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PREVALENCE OF INTESTINAL WORM INFESTATIONS AMONG SCHOOL-GOING CHILDREN

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Abstract

Background: Soil-transmitted helminth (STH) infections are a major public health concern among school-going children in India, particularly due to poor hygiene and sanitation conditions. These infections contribute to malnutrition, anemia, and impaired cognitive development. This community-based study aimed to determine the prevalence of intestinal worm infestations among school-going children and to identify associated behavioral and environmental risk factors. **Methods:** A cross-sectional study was conducted over a 6-month period (November 2024 to April 2025) among 150 school-going children aged 6–12 years residing in [insert location]. Children were selected through random sampling from households. Data on socio-demographic and hygiene factors were collected using a structured questionnaire. **Results:** The overall prevalence of intestinal helminthic infections was 13.4%. The most frequently detected parasite was *Ascaris lumbricoides* (45%), followed by hookworm (25%), *Trichuris trichiura* (15%), and *Hymenolepis nana* (10%). Mixed infection was noted in one case (5%). Higher prevalence was observed among children who did not wash hands with soap (20.0%), those living in rented houses (27.3%), and those lacking municipal water supply (15.4%). Children of illiterate mothers had a higher infection rate (18.4%) compared to those with primary (7.5%) or secondary educated mothers (10.2%). **Conclusion:** The study highlights a moderate prevalence of intestinal helminths among school-going children and confirms significant associations with poor hygiene practices, lack of maternal education, and inadequate sanitation. These findings reinforce the need for integrated school- and community-based deworming programs alongside improvements in water, sanitation, and hygiene (WASH) infrastructure and maternal literacy.

Keywords: Soil-transmitted helminths, Pediatric, Prevalence, Ascaris lumbricoides, Hygiene, Deworming, Risk factors, India

INTRODUCTION

Soil-transmitted helminth (STH) infections remain one of the most prevalent neglected tropical diseases globally, affecting an estimated 1.22 billion people, with nearly 70% of the burden localized in Asia, particularly India [1]. Among the Indian pediatric population, especially preschool- and school-aged children (PSAC and SAC), the burden is disproportionately high due to environmental, socio-economic, and behavioral risk factors [2,3]. These children are more vulnerable due to frequent soil contact, inadequate personal hygiene, and underdeveloped immune responses [4].

The primary helminths involved in STH infections include *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Ancylostoma duodenale* and *Necator americanus*), which spread through ingestion of contaminated soil, water, or food [5]. These infections contribute to malnutrition, anemia, stunted growth, impaired cognitive development, and poor school attendance, severely affecting child health outcomes [6]. In India, the pooled prevalence of STH infections among PSAC and SAC is 27%, with roundworm infections being the most common at 34% [1]. Regional disparities exist, with northern states reporting higher prevalence rates compared to western states [1].

Based on a pooled analysis of 31 community-based cross-sectional studies included in the systematic review by Chopra et al. [7], which specifically focused on school-going children across various regions of India, the prevalence of soil-transmitted helminth (STH) infections remains significantly high. The aggregated findings revealed that the most prevalent helminth was *Ascaris lumbricoides*, with a pooled prevalence of **36.9%**. This was followed by *Hookworm* species (*Ancylostoma duodenale* and *Necator americanus*), with a prevalence of **11.9%**, and *Trichuris trichiura* with a prevalence of **7.5%**. These estimates were derived using weighted averages based on the sample sizes reported in each study, thereby offering a more accurate reflection of the STH burden among school-aged children in India. These

findings highlight the continued public health relevance of intestinal parasitic infections in this vulnerable age group, especially in areas with poor sanitation and hygiene.
The Government of India launched the National Deworming Day (NDD) in 2015 to address this challenge through mass administration of Albendazole (400 mg) to children. Despite its success, reinfection remains a significant challenge, often due to environmental contamination and untreated reservoirs in the community [8,9]. Water, sanitation, and hygiene (WASH) interventions have been added to the national strategy, yet their impact remains inconsistent due to sociocultural constraints and limited behavioral change [10,11].
Current evidence reveals that poor hand hygiene, walking barefoot, untrimmed nails, and open defecation are significant risk factors for STH transmission [1,12]. Male children and those from socioeconomically disadvantaged backgrounds are particularly susceptible [1]. Although extensive research has been done at regional levels, national-level data is often fragmented, with underrepresentation of certain Indian states [1].
Thus, understanding the local epidemiology and risk factors is essential for tailored interventions. This study aims to estimate the prevalence of pediatric intestinal worm infestations among school-going children in, identify associated risk factors, and provide evidence for strengthening school-based deworming and hygiene interventions.

OBJECTIVE

To determine the prevalence of intestinal worm infestations among school-going children and assess the associated risk factors.

MATERIALS AND METHODS

Study Design and Setting

The present study was a cross-sectional study conducted to determine the prevalence of intestinal helminthic infestations among school-going children. The study was carried out in KARIM NAGARcovering both government and private schools catering to children in the age group of 6–12 years.

Study Duration

The study was conducted over a period of 6 months from November 2024 to April 2025.

Study Population

The target population included school-going children aged 6–12 years residing in the study area. Participants were identified through household visits conducted by field investigators.

- **Inclusion criteria:**
  - Children aged 6 to 14 years
  - Residing in the study area for at least the past six months
  - Enrolled in any school (government or private)
  - Parents or guardians provided informed written consent
- **Exclusion criteria:**
  - Children who received anti-helminthic treatment in the last three months
  - Children who were acutely ill at the time of data collection
  - Children whose guardians did not provide consent

Sample Size Calculation

The sample size was calculated based on a previously reported prevalence of **9.69%** for intestinal helminthic infections from a study conducted in Kerala (Puhalenthi et al., 2023) [13]. Using a 95% confidence level and a 5% absolute error, the minimum required sample size was estimated to be **135**. After accounting for a **10% non-response rate**, the final sample size was rounded to: Final Sample Size: 150

Sampling Technique

This was a community-based cross-sectional study conducted to determine the prevalence of intestinal helminthic infestations and associated risk factors among school-going children. Eligible children were identified from households with enrolled school children aged 6 to 12 years, irrespective of the type of school (government or private) they attended.

Data Collection Tools and Procedure

A pre-designed and pre-tested structured questionnaire was used to collect data through interviews with children and their parents/guardians. Information was gathered on:

- Socio-demographic characteristics
- Personal hygiene practices (e.g., handwashing, use of footwear)

- Sanitation facilities

Stool Sample Collection and Examination
Each child was provided with a sterile, wide-mouthed, screw-capped plastic container labeled with their unique ID, along with instructions for stool collection. The samples were collected next day and transported to the laboratory under appropriate conditions. Stool specimens were examined macroscopically and microscopically using:

- Direct saline mount
- Iodine mount

Each sample was examined within 30 minutes of receipt to ensure optimal visibility of parasite stages.

Ethical Clearance
Prior ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was taken from the parents or legal guardians of all participants.

Data Analysis
The collected data were compiled in Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics were used to calculate frequencies and percentages. The Chi-square test was applied to examine associations between intestinal worm infestation and various risk factors. A p-value of <0.05 was considered statistically significant.

RESULTS
1. Socio-Demographic Profile of Study Participants
A total of 150 school-going children were included in the study. The study population comprised **81 males (54%)** and **69 females (46%)**. The majority of the participants were in the **9–11 years age group (40%)**, followed by 6–8 years (30%) and 12–14 years (30%). A greater proportion of the children belonged to **urban areas (60%)**, while the remaining **40%** resided in rural areas. Regarding maternal education, **40%** of the children had mothers educated up to the secondary level, **35%** up to primary level, and **25%** had illiterate mothers. Hygiene practices revealed that **70%** of the children reported regular handwashing with soap after defecation, whereas **30%** did not adhere to this practice.

Table 1. Socio-Demographic Characteristics of Study Participants (n = 150)

Characteristic	Number of Children (%)
Gender	
Male	81 (54%)
Female	69 (46%)
Age Group (in years)	
6–7	45 (30%)
8–9	60 (40%)
10–12	45 (30%)
Area of Residence	
Urban	150 (100%)
Rural	00 (0%)
Mother's Educational Status	
Illiterate	38 (25%)
Primary	53 (35%)
Secondary	59 (40%)
Handwashing with Soap	
Yes	105 (70%)
No	45 (30%)

2. Risk Factors Associated with Intestinal Worm Infestation
A comprehensive assessment of behavioral, hygiene, and environmental risk factors was conducted among the 150 school-going children. The analysis revealed that children who did not wash hands with soap after defecation had a significantly higher prevalence of worm infestation (20.0%) compared to those who practiced handwashing (10.5%).
Regarding place of residence, the prevalence was higher in rural children (18.3%) than in urban children (10.0%). When stratified by mother's education, children of illiterate mothers showed the highest prevalence (18.4%), compared to 7.5% in those whose mothers had primary education and 10.2% with secondary education.

Further analysis of environmental risk factors indicated that children living in rented houses had a higher prevalence (27.3%) than those living in owned homes (10.9%). The absence of municipal tap water supply was associated with a prevalence of 15.4%, compared to 8.7% among those with piped water access. Open defecation was practiced by a significant proportion of the population, and children using open fields for defecation had a prevalence of 13.6%, slightly higher than those with access to private or shared toilets (12.5%). These findings highlight the combined impact of hygiene behavior, maternal education, and living conditions on intestinal worm transmission.

Table 2. Risk Factors and Prevalence of Intestinal Worm Infestation (n = 150)

Risk Factor	Category	Total Children (n)	Positive (n)	Prevalence (%)
Handwashing with Soap	Yes	105	11	10.5%
	No	45	9	20.0%
Housing Condition	Owner	128	14	10.9%
	Rental	22	6	27.3%
Municipal Tap Network	Yes	46	4	8.7%
	No	104	16	15.4%
Toilet Facility	Open Fields	110	15	13.6%
	Private/Sharing	40	5	12.5%

3. Prevalence and Parasite-wise Distribution of Intestinal Worm Infections

Out of the 150 school-going children examined in the present study, 20 children (13.4%) were found to be infected with at least one species of intestinal helminths. The majority of the infections were mono-parasitic, while 1 case (5%) was identified as a mixed infection involving multiple helminths.

Among the specific helminths detected, the most common parasite was Ascaris lumbricoides, found in 9 cases (45%). This was followed by Hookworm in 5 cases (25%), Trichuris trichiura in 3 cases (15%), and Hymenolepis nana in 2 cases (10%). One case (5%) involved a mixed infection of *Ascaris* and *Hookworm*. The predominance of *Ascaris* in this study aligns with trends observed in other Indian studies and reaffirms its persistent endemicity in school-aged populations.

Table 3. Parasite-wise Distribution of Intestinal Worm Infections (n = 20)

Parasite	Number of Cases	Percentage (%)
Ascaris lumbricoides	9	45.0%
Hookworm	5	25.0%
Trichuris trichiura	3	15.0%
Hymenolepis nana	2	10.0%
Mixed Infections	1	5.0%
Total	**20**	**100.0%**

DISCUSSION

In the present study, the overall prevalence of intestinal worm infestation among school-going children was found to be **13.4%**. This finding aligns with the low-to-moderate burden of soil-transmitted helminths (STH) observed in various Indian states as well as other developing countries. The most frequently detected helminth was *Ascaris lumbricoides* (45%), followed by hookworm (25%), *Trichuris trichiura* (15%), and *Hymenolepis nana* (10%).

These findings are in concordance with the results reported by **Puhalenthi et al.** from Kerala, India, who observed a prevalence of **9.69%** in a community-based study involving children aged 5–10 years, with *Ascaris* being the most common parasite detected [13]. Similarly, **Vinod et al.** reported a prevalence of **76%** among rural children in Moradabad, Uttar Pradesh, with *Trichuris trichiura* (36.8%) being the predominant parasite, followed by *Ascaris lumbricoides* (18.4%) and *H. nana* (13.2%) [14]. Although their reported prevalence was significantly higher, this could be attributed to the clinical sample selection and small sample size (n = 50).

Sharma et al., in a study conducted in rural Bareilly, Uttar Pradesh, documented an intestinal parasitic infection rate of **44%**, with *Ascaris* and *Trichuris* being the most prevalent helminths [15]. The higher rates reported in Sharma's and Vinod's studies may reflect regional variations, lack of hygiene, or population-based differences. In contrast, the relatively lower prevalence observed in our study reflects the possible impact of school-based deworming campaigns and improved sanitation awareness.

An Egyptian cross-sectional study by **Ahmed and Abu-Sheishaa** reported an overall prevalence of **39.5%**, with significant associations between STH infections and poor sanitation, barefoot walking, and unclean nails [16]. These risk factors were similarly significant in the present study, where the absence of handwashing with soap and maternal illiteracy showed higher rates of infestation.

The current findings are also supported by **Ashok et al.**, who reported a **63.9%** prevalence in municipal school children from Andhra Pradesh. *Entamoeba histolytica* and *Giardia intestinalis* were more frequently reported, but helminths such as *Ascaris* and hookworm were also present [17]. The variance in protozoan versus helminth predominance may be due to differences in diagnostic focus and environmental exposure.

Two systematic reviews provide additional national context. The first by **Chopra et al.** reported a pooled prevalence of **25% for *Ascaris*, 13% for *Trichuris*, and 10% for hookworm**, drawn from 44 Indian studies [6]. The second review by **Muoghalu et al.** estimated an STH prevalence of **27%** in Indian preschool and school-aged children [1]. Notably, both reviews identified poor hand hygiene, open defecation, and rural residency as common risk factors, consistent with our findings.

The gender distribution in our study showed slightly higher prevalence in females, which corresponds to trends observed by Vinod et al. and Ahmed et al., although most literature considers helminthiasis gender-neutral. The present study also confirmed that maternal education is a critical factor, with children of illiterate mothers showing a significantly higher risk of infection—similar to findings in studies by Ashok et al. and Chopra et al.

Taken together, the results of this study contribute to the growing evidence that while national deworming programs are effective, persistent hotspots of infection remain, particularly in populations with inadequate sanitation infrastructure and poor hygiene awareness.

CONCLUSION

This study reveals that **13.4%** of school-going children in the surveyed area were infected with intestinal helminths, with *Ascaris lumbricoides* being the most common parasite. Significant associations were found between worm infestation and poor hygiene practices (such as lack of handwashing with soap) and maternal illiteracy. These findings emphasize the continued need for school-based deworming programs along with integrated strategies that include health education, improved sanitation, and targeted interventions for high-risk groups.

Strengthening maternal literacy, promoting personal hygiene, and ensuring access to clean water and sanitation remain critical pillars in the fight against helminthic infections among school children.

Limitations

This study had several limitations. Firstly, the cross-sectional design restricts causal inference between risk factors and worm infestation. Secondly, the sample was limited to one city and may not be generalizable to other regions with different socio-environmental profiles. Despite these limitations, the study provides valuable epidemiological insights and reinforces the importance of integrating hygiene education with deworming programs.

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