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Original Research Article

Prevalence and correlation of soil transmitted helminth infection to the degree of anemia and nutritional status among pediatric patients of age group 6-14 years in Kishanganj, Bihar, India

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ABSTRACT

Background: Intestinal parasites are a major public health problem in tropical and sub-tropical countries, affecting the physical growth and cognitive development in school age children. This study was conducted to estimate the prevalence of various helminthes, the symptomatology and clinical manifestations of various helminthes and to correlate the nutritional status with the type of helminthic infestation.
Methods: Cross-sectional study involving children aged 6-14 years attending pediatric outpatient department in MGM Medical College, Kishanganj who were screened to estimate the prevalence of soil transmitted helminthes.
Results: Out of the 500 children examined, 275 children were positive for one or other helminthic ova in the stool samples giving overall incidence of 55 %. Ascariasis was most common with 58.2% among all the positive cases, hookworm 7.3%, trichuris trichura 14.5%, hymenolepsis nana 3.6%, taenia saginata 1.8% while mixed infestations constitute 14.5%. There was no significant association of gender and infestation (p value >0.05). Patients on non-vegetarian diet were more prone to get infested (Chi- square value = 19.48, p value<0.05). Children with low socio economic status were more likely to have intestinal parasites (Chi-square value = 63.32, p value<0.05). Out of the 275 children with helminthic infestation, 150 children were found anaemic. Out of the 160 children positive for ascariasis, 110 children were anaemic (68.80%). Mild degree of anemia had statically more significant association with ascariasis, Hookworm infestation and mixed infestation in comparison to moderate to severe anemia (p value<0.05). Poor nutritional status was found significantly associated with risk of worm infestations (Chi-square value = 243.48, p value <0.05).
Conclusions: This study demonstrated the results similar to other studies of various authors all over India regarding helminthic infestation with respect to epidemiology, clinical manifestations and relation with nutritional status. Helminthic infestations can be brought down by simple measures such as mass education, good personal hygiene, proper and safe disposal of faecal wastes, proper sanitation, and clean eating habits and by periodic deworming of children.

Keywords: Ascaris, Hookworm, Intestinal parasites, Soil-transmitted helminths, Trichuris

INTRODUCTION

Soil-transmitted helminths (STHs) are among the most common chronic infections worldwide mainly in low and middle income countries.[1] Helminthic infestations are infamous among children in rural areas such as aborigine settlements associated with substandard sanitation system and low socioeconomic status. Among young, in tropical and subtropical regions in particular, these constitute a major health problem. The three common STH species

that infest the school children are roundworm (ascaris lumbricoides), whipworm (trichuris trichiura), and hookworms (ancylosyoma duodenale).[2] Helminthic infestations are associated with poor growth, reduced physical activity, and impaired cognitive function and learning ability.[3-6] High intensity of STH infections in children showed negative impact on the nutritional status as infected children have decreased food intake, malabsorption, and poor food digestion.[7] The present study was done to determine the prevalence of various helminthes, the symptomatology and clinical manifestations of various helminthes and to correlate the nutritional status with the type of helminthic infestation.

METHODS

This cross sectional study was conducted at MGM Medical College and LSK Hospital, Kishanganj during the period of July 2015 to June 2016. All the children between the age group of 6-14 years who came to pediatric outpatient department were enrolled in the study. Children who were hemodynamically unstable were excluded. Informed consent had been taken. The study was approved by the ethical committee of the institute. A detailed history was taken and clinical examination was done to all the enrolled patients. Socio economic status was measured by modified Kuppuswamy socio-economic status scale. Stool samples were collected in empty clean bulbs and both macroscopic and microscopic examination was done within two hours of collection. Modified D. S. Ridley and B. C. Haw good method was used for concentration. Blood examination was done for degree of anemia. Nutritional status of children in the study was assessed by standard anthropometric measurements of weight, height and mid arm circumference.

RESULTS

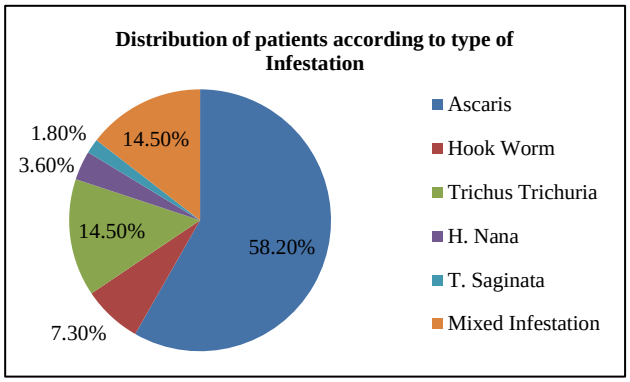

Figure 1: Prevalence of different type of helminthes in positive stool samples.

Out of 500 children in the study, 275 children were positive for one or another helminthic ovum in the stool samples examined, giving an overall incidence of 55%. Ascariasis was most common with 58.2% among all the positive cases, hookworm 7.3%, trichuris trichura 14.5%, hymenolepsis nana 3.6%, taenia saginata 1.8% while mixed infestations constitute 14.5%. Prevalence of different type of helminthes in positive stool samples is shown in Figure 1.

Out of 235 male and 265 female children, 130 male and 165 female children were found positive for helminthic infestation. However, There was no effect of gender on infestation (Chi square value was 0.0182, p value = 0.8). There was significant association between the type of diet and infestation - 70% among non-vegetarian and 48.6% among vegetarian. Patients on non-vegetarian diet were more prone to get infested (Chi- square value = 19.48, p value <0.00001) as shown in Table 1.

Table 1: Association of type of diet and helminthic infestation.

Type of diet	Infested	Not infested	Total
Vegetarian	170	180	350
Non-vegetarian	105	45	150
Total	**275**	**225**	**500**

There was significant association of socio-economic status and helminthic infestation as shown in Figure 2. Children with low socio economic status were more likely to have intestinal parasites (Chi-square value for economic status 63.32, p value<0.00001).

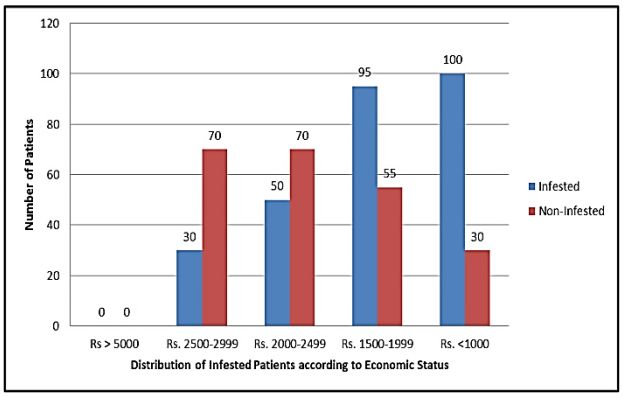

Figure 2: Relation of economic status and helminthic infestation.

Table 2: Degree of anemia and helminthic infestation.

Degree of anemia	Ascaris		Hook worm		Mixed	
	No.	%	No.	%	No.	%
Mild degree (Hb 7 - 9 gm%)	80	72.72	15	100	20	80
Moderate degree (Hb 4 - 6 gm%)	30	2.72	0	0	5	0
Severe degree (Hb below 4 gm%	0	0	0	0	0	0
Total anemic patients	**110**		**15**		**25**	

Out of the 275 children with helminthic infestation, 150 children were found anaemic. Out of the 160 children positive for ascariasis, 110 children were anaemic (68.80%). Mild degree of anemia had statically more significant association with ascariasis, Hookworm infestation and mixed infestation in comparison to moderate to severe anemia (p value<0.05) (Table 2).

Table 3: Nutritional status in helminthic infestation.

Nutritional status	Infested	Non-infested	Total
Normal	80	220	300
Grade - I	134	5	139
Grade - II	40	0	40
Grade - III	20	0	20
Grade - IV	1	0	1
Total	**276**	**225**	**500**

Poor nutritional status was found significantly associated with risk of worm infestations (Chi-square value = 243.48, p value<0.05) (Table 3).

DISCUSSION

Helminthic infestation is a major public health problem not only in India but in other developing countries too. Of the 500 children included in this study, 55% had helminthiasis. Our results are comparable to results of other studies done across India by various authors, Table 4.

Table 4: Studies by various authors and the prevalence of helminthic infestation.

Author	Place	Incidence	
Rao et al[8]	Madras	55.40%	(School children)
Ajawani KD et al[9]	Kanpur	18.00%	(General population)
Gupte S et al[10]	Jammu	59.00%	
Subannayya K et al[11]	Manipal	80.90%	
Bhandari B et al[12]	Udaypur	45.50%	
Present study	Kishanganj	55 %	Children of 6-14 years

Ascaris was the most prevalent infestation in this study (32%, 160 positive cases out of 500).

In the present study, anemia was found commonly in hookworm infestation followed by roundworm and they mixed infestation. Mild degree of anemia was common in helminthic infestation. Dhingra DC et al noted 38.4% of malnutrition and 20% nourished group in parasitic infestation.[13] Bhandari B et al noted that parasitic infestation was more common in severe grades of protein energy malnutrition.[12] The relationship of malnutrition and intestinal parasitic infection has been well established.[14] Different reports showed a close association between intestinal parasitism and malnutrition.[15,16] Present study significantly shows a high incidence of helminthiasis in protein energy malnourished children. Present study shows protein energy malnutrition was more in children with ascariasis (96.85%) followed by mixed infestation (87.5%). Protein energy malnutrition of grade I was note more commonly in children infested with ascariasis. Grade II and grade III were found in children infested with mixed infestation. This shown that children infested with mixed infestation or heavy worm load of ascariasis resulted in severe degrees of malnutrition. Ascariasis was found in all children with mixed infestation with grade II and grade III protein energy malnutrition, thereby showing that it is etiologically related to the occurrence of malnutrition in children. Ascaris infestation is known to cause absorption and retention of protein, nitrogen and by themselves ingesting, absorbing and utilizing the host food. Heavy ascariasis can probably induce protein energy malnutrition in children whose diet is otherwise inadequate.[17] Improved socio-economic status definitely helps in reducing the prevalence of STH infection. Economic development which is usually accompanied by better housing and sanitation conditions will reduce the risk factors for STH.[18] There was significant association of socio-economic status and helminthic infestation in this study.

Some limitations of the present study. First, as it was a cross-sectional study, this limits our ability to confirm the causal relationship between helminthiasis and the clinical parameters. Secondly, this study had to rely on a single faecal sample instead of the ideal three consecutive samples because of the limitation of resources .Thus, the prevalence rate of IPIs is likely to be underestimated due to the temporal variation in egg excretion and cystoocysts shedding over hours and days.

CONCLUSION

This study confirms the finding of the other authors all over India regarding helminthic infestation in respect to epidemiology, clinical manifestation and relation with nutritional status. There was a strong co-relation in our study between helminthic infestation and poor nutritional status. In a developing country like ours, this findings is significant in that almost three fourth of our childhood population are undernourished. Helminthic infestation will further precipitate the malnutrition. Helminthic infestation can be brought down by simple measures such as mass education, safe disposal of faecal wastes, good personal hygiene, proper sanitation, clean eating habits and by periodic de worming of children in endemic areas.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Hotez PJ, Alvarado M, Basáñez MG, Bolliger I, Bourne R, Boussinesq M, et al. The global burden of disease study 2010: interpretation and implications for the neglected tropical diseases. PLoS Negl Trop Dis. 2014;8(7):e2865.
2. Pullan RL, Smith JL, Jasrasaria R, Brooker SJ. Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. Parasit Vectors. 2014;7:37.
3. Shang YU, Tang LH, Zhou SS, Chen YD, Lin SX. Stunting and soil-transmitted helminth infections among school age pupils in rural areas of southern China. Parasit Vectors. 2010;3:97.
4. Al-Mekhlafi MH, Azlin M, Aini UN, Shaik A, Sa'iah A, Norhayati M. Prevalence and predictors of low serum retinol and hypoalbuminaemia among children in rural Peninsular Malaysia. Trans R Soc Trop Med Hyg. 2007;101(12):1233-40.
5. Ahmed A, Al-Mekhlafi H, Azam M, Ithoi I, Al-Adhroey A, Abdulsalam A, et al. Soil-transmitted helminthiasis: a critical but neglected factor influencing school participation of aboriginal children in rural Malaysia. Parasitol. 2012;139:802-8.
6. Al-Mekhlafi HM, Al-Maktari MT, Jani R, Ahmed A, Anuar TS, Moktar N, et al. Burden of giardia duodenalis infection and its adverse effects on growth of school children in rural Malaysia. PLoS Negl Trop Dis. 2013;7(10):e2516.
7. Wong W, Foo P, Roze M, Pim C, Subramaniam P, Lim B. Helminthic infection and nutritional studies among orang asli children in Sekolah Kebangsaan Pos Legap, Perak. Canadian J Infect Dis Med Microbiol. 2016;2016:1-5.
8. Rao RBH, Benjamin V. Nutrition and health status survey of school children Kaniyambadi valley North Arcot Dist. Indian pediatrics. 1961;28:39.
9. Ajawani KD, Saxena H, Kumar. Corpological survey of parasitism in children in Kanpur. Indian J Pediatr. 1974;41:209.
10. Gupte S, Pal M, Gupta CL. Prevalence of intestinal parasitic infestations among children attending hospital, Jammu. Indian J Pediatr. 1978;45.
11. Subbannayya K, Kumar A, Rao KNA. Parasitic infestations in primary school children. Indian Pediatr. 1984;21:479.
12. Bhandari B, Gupta GP, Mandowara SL. Prevalence of intestinal parasites in Udaipur. India J Pediatr. 1985;52:299.
13. Dhingra DC, Anand NK. Interaction of nutrition and infection in school children. Indian Pediatr. 1977;14:189.
14. Walker A, Walker B. Moderate to mild malnutrition in African children of 10-12 years: roles of dietary and non-dietary factors. Int J Food Sci Nutr. 1997;48:95-101.
15. Tsuyuoka R, Bailey JW, Nery Guimaraes AM, Gurgel RQ, Cuevas LE. Anaemia and intestinal parasitic infections in primary school students in Aracaju, Sergipe, Brazil. Cad Saude Publica.1999;15:413-21.
16. Quihui CL, Valenica ME, Crompton DWT, Phillips S, Hagen P, Diaz-C SP, et al. Prevalence and intensity of intestinal parasitic infections in relation to nutritional status in Mexican school children. Trans R Soc Trop Med Hyg. 2004;98:653-9.
17. Crompton DW, Nesheim MC. Nutritional impact of intestinal helminthiasis during the human life cycle. Annu Rev Nutr. 2002;22:35-59.
18. Kattula D, Sarkar R, Ajjampur SSR, Minz S, Levecke B, Muliyil J, et al. Prevalence and risk factors for soil transmitted helminth infection among school children in south India. Indian J Med Res. 2014;139:76-82.

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