Original Article

Pattern and determinants of soil-transmitted helminthiasis in a rural area of Haryana: A school-based study

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Abstract

Background: In the world, helminthiasis is the major public health problem in school-age children. More than 60 million school-age children live in intensively transmitted areas and they need immediate treatment and preventive interventions. **Methodology:** The study was conducted in the rural government schools of Block Beri, District Jhajjar (Haryana), India, and the study was descriptive and cross-sectional in design. The study recruited 300 school-going children in the age group of 6–10 years. **Results:** In this study, the mean age of subjects was 7.68 ± 1.467 years and prevalence of soil-transmitted helminths was 28.7%. The association between practice of hand washing and practice of washing fruits and vegetables with helminthic children were found statistically significant. **Conclusion and Recommendation:** Impart health education among community through primary care physician about wash hands before eating food and after defecation, washed thoroughly raw and uncooked food before eating.

Keywords: Anemia, hygiene, infection, prevention, worm

Introduction

Soil-transmitted helminths (STHs) infection is the major cause of public health problem in the world especially in school-age children,[1,2] and these infection impairs physical and mental development, causes malnourishment, causes anemia, decreases cognitive performances, and decreases school performance in children.[3-6] More than 1.5 billion people means nearly every fourth person in the world is infected with helminths. More than 6-crore school-age children live in areas where these infections are intensively transmitted and are in need of immediate treatment and preventive interventions.[2] The most common helminthiasis are *Ascaris lumbricoides*, *Trichuris trichiuria*, Hookworm, Taenia, and Hymenolepis *nana*. India has the highest burden of STH in the world according to WHO and it contribute one-fourth of total global cases and maximum estimated in children age group of 1–14 years.[7] No doubt that improved living conditions in India has definitely contributing to the declining prevalence of helminthiasis. WHO recommends that where the prevalence of worm is high, the chemotherapy is the only primary treatment for controlling STH infections.[8]

Many national programs for control of helminthiasis target the school-age children because they harbor the highest worm burdens that is why the school offers an ideal setting for deworming and provision of preventive messages to children.[9] The school children are an important high-risk group for STHs because they are continuously being exposed to contaminated

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soil and water. In the rural area of western Haryana, no such type of study ever has been carried out in the school that is why this study was planned to evaluate the determinants of soil-transmitted helminthiasis among school-going children in a rural block of Haryana.

Methodology

The study was conducted in the rural government schools of Block Beri, District Jhajjar (Haryana), India, which is field practice area of Department of Community Medicine, Pt B D Sharma PGIMS, Rohtak (Haryana). The study was descriptive and cross-sectional in design. The study recruited 300 subjects taking prevalence of soil-transmitted helminthiasis as 30%[10] and L as 20% of P by using the formula $4PQ/L^2$. About 300 school-going children in the age group of 6–10 years were taken and duration of study was 1 year (October 2017 to September 2018). The list of government schools having students from classes 1 to 5 was obtained from district education officer (DEO), Jhajjar (Haryana). From 20 government schools, six schools were selected randomly. Further, 50 students from each school were selected randomly for conducting the study. Ten children were selected randomly from each class 1 to 5. Every school was visited with prior information to school authorities in school timings. In case of any student who was not willing to participate in the study, the next student was involved. In this way, a total of 300 study subjects were enrolled.

Stool Sample collection

After completion of interview, screw-capped 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 h to the Department of Microbiology, Pt. B D Sharma PGIMS, Rohtak, for their examination. The statistical tests were performed at a 5% level of significance; thus, an association was significant if the *P* value was < 0.05. Data were analyzed in percentages, proportions, and Chi-square test using SPSS version 20.

Observations

In the study, prevalence of helminthiasis came out to be 28.7% (86/300) among 300 children and maximum (14.0%) of study participants were infected with *Ascaris lumbricoides* followed by *Ancylostoma duodenale* (5.0%), 4.0% subjects had Hymenolepis *nana*, whereas 3.3% children had Taenia [Table 1].

Table 2 depicts that from 86 infected children, majority (46.51%) infected children did not follow the practice of hand washing before taking food regularly, whereas 32.55% and 20.93% helminthic children follow the practice of hand washing occasionally and regularly, respectively, and statistically this was found to be significant ($P = 0.043$). Similarly, the association between practice of washing fruits and vegetables among helminthic children come out to be significant ($P = 0.039$), whereas the habit of drinking water with helminthic children was statistically nonsignificant ($P = 0.414$).

Table 1: Pattern of helminthiasis among school going children (*n*=300)

Pattern of helminthic infection	Frequency	Percentage
Ascaris lumbricoides	42	14.0
Ancylostoma duodenale	15	5.0
Hymenolepis nana	12	4.0
Taenia	10	3.0
Strongyloides stercoralis	7	2.3
Total helminthic infection	86	28.7
No helminthic infection	214	71.4

This study showed that children those who had dirty and untrimmed nails were more infected and this confirmed by applying Chi-square test, i.e. the association between helminthic infected cases and nails hygiene practice was found to be statistically significant ($P = 0.033$). Also, regarding habit of eating fallen food on ground, the study found that those children who had practice of eating food fallen on ground were more infected, and also statistically, this association was calculated as significant ($P = 0.014$). This study also evaluated the association between practice of wearing foot wear and helminthic children and found statistically nonsignificant ($P = 0.246$) and also observed nonsignificant association between helminthic infected children and practice of taking bathing ($P = 0.461$).

Defecation practices in the rural area are important determinant of helminthiasis in the study and found out that those children defecate in the open areas were more infected as compared with those children used latrine and this association observed as statistically significant ($P = 0.044$). One of most important determinant of transmission of STH is washing hand after defecation and the study also found out that those children who wash their hand after defecation with plain water were more infected and this association between hand hygiene practice and after defecation was found statistically significant ($P = 0.003$).

In the study, it was revealed that there was no relationship between type of latrine available in the houses and STH and also this association was comes out to be statistically nonsignificant ($P = 0.792$) [Table 3].

Discussion

STHs continue to be endemic in large parts of the world including India. In India, STHs contributes significant burden of disease in children. Children are vulnerable to intestinal worm infestation that causes malnourishment, anemia, sickness episodes, and feeling of weakness and tiredness with poor concentration. Hence, it is need of hour to address this problem and prevent worm infection through good personal hygienic practices and deworming tablets. Ministry of Health and Family Welfare, Government of India, launched National Deworming Day and make people aware about worm infestation, aimed at improving child's health, by prevention and cure of worm from further infection through deworming tablets.

Table 2: Association of helminths infected children with personal hygiene practices (*n*=300)

Hand hygiene	Practices	Helminthic infection		Test of significance
		Present (*n*=86)	Absent (*n*=214)	
Hand washing before taking food	Regularly	18 (21.0)	123 (57.5)	χ^2=3.702, df=2 *P*=0.043
	Occasionally	28 (32.5)	73 (34.0)	
	No such practice	40 (46.5)	18 (8.5)	
Practice of washing fruits and vegetables	Regularly	12 (13.9)	143 (67.2)	χ^2=5.932, df=2 *P*=0.039
	Occasionally	27 (31.4)	52 (24.4)	
	No such practice	47 (54.7)	18 (8.4)	
Habit of drinking water	With hands	22 (25.6)	53 (24.8)	χ^2=0.773, df=2 *P*=0.414
	With glasses	51 (59.3)	135 (63.1)	
	With hand and glasses	13 (15.1)	26 (12.1)	
Nails hygiene	Clean and trimmed	34 (39.5)	138 (64.5)	χ^2=4.563, df=1 *P*=0.033
	Dirty and untrimmed	52 (60.5)	76 (35.5)	
Habit of eating food fallen on ground	Regularly	49 (57.0)	18 (8.4)	χ^2=8.565, df=2 *P*=0.014
	Occasionally	34 (39.5)	51 (23.8)	
	No such practice	3 (3.5)	145 (67.8)	
Use of foot wears	Regularly	83 (96.5)	199 (93.0)	χ^2=1.348, df=1 *P*=0.246
	Occasionally	3 (3.5)	15 (7.0)	
Practice of taking bath	Regularly	68 (79.0)	177 (82.7)	χ^2=0.543, df=1 *P*=0.461
	Occasionally	18 (21.0)	37 (17.3)	

Values in parenthesis show percentages

Table 3: Association between helminths infected cases with defecation practices (*n*=300)

Defecation practices		Helminthic infection		Test of significance
		Present (*n*=86)	Absent (*n*=214)	
Defecation practices	Open defecation	52 (60.5)	31 (14.5)	χ^2=6.248, df=2 *P*=0.044
	Open defecation and latrine	18 (20.9)	23 (10.7)	
	Latrine	16 (18.6)	160 (74.8)	
Wash hand after defecation	Water only	52 (60.4)	24 (11.2)	χ^2=19.792, df=6 *P*=0.003
	Soap and water	24 (27.9)	152 (71.0)	
	Soil and water	5 (5.8)	16 (7.5)	
	Antiseptics solution	2 (2.3)	15 (7.0)	
	Soil only	1 (1.2)	2 (0.9)	
	Ash only	1 (1.2)	4 (1.9)	
	No such practices	1 (1.2)	1 (0.5)	
Type of latrine at home	Nonservice type	59 (68.6)	138 (64.5)	χ^2=0.466, df=2 *P*=0.792
	Service type	14 (16.3)	40 (18.7)	
	No latrine present	13 (15.1)	36 (16.8)	

Values in parenthesis show percentages.

In this study, 300 study subjects were recruited and age of study participants ranged from 6 to 10 years with mean age of 7.68 ± 1.467 years and prevalence of STHs was 28.7%. In India, the overall prevalence rates ranged from 13% to 66%.[11-13]

About pattern of helminthiasis, this study showed that 48.33% of subjects were positive for Ascaris followed by 17.44% Ancylostoma, 13.95% *H. nana*, whereas 11.62% were positive for Taenia. Similar observations were quoted by Greenland *et al.*,[14] Egwunyenga *et al.*,[15] and Yasmeen *et al.*[12]

Table 2 depicts that from 86 infected children, majority (46.51%) infected children did not have practice of hand washing before taking food regularly and statistically the association was found to be significant (*P* = 0.043). Similarly, the association between practice of washing fruits and vegetables with helminthic children come out to be significant (*P* = 0.039), whereas the habit of drinking water using different methods (hands/glass) with helminthic children was statistically nonsignificant (*P* = 0.414). These observations highlight the need of educating the community about transmission and prevention of STHs by interpersonal communication through primary care physicians.

The association between helminthic infected cases and nails hygiene practice was found to be statistically significant (*P* = 0.033). Lone R *et al.*[16] and Shumbej[17] also quoted significant association. The study found that those children who had practice of eating food fallen on ground were more infected, and also statistically, this association was calculated as significant (*P* = 0.014). Kattula *et al.*[18] reported the statistically significant (*P* = <0.01) association of helminthic infection and habit of eating food fallen on ground.

This study also evaluated the association between practice of wearing foot wear and helminthic children and found statistically nonsignificant ($P = 0.246$). Kattula *et al.*,[18] Greenland K *et al.*,[14] and Jiraanankul[19] did not identify the absence of footwear as a risk factor for infection.

Most of defecation practices in the rural area are important determinant of helminthiasis in the study and found out that those children who defecate in the open areas were more infected as compared with those children used latrine and this association observed as statistically significant ($P = 0.044$). One of the most important determinants of transmission of STH is washing hand after defecation and the study also found out that those children who wash their hand after defecation with plain water were more infected and this association between hand hygiene practice and after defecation was found statistically significant ($P = 0.003$). Lone *et al.*[16] and Greenland *et al.*[14] demonstrated similar statistically significant association ($P = 0.001$). It has been postulated that intestinal parasites spread through poor hygienic practices, evidenced by contaminated finger nails and unclean hands.[20]

Abraham *et al.*[21] suggested that the strategies to control the helminthic infection could include community-wide mass drug administration at increased frequency to attempt to reduce infection and reinfection and reach the elimination at that level within population. They also expressed that maximizing use of public resources in India to improve healthcare services requires careful strategies for control and elimination of helminthiasis. STH infections are prevalent in India, and different approaches to interrupt chain of transmission may be highly cost-effective in many areas.

Karshima[22] did meta-analysis on prevalence and distribution of STH infections in Nigerian children and reported that the adoption of the current WHO recommended prevalence-based targeted distribution of albendazole and mebendazole among school children to control the STH infections would reduce the burden of helminths in these children.

Simple community-based preventive measures such as awareness generation regarding drawbacks of open defecation, safe disposal of waste water, and water drinking practices may help in reducing the transmission of infections. Also, sanitation education campaigns are necessary among community to increase awareness of populations at risk about the relationship between deploying safe sanitation practices, sanitary conditions, in general, and helminthiasis.

Conclusion and Recommendations

The study concluded that common determinants of STHs in children were practicing of not washing hand before taking food, had dirty and untrimmed nails, habit of eating food fallen on ground, open defecation practice, and washing hand with water only after defecation. Educating the community, such as washing hands before eating food and after defecation, raw and uncooked food should be washed thoroughly with running water before eating, and do not eat raw food directly from the fields, through primary care physician with special focus on the vulnerable groups of population (children and their parents) with the suggested deworming intervention will surely yield better results.

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Conflicts of interest

There are no conflicts of interest.

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