardian was counseled regarding the hygienic characters and their importance in prevention of parasitic infections.

RESULTS

A total of 1246 child aged between 5-18 years presented with diarrhoea to the emergency and department of pediatrics. The mean age of the children presented with diarrhoea was 12.6±1.65 years and male children were predominant (784/1246, 62.92%) than females (462/1246, 37.08%). Mean age of the male child was 12.8±2.48 years and female child was 10.2±2.8 years. Majority of the children were from urban (824/1246, 66.13%) than from rural area (422/1246, 33.87%).

Majority of the children who presented with diarrhoea were in the age group of 5-8 years (448/1246, 35.96%) followed by 8-11 years (322/1246, 25.84%). The socio demographic data of cases and parents, hygienic characteristics and risk factors of the cases were noted.

Out of the total 1246 cases of diarrhoea, 286 cases (22.95%) demonstrated parasitic infection as a cause of diarrhoea. Male children were predominant with 182 number (63.64%) and female 104 (36.36%). The most common age group in both sexes was 8-11 years with 34.27% (98/286) followed in order by 5-8 years (26.57%), 11-14 years (20.98%) and 14-18 years (18.18%). Mean age of the children with parasitic infection was 11.6±1.8 years. Mean age of the male cases was 12.1±1.2 years and female cases 11.3±1.8 years. 65.73% of the cases were from rural area and 34.27% from urban area. With regard to family size, family number was significantly higher in rural compared to urban (4.21±1.2 in urban vs 6.11±1.4 in rural, P value<0.01).

Table 1: Socio demographic data of confirmed cases with parasitic infections in the study.

Characteristics	Number	%
Age (Years)		
5-8 years	76	26.57
8-11 years	98	34.27
11-14 years	60	20.98
14-18 years	52	18.18
Gender		
Male	182	63.64
Female	104	36.36
Residence		
Rural	188	65.73
Urban	98	34.27
Family size		
≤5	158	55.24
>5	128	44.76
Socio economic status		
Low	128	44.76
Middle	118	41.26
High	40	13.99
Educational status mother		
Illiterate	158	55.24
Primary school	78	27.27
Secondary school	50	17.48
Source of drinking water at home		
Tap	176	61.54
Bore	38	13.29
Water Can	44	15.38
Well	28	9.79

Educational status of the mother showed that most of them were illiterate (158/286, 55.24%), 27.27% completed primary education and 17.48% secondary education. Socio economic status of the cases

demonstrated that 44.76% were of low socio economic group, 41.26% middle class and 13.9% higher economic class and all of them were literate and from rural area. 61.54% of cases had tap water as the drinking source of water while 13.3% with bore water, 15.38% with water can and 9.79% had well water as drinking source of water (Table 1).

Table 2 clearly demonstrates the hygienic characters and association of risk factors of the cases with parasitic infections in the study. 60.84% of cases in the study had no habit of hand washing before meals; with 34.27% of cases wash rarely and 4.9% of cases never wash the hands before meals. Statistically significant association was found between the habit of hand washing before meals and presence of parasitic infection. (p value <0.05) 69.23% of cases had the habit of nail trimming irregularly (once in a month or more) and association of parasitic infections was observed higher in these cases and was found statistically significant. 48.95% of cases gave irregular history of hand washing after defecation while 34.27% had sometimes and 16.78% never had hand washing after defecation.

Table 2: Risk factors and hygienic characters of cases in the study.

Hygienic characters	Number	%
Hand washing before meals		
Always	14	4.9
Sometimes	98	34.27
Rarely	174	60.84
Nail cutting frequency		
Regularly (once/week)	88	30.77
Irregularly (Once/month)	198	69.23
Hand washing after defecation		
Always	48	16.78
Sometimes	98	34.27
Rarely	140	48.95
Method of hand washing after defecation		
water only	94	64.38
Water and soap	52	35.62
Old history of parasitic infections in cases		
Yes	56	19.58
No	184	64.34
Don't know	46	16.08
Old history of parasitic infections among family		
Yes	124	43.36
No	162	56.64
Toilet facilities		
Open defecation	74	25.87
Closed defecation	212	74.13
Bare foot walking		
Yes	86	30.07
No	200	69.93

Water only was used as hand washing in 64.38% of cases (94/146 cases) and water admixed with soap was used in

35.62% (52/146 cases), however significant association was not found between the hand washing type and the parasitic infections in the study. 19.58% of cases had an old history of parasitic infections and was found statistically significant. 43.36% of cases had a history of parasitic infection among house hold contacts and was found to be significant factor in acquiring parasitosis. History of open defecation was elicited from 25.87% cases and bare foot waking in 30.07% of cases and there was no significant association between open defecation practice and bare foot walking In the Present study. The distribution of parasites in the study is recorded in Table 3.

Table 3: Distribution of intestinal parasites in the study

Name of the parasite	No	%
Protozoal parasites		
<i>Entamoeba histolytica</i>	121	31.76
<i>Giardia lamblia</i>	46	12.07
<i>Cryptosporidium parvum</i>	2	0.52
<i>Isospora belli</i>	4	1.05
Helminthic parasites		
<i>Ascaris lumbricoides</i>	86	22.57
<i>Ancylostoma duodenale</i>	76	19.95
<i>Trichuris trichura</i>	28	7.35
<i>Enterobius vermicularis</i>	18	4.72

A total of 381 parasites were observed from all the cases in the study, with 45.41% of protozoal and 54.59% of helminthic infections. Eight different species of parasites were encountered In the Present study. *Entamoeba histolytica* was the major parasite (31.76%) followed by *Ascaris lumbricoides* (22.57%) and in orders *Ancylostoma duodenale* (19.95%), *Giardia lamblia* (12.07%), *Trichuris trichura* (7.35%), *Enterobius vermicularis* (4.72%), *Isospora belli* (1.05%) and *Cryptosporidium parvum* (0.52%). Table 4 and Figure 1 represents the multiplicity of parasitic infections among the cases in the study.

Table 4: Multiple parasitic infections among the cases in the study

Type of multiple parasitic infections	Number	%
<i>Ascaris</i> + hook worm	12	4.2
EH + <i>Ascaris</i>	24	8.39
<i>Ascaris</i> + <i>Trichuris</i>	26	9.09
Hook worm + <i>Enterobius</i>	18	6.29
EH + Hook worm	10	3.5
<i>Ascaris</i> + <i>Cryptosporidium</i>	2	0.7
<i>Ascaris</i> + <i>Trichuris</i> + EH	6	2.1

*EH: Entamoeba histolytica

In the Present study, 65.73% of cases were infected with one parasite whereas 32.17% were infected with two parasite and 2.1% were infected with three parasites. *Ascaris lumbricoides* with *Trichuris trichura* was the

commonest two parasite combination (26/92 cases) followed by *Ascaris* and *Entamoeba histolytica* (24/92 cases). The clinical signs and symptoms associated with parasitic infections other than diarrhoea In the Present study were dysentery, Anemia, malnutrition, pallor, urticaria and rashes.

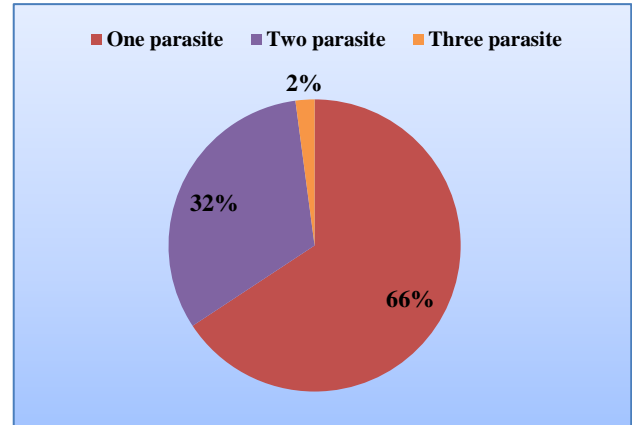


Figure 1: Infections multiplicity chart.

DISCUSSION

Intestinal parasitic infections among children are one of the most important social health problem commonly encountered in developing countries. Most of these infections are presented to the clinician in late advanced stages in children suffering with malnutrition and anemia. Most of the studies earlier conducted the prevalence of parasitic infections in different settings but our present study focused the prevalence of parasitic infections in children suffering from diarrhoea which may be of viral, bacterial and parasitic in origin. This is a first type of study to be conducted in our region.

In the current study, children between 5-18 years of age suffering with diarrhoea was selected and screened for the diagnosis of parasitic infection by stool microscopy. The prevalence of parasitic infection in the Present study was 22.95% which is similar and comparable with the findings of Maharaj V et al who reported the prevalence as 30% in his study, while is in contrast to the findings of Okyay P et al, who reported a prevalence of only 12% in his study among children.^{6,7} This can be explained by the fact that prevalence of parasitic infections may differ from developing and developed countries. This may be also due to the increased hygienic care and proper sanitation facilities of the study area and population. However, prevalence of parasitic infections reflects the socioeconomic status, hygienic characters and advancements of healthcare system of an area or country. In the Present study, incidence of parasitosis was higher in male children than female children as observed in many studies globally and there was no statistically significant association between the prevalence rates of parasites among both sexes. Studies conducted globally as well as in India and our study also have demonstrated

that parasitic infections are more common in the age group of 5-11 years than 12-18 years. Findings of our study were in concordance with Sayyari et al, Singh C et al but in contrary to the findings of Singh S et al who reported higher incidence of parasitosis in age group of 12-18 years.⁸⁻¹⁰ In the Present study, the prevalence of parasitic infections were higher among children from rural areas than from urban locality which was also statistically significant, this finding is similar to the findings in the studies of Bansal D et al.¹¹ Few studies from the developing countries reported no significant association between prevalence of parasitic infections and the region. This can be explained by the fact that rural and urban geographical areas are intermingled and there is no clear demarcation in well developed countries. The present study clearly explains the fact that parasitic infections are more predominant in children of low socioeconomic status than of higher and middle status which is a common observed fact in many studies globally. Illiteracy of the mother is associated with high prevalence of parasitosis among children In the Present study but without any significant association. Higher level of maternal education was associated with less number of parasitic infections among children. In the Present study an interesting thing observed was less association of parasitic infections in children having well water as a source of drinking water than other sources like water can or bore water. This is contrary to the findings of Subbannayya K et al., who reported well water as an unhygienic contaminated source of intestinal parasites in his study.¹² Most of the studies conducted on sanitary and hygienic practices stated that well water is a source of easy contamination by parasites transmitted by faeco-oral route of transmission.

In our present study significant association was observed with hygienic practices and prevalence of parasitic infections with regard to hand washing practice before meals, method of hand washing after defecation and old history of parasitic infections among the family members of the cases in the study. Findings of our study were similar to the findings of Chandrasekhar TS et al., who reported significant association between parasitic infections and hygienic practices in their study.¹³ The results of most of the studies conducted earlier reported that rate of intestinal parasitic infections are linked with hygienic practices of the children, socio economic status of the family, maternal educational status and old history of parasitic infections in the family. Few studies conducted by Osten et al., and Maia et al reported that overcrowding in the house and increased number of household members are associated with higher frequency of parasitic infections.^{14,15}

In the present study, protozoal infections were predominant than helminthic infections and is on par with findings of Rao VG et al who reported 65% of protozoal infections in his study.¹⁶ This is in accordance with reports of many studies in India and across the world. Entamoeba histolytica was the major protozoal parasite in

all the age groups of the study followed by *Giardia lamblia*, *Isoospora belli* and *Cryptosporidium parvum*. *Cryptosporidiosis* was found as a combined parasitic infection associated with *Ascaris lumbricoides* and not as a monoparasitic infection. In the Present study two cases of cryptosporidium infection was observed in children with HIV status positive and with severe malnutrition. An observation In the Present study was Protozoal infections were higher among children having piped water as a source of drinking water which was also observed in the study of Thompson et al.¹⁷ *Ascaris lumbricoides* was the common helminthic parasitic infection In the Present study followed by *Ancylostoma duodenale*, *Trichuris trichura* and *Enterobius vermicularis*. These findings of our study were in agreement with the study reports of Nitin S et al who reported the same in his study with a prevalence of 32% in his study among school children. Similar findings were reported from many developing countries with a high prevalence of parasitic infections.¹⁸ Prevalence of monoparasitic infections In the Present study was 65.73% followed by two parasitic infections with 32.17% and 2.1% had three parasitic infections. The commonest combination was *Ascaris lumbricoides* with *Trichuris trichura* 99.09%) followed by Entamoeba histolytica and *Ascaris lumbricoides*. However, the distribution of multiple parasitic infections is dependable upon multiple factors like climatic conditions of the study area, age group of the study population, number of stool specimens observed, and any other concentration techniques used in the identification of the parasites.¹⁹

CONCLUSION

The present study highlights the distribution and prevalence of intestinal parasitic infections among children suffering with diarrhoea. This current study helps in identification of common socio demographic variables, risk factors and hygienic practices associated with more incidences of parasitic infections among children. Lack of precise knowledge regarding the type of parasitic infections in a geographic area leads to misdiagnosis as appendicitis or other bowel diseases. Poverty, illiteracy and sanitation practices are important factors associated with high prevalence of IPIs. Government should concentrate more on poverty reduction programmes. An urgent need is required to promote mass scale deworming and health promotion campaigns to create awareness on health and hygiene.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Tenali RK, Badri NV, Kandati J, Ponugoti M, Chawla PS, Fernandez K. Prevalence of intestinal parasitic infections in cases of diarrhoea among school children attending a tertiary care hospital: a two year study. *Int J Contemp Pediatr* 2018;5:873-8.