

# Association between the socioeconomic determinants and soil-transmitted helminthiasis among school-going children in a rural area of Haryana

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## ABSTRACT

**Background:** WHO indicates that India has the highest burden of soil-transmitted helminthiasis (STH) in the world, contributing to 25% of the total global cases, with 220 million children aged 1–14 estimated to be at risk. **Aim and Objective:** To study the association between the socioeconomic factors and STHs among primary school children in a rural area of Haryana. **Methodology:** The study was conducted among children aged 6–10 years studying in the rural government primary schools in the rural areas of Haryana. A total of 300 children were enrolled from government school. **Results:** The study found that the prevalence of helminthiasis was 28.7% (86/300) and of these 14.0% children were infected with *Ascaris lumbricoides* and sex wise association with Helminthic infection was observed as statistically nonsignificant. One third of the (31.39%; 27/86) children were pallor and 5.81% subjects were having Bitot's spot while 13.95% children were having constitutional symptoms such as weakness, 6.97% subjects have fatigue, and 5.81% children have body ache. **Discussion:** The morbidity can be reduced with appropriate inputs to improve the environmental factors. This may need investment for sanitary latrines, food hygiene, and safe drinking water, anti-helminthic drugs, and health education. **Conclusion and Recommendations:** The results of the study concluded and recommended that proper implementation of national deworming day and other long-term strategies like sanitation, clean drinking water, adequate sanitation, and also improvement in nutritional status through various nutritional health programmes.

**Keywords:** Bitot's spot, children, helminthes, hygiene, infection

## Introduction

Soil-transmitted helminths (STHs) refer to the intestinal worms infection in humans that are transmitted through contaminated

soil mainly by *Ascaris lumbricoides*, Whip worm, Hookworm, *Hymenolepis nana* (H. Nana), *Strongyloides stercoralis*, Taenia etc., and it is a major cause of public health problem in India. STHs impair physical development, causes malnourishment, decreases cognitive performances, anemia, and school absenteeism, and decreases school performance in school-age children.<sup>[1]</sup> STH infection is found mainly in areas with warm and moist climates where sanitation and hygiene are poor, including temperate zones during warmer months. Soil-transmitted helminths are

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transmitted by eggs that are passed in the feces of infected people as the adult worms live in the intestine where they produce thousands of eggs each day. In areas that lack adequate sanitation, these eggs contaminate the soil. WHO indicates that India has the highest burden of soil-transmitted helminths (STH) in the world contributing upto 25% of the total global cases with 220 million children aged 1–14 estimated to be at risk of worm infections. In India, the prevalence of *Ascaris lumbricoides* was highest (68.3%) followed by *Trichuristrichiura* (27.9%), *Enterobius vermicularis* (12.7%), and *Taenia saginata* (4.6%).<sup>[2]</sup>

The elimination of STH as a public-health problem refers to the elimination of the morbidity caused by the infections in children. The goal is not to eliminate the parasites but to reduce the morbidity they cause to levels that can be controlled through routine healthcare or school-based services.<sup>[3]</sup> The WHO recommended tablets albendazole (400 mg) and mebendazole (100 mg) because these are effective, inexpensive, and easy to administer even by nonmedical personnel (e.g., teachers). Improved living conditions almost inevitably lead to declining the prevalence of STH infections. STHs basically transmitted through the contamination of surface soil with human feces. Economic development, which is usually accompanied by improved housing and the adoption of better sanitation, will reduce the kind of risk factors identified in this study, such as living in field huts and defecation in open fields.<sup>[4,5]</sup>

In India, various studies have been carried out to estimate the status of STHs in school children but there is paucity of data on intestinal helminthiasis among school children especially in rural children in Haryana. Further, this group of population is always considered to remain in the risk of acquiring parasitic infection including STH because of their outside playing and eating habits. Moreover, they lack proper knowledge in hygiene and sanitation. Therefore, the present study was undertaken to study the association between the socioeconomic factors and STHs among primary school children in rural area of Haryana.

## Materials and Methods

The study was conducted among children aged 6–10 years studying in the rural government primary schools in the rural field practice area of the Department of Community Medicine, Pt. B. D. Sharma PGIMS, Rohtak (Haryana). The study was a descriptive and cross-sectional study and the study period was one year. The sample size amounted to 233 using the formula  $4PQ/L^2$ , where  $P$  denotes the prevalence of soil-transmitted helminthiasis consider as 30%<sup>[6]</sup> & allowable error as 20% of  $P$ . But the study recruited 300 children. The study randomly selected six schools from the total government schools in the study area. From a selected school, 50 students were randomly selected and then 10 children were selected randomly from class 1 to 5. So, a total of 300 children were enrolled. A written permission was taken from the school incharge for conducting the study and the school authorities were requested to provide a separate

room for the physical examination of selected students. Then, the home addresses of the selected students were taken from themselves or school authorities & home visits were made by the investigator himself accompanying the students with the help of ANM/ASHA worker.

An informed written consent was taken from their mothers for participating in the study and a predesigned, pretested, and semistructured schedule was filled by the investigator himself. After the completion of interview, plastic containers for morning stool sample collection were given to their mothers which were collected the next morning. The collected stool samples were brought within 2 hours to the Department of Microbiology, Pt. B. D. Sharma PGIMS, Rohtak (Haryana) for examination. Macroscopic examination of the stool was done for the presence of mucus, blood, and any segments or adult worms of helminths. Microscopic examination of the stool samples for cysts and ova of intestinal parasites by direct wet smear was performed within 2 hours of the collection of sample at the Department of Microbiology, Pt B D Sharma PGIMS, Rohtak. The ethical permission was sought before starting the study from the Post Graduate Board of Study, Pt B D Sharma PGIMS, Rohtak. The statistical tests were performed at a 5% level of significance; a  $P$  value of  $< 0.05$  was considered significant. Data were analyzed in percentages, proportions, and Chi-square test using SPSS version 20.

## Results

The study was conducted in the government schools of rural Haryana with 300 primary school children. The study found that the prevalence of helminthiasis was 28.7% (86/300) and out of these 14.0% children were infected with *Ascaris lumbricoides* followed by *Ancylostoma duodenale* (5.0%), *Hymenolepis nana* (4.0%), and *Taenia* (3.3%).

Of the 86 positive cases, one third participants (36.04%) belonged to 6 years of age; 55.81% children were males while the rest were females. Caste wise, 38.37% belonged to other backward class and 33.72% belonged to the SC/ST category, while 24 (27.90%) belonged to the general category. The socioeconomic status was assessed using Udai Pareek's Scale which found that 59.30% belonged to lower middle class, 20.93% to lower class, and 17.44% to middle class.

The association between age and sex of participants with Helminthic infection is statistically nonsignificant, while the association between caste and socioeconomic status with Helminthic infection comes out to be statistically significant [Table 1].

In this study, one third (31.39%; 27/86) of the children were pallor and 5.81% subjects were having Bitot's spot while 13.95% children were having constitutional symptoms such as weakness, 6.97% subjects had fatigue, 5.81% children had body ache while 10.46% participants had all the constitutional symptoms such

as fatigue, weakness, and body ache. The association between pallor and Helminthic infection was observed to be statistically nonsignificant ( $p = 0.456$ ) and also the association between Helminthic infection and constitutional symptoms was also found to be statistically nonsignificant ( $p = 0.429$ ); however, the association between Helminthic infection and Bitot's spot observed as statistically significant ( $p$  value = 0.011) Table 2.

### Discussion

Worldwide, infection through soil transmitted helminthes is very famous and common infection in children. Children are vulnerable to worm infection that leads to faultered growth and development. To combat this public health problem government of India started National Deworming Day that makes the people aware about worm infections, its effects on the health, also aware about prevention and cure through deworming tablets.

In the present study, 56.3% study participants were males and 43.7% were females. The sex wise association with Helminthic infection was found to be statistically nonsignificant ( $p$  value = 0.908).

Similar findings were reported in Dhaka, Bangladesh by Banu S. S. *et al.*<sup>[7]</sup> and in Nigeria by Saka MI *et al.*<sup>[8]</sup> The present study found out that the age and caste wise association with helminthes was statistically significant ( $p$  value = 0.005). Kumar S *et al.* in Bihar<sup>[9]</sup> reported similar observations. Nearly half of the subjects belonged to lower middle class IV (48.7%) followed by middle class III who account for 28%; however, the association between helminthic infection and the socioeconomic status of participants was found to be statistically significant ( $p$  value = 0.010). Banu SS *et al.*, Dhaka, Bangladesh<sup>[7]</sup> and Kumar S *et al.*<sup>[9]</sup> also found a similar significant association of socioeconomic status and Helminthic infestation. Kaur H and Sween<sup>[10]</sup> also found higher incidence of parasitic infections among children belonging to low socioeconomic status. Saifi M A and Wajihullahin Budaun (UP)<sup>[11]</sup> observed higher incidence of parasitic infections among children belonging to the low socioeconomic status.

In the present study, 28.3% of study participants were pallor and 2.3% of study participants were having Bitot's spots but the association between Helminthic infection & pallor were observed as statistically nonsignificant ( $p = 0.456$ )

**Table 1: Association of helminthic infection with socioeconomic variables**

Socioeconomic variables		Helminthic Infection		Test of significance
		Present (n=86)	Absent (n=214)	
Age	6 years	31 (36.04)	61 (28.50)	$\chi^2=5.541$ df=4 $p=0.236$
	7 years	16 (18.60)	41 (19.15)	
	8 years	16 (18.60)	42 (19.62)	
	9 years	6 (6.97)	35 (16.35)	
	10 years	17 (19.76)	35 (16.35)	
Sex	Male	48 (55.81)	121 (56.54)	$\chi^2=0.013$ df=1 $p=0.908$
	Female	38 (44.18)	93 (43.45)	
Caste	General	24 (27.90)	100 (46.72)	$\chi^2=10.540$ df=2 $p=0.005^*$
	OBC	33 (38.37)	50 (23.36)	
	SC/ST	29 (33.72)	64 (29.90)	
Socioeconomic Status	Upper class	0 (00)	5 (2.33)	$\chi^2=13.216$ df=4 $p=0.010^*$
	Upper middle class	2 (2.32)	14 (6.54)	
	Middle class	15 (17.44)	69 (32.24)	
	Lower middle class	51 (59.30)	95 (44.39)	
	Lower class	18 (20.93)	31 (14.48)	

Values in parenthesis show percentages, \*Statistically significant

**Table 2: Association between Helminthic infection with symptoms of subjects**

Symptoms		Helminthic Infection		Test of significance
		Present (n=86)	Absent (n=214)	
Pallor	Present	27 (31.39)	58 (27.10)	$\chi^2=0.557$ df=1 $p=0.456$
	Absent	59 (68.60)	156 (72.89)	
Bitot's Spots	Present	5 (5.81)	2 (0.93)	$\chi^2=6.409$ df=1 $p=0.011^*$
	Absent	81 (94.18)	212 (99.06)	
Constitutional symptoms	Fatigue	6 (6.97)	21 (9.81)	$\chi^2=3.837$ df=4 $p=0.429$
	Weakness	12 (13.95)	27 (12.61)	
	Body ache	5 (5.81)	21 (9.81)	
	All of these	9 (10.46)	12 (5.60)	
	None of these	54 (62.79)	133 (62.14)	

(Values in parenthesis show percentages) \*Statistically significant

while the association between Helminthic infection & Bitot's spot observed as statistically significant ( $p$  value = 0.011). 13.0% of study participants were having general weakness while 9.0% & 8.7% were having fatigue & body ache respectively. A statistically nonsignificant association was found between Helminthic infection and constitutional symptoms ( $p$  = 0.429). Sinha A *et al.* from central India<sup>[12]</sup> and Ashtekar *et al.* from Sangli district of Maharashtra<sup>[13]</sup> reported similar observations.

The WHO recommended drugs albendazole (400 mg) and mebendazole (500 mg) are safe, effective, inexpensive, and easy to administer even by teachers. These drugs have been used by millions of people with minimal side-effects.<sup>[14]</sup> The Ministry of Health and Family welfare should include regular deworming programmes in school health check-ups. It is important that the intestinal parasites control programmes target the heavily infected individuals who are epidemiologically important and are the major sources of infection in the community. Morbidity can be reduced with appropriate inputs to improve the environmental factors.<sup>[15]</sup> The study summarized that there is need of investment in sanitary latrines, food hygiene, and safe drinking water facility, anti-helminthic drugs and health education. In the absence of sanitation, however, reinfection will occur and periodic retreatment will be necessary. All these investments would also address other food/waterborne diseases as a collateral benefit.

## Conclusion and Recommendations

STHs are a major public health problem in tropical and subtropical countries that affecting the physical growth and cognitive development of school-age children. Multipronged approaches are needed to control the burden of STH which include health education, improving the existing sanitary practices, and regular preventive chemotherapy in endemic areas. The results recommend that proper implementation of a national deworming day and other long-term strategies through primary care physicians like sanitation, clean drinking water, adequate sanitation, and also improvement in nutritional status through various nutritional health programmes.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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