

Prevalence of Soil Transmitted Helminthic Infections among Adolescent Girls in a Residential School of North Coastal Andhra Pradesh

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ABSTRACT

BACKGROUND

Intestinal helminthic infections are endemic worldwide. In developing countries like India these contribute to a major morbidity among children. Factors like poverty, lack of proper sanitation, hygiene, illiteracy, hot and humid tropical climate play a role in the transmission of these infections. Under RMNCH + A (child health) school children were receiving biannual albendazole in the months of February and August. We wanted to assess the prevalence of soil transmitted helminthic infections (STHI) among adolescent school children in a residential welfare school.

METHODS

A cross-sectional study was conducted in the month of October 2018 in rural field practice area of the Department of Community Medicine, Andhra Medical College, Visakhapatnam. The study was done in a residential welfare school for girls in peri urban areas of Visakhapatnam. The study was done among 96 girls who were present in the school during the days of survey by using systematic random sampling after obtaining informed consent. A pretested interview schedule was used to collect data. Microscopic stool examination for ova / cyst and haemoglobin estimation was done for all the study subjects. Data was entered in Microsoft Excel and analysis was done by Statistical Package for Social Sciences (SPSS version 21).

RESULTS

The mean age of the subjects was 13.41 ± 1.07 years, with age ranging from 12 to 15 years. About 19 % (19.8 %) of the study subjects were found to have STHI on microscopic stool examination. Among them about 68 % of the study subjects were found to have *Ascaris lumbricoides* followed by *Trichuris trichiura* (32 %). Mean haemoglobin level was 9.73 ± 1.06 (g / dl). On statistical analysis, no significant difference was found between presence of infection and variables like anaemia ($P = 1$), open air defecation ($P = 0.51$), nail biting ($P = 1$), presence of symptoms ($P = 1$) and pica ($P = 0.75$).

CONCLUSIONS

Helminthic infections burden is still high in the school children.

KEYWORDS

Adolescent School Girls, Anaemia, Soil Transmitted Helminthic Infections (STHI's), Residential School, Visakhapatnam

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BACKGROUND

Soil transmitted helminthic infections are caused by different nematode groups which include round worms (*Ascaris lumbricoides*), hook worm (*Necator americanus*, *Ancylostoma duodenale*), and whip worm (*Trichuris trichiura*).¹

These STI's are also considered neglected tropical diseases as they inflict considerable mortality and morbidity in the community although they are entirely preventable.² Infection is transmitted by eggs that are passed in faeces by the adult worms residing in the intestine and the eggs take 3 weeks to mature before they become infective. Conditions like hot climate, poor sanitation, factors facilitating faeco-oral spread which include open air defecation, no proper hand washing techniques, will enhance the spread of the disease.

Approximately 1.5 billion population or 24 % of the world's population are infected with soil transmitted helminthic infections. Infections are widely distributed in tropical and subtropical areas, with the greatest numbers occurring in sub-Saharan Africa, the Americas, China and East Asia. Over 267 million pre-school children and over 568 million school children are living in the areas where these parasites are intensively transmitted.³

The infections due to these worms can cause a wide variety of symptoms like malaise, generalised weakness, impaired growth, diarrhoea, abdominal pain loss of appetite. etc. The morbidity due to the worms is directly proportional to the number of worms harboured by the host.³ In 2015, the global burden of infections with soil transmitted helminths was estimated at 3.4 million disability adjusted life years (DALYs).⁴

The goal of the World Health Organization (WHO) is to reduce the prevalence of moderate and heavy infections with soil transmitted helminths in preschool and school aged children to below 1 % by 2020.⁵⁻⁷ To achieve this goal, school aged children in endemic areas are regularly treated in so called preventive chemotherapy programmes.¹

In 2015, about 573 million children received preventive chemotherapy against soil transmitted helminths, corresponding to a global coverage of 59.5 %.⁹ The ultimate target is to cover at least 75 % of school aged children (an estimated 836 million children in 2016) in need of treatment.¹

Albendazole, mebendazole, levamisole, and pyrantel pamoate are currently on the WHO list of essential medicines for the treatment of such infections.¹ Albendazole and mebendazole are most widely used drugs in preventive therapy. Albendazole administration is a simple, feasible and cost-effective way to decrease the burden of disease with a cure rate of 95.7 %.

In India school children receive biannual albendazole under RMNCH + A (child health) from February 2015⁵ and this study is carried out to know the effectiveness of this program by measuring the prevalence of STHI in among adolescent school girls from a residential welfare school and also to know the prevalence of anaemia and other morbidities and practices associated with the infection.

Objectives

To assess the prevalence of soil transmitted helminthic infections among adolescent school children in a residential welfare school. To assess the prevalence of anaemia and other morbidities associated with STHI. To assess the prevalence of practices associated with STHI.

METHODS

A cross sectional descriptive study was undertaken among adolescent schoolgirls of age 12 - 15 years in the month of October 2018 in rural field practice area of the Department of Community Medicine, Andhra Medical College, Visakhapatnam. Out of 5 schools, one school was selected by simple random sampling.

Inclusion Criteria

Adolescent girls who were present on the day of the study, age group between 12 to 15 years, and who gave informed consent.

Exclusion Criteria

Students suffering from any illness, menstruating girls, who refused to give sample.

Ethical Consideration

Institutional ethics committee approval was taken. Permission from school authority, class teacher and students were obtained after explaining the purpose of the study and rapport was built up with the girl students and informed consent was taken before collecting the data. Telephonic intimation was given to parents regarding the study and verbal consent was taken.

Sample Size

Based on previous studies the sample required was 89 using the formula $N = 4 PQ / L^2$ [$P = 34 \%$ ($q = 66 \%$ absolute precision = 10 %)] it was rounded off to 100, however, finally a total of 96 was obtained.

Sampling Technique

Total number of students in each class ranged from 52 - 56. In each class students were educated regarding STHI's and their prevention. 25 students were chosen in each class from attendance register by using systematic random sampling.

After selecting the students, a pretested validated interviewer schedule was applied, and labelled plastic containers were distributed with sterile paper and spatula, a day before. They were advised to pass the stool on a sterile paper and collect in the container with the spatula both provided to them on the next day. Single specimen was collected from each individual. They were advised not to contaminate the stool with water and urine. The stool

samples were immediately examined in the school by the microbiology lab technician in the school campus itself.

Macroscopic examination: The stool sample was checked for its consistency, colour, blood, mucus and any adult worms.

Microscopic examination of the stool sample for helminthic eggs or larva by wet preparation (normal saline and iodine preparation). The slides were observed first under low power (10x) and followed by high power (40x) of the microscope. The children found to be positive for the presence of eggs in the stool were traced back and given single dose of 400 mg albendazole.

Study variables were age, gender, caste, anthropometry, passage of worms in stools, usage of anti-helminths, drinking water source, nail biting, open air defecation, hand washing, abdominal pain, loss of appetite, peri anal itching, use of foot wear, pica. Symptomatic includes children with abdominal pain, loss of appetite, and peri-anal itching.

Statistical Analysis

Categorical data was expressed as proportions and quantitative data as means and standard deviation. Chi-square test and Fishers test were applied. A P-value of < 0.05 was considered as statistically significant.

RESULTS

A total of 96 students were enrolled in the study and all were girls aged between 11 - 16 years. Table 1 shows that mean age of study subjects was 13.41 ± 1.07 years. Majority (82 %) of the study subjects belonged to scheduled caste category.

Socio Demographic Variables		No. (%)
Caste	OC	2 (2.1)
	BC	8 (8.3)
	SC	79 (82.3)
	ST	7 (7.3)
BMI	Normal	32 (33.3)
	Underweight	62 (64.6)
	Overweight	2 (2.1)
Socio economic status – Modified BG Prasad	Class 1	1 (1)
	Class 2	12 (12.5)
	Class 3	12 (12.5)
	Class 4	1 (1)
	Class 5	1 (1)
	Don't know	69 (72)

Table 1. Sociodemographic Characteristics of the Study Population N = 96

Table 2 shows that overall prevalence of helminthic infections was found to be 19.8 % (19). Different species identified in the stool sample were *Ascaris lumbricoides* (68 %) and *Trichuris trichiura* (32 %).

Table 3 provides information on the distribution of STHI's related morbidities among the children. It was observed that 97 % of the children were anaemic with a Hb of < 12 g / dl. Mean Hb was found to be 9.73 ± 1.06 (g / dl). 64.6 % were underweight and 24 % of the children presented with one or more of the symptoms associated with STHI's.

Among the children practices such as nail-biting, open defecation and pica that enhance the transmission of STHI's was found to be 14.4 %, 18 %, 19 % respectively (Table 4).

There was no statistically significant difference observed between presence of STHI's and other variables like anaemia (P = 1), open air defecation (P = 0.51), nail biting (P = 1), presence of symptoms (P = 1) and pica (P = 0.75).

Prevalence of STHI's in Stool Sample		No. (%)
Infection	Present	19 (19.8)
	Absent	77 (80.2)
Type of STHI (N = 19)	<i>Ascaris lumbricoides</i>	16 (84.0)
	<i>Trichuris trichiura</i>	3 (16.0)

Table 2. Prevalence of Total and Individual STHI's. N = 96

Reported Morbidities		No. (%)
Symptoms	Abdominal pain	16 (6.7)
	Loss of appetite	6 (6.3)
	Peri anal itching	1 (1.0)
	Nil	73 (76.0)
Anaemia	Mild	9 (9.4)
	Moderate	81 (84.4)
	Severe	3 (3.1)
	Normal	3 (3.1)
Underweight	Present	61 (63.54)
	Absent	35 (36.45)

Table 3. Reported Morbidities among Study Subjects

Variables		STHI's as Reported by Stool Sample		χ^2 -Value (P-Value)
		Positive N (%)	Negative N (%)	
Symptomatic	Yes	4 (17)	19 (83)	0.001 (P = 1)
	No	15 (20)	58 (80)	
Anaemia	Yes	19 (20)	74 (80)	Fishers exact test P = 1
	No	0 (0)	3 (100)	
pica	Yes	4 (22)	14 (78)	0.08 (P = 0.75)
	No	15 (19)	63 (81)	
Underweight	Yes	6 (10)	55 (90)	8.79 (0.003)
	No	13 (37)	22 (63)	

Table 4. Association of Various Manifestations of STHIs with Positivity of Stool Sample among the Study Subjects N = 96

Practices		STHI's as Reported by Stool Sample		χ^2 -Value (P-Value)
		Positive N (%)	Negative N (%)	
Drinking water	Municipal water	19 (21)	71 (79)	Fishers exact test P = 0.59
	Others	0 (0)	6 (100)	
Nails	Present	14 (22)	50 (78)	0.205 (P = 0.65)
	Absent	5 (16)	27 (84)	
Nail biting	Present	3 (23)	10 (77)	0.102 (0.74)
	Absent	16 (19)	67 (81)	
Defecation	Sanitary latrine	17 (22)	62 (78)	Fishers exact test (P = 0.5)
	Open air / fields	2 (12)	15 (88)	
Habit of hand washing after defecation and before meals	Only with water	0 (0)	5 (100)	Fishers exact test P = 0.5
	with soap	19 (20)	72 (80)	

Table 5. Association of Various Water, Sanitation and Personal Hygiene Practices with Positivity of Stool Sample among the Study Subjects N = 96

DISCUSSION

Intestinal parasitic infection represents a large public health problem in developing countries. The prevalence of parasite exhibits wide variations from country to country, state to state, between geographical areas and between communities and even seasons which can be attributed to various factors like environment sanitation, water supply, socio economic status.

The overall prevalence rate was found to be 19.8 % (19) among these 68 % were eggs of *Ascaris lumbricoides*, 32 % was *Trichuris trichiura*. Similar studies done in Amalapuram

and Vijayanagaram of Andhra Pradesh state showed a high prevalence of intestinal parasitic infections of 63 %, 55.6 % respectively with STHIs being 12 %, 13 % and multiple infections were observed in 18.3 %, 8 % of study population respectively.^{6,7} Various studies from overall of India showed a prevalence rate of ascaris ranging from 0.6 % to 91 %, *Trichuris trichiura* 0.7 to 72 % and hookworm ranging from 0.02 to 52 %. Higher than 50 % prevalence was located in 10 states including Andhra Pradesh.⁸

In contrast to the this, study conducted by Yadav and Prakash et al.⁹ done in school going children of Dallu area, Kathmandu valley, Nepal, the overall incidence of parasites (protozoal and helminthic infections) was found to be 58.77 %, among them the most frequent were *Entamoeba histolytica* 25 %, 21 % *Giardia lamblia*, 10 % *Trichuris trichiura*, 16 % *Ascaris lumbricoides*, 6 % *Hymenolepis nana*, 12 % cryptosporidium spp. and 9 % cyclospora spp.

A study by Kattula et al.¹⁰ done among children aged between 4 - 16 years, prevalence was found to be 7.8 % with prevalence ranging from 0 - 20.4 % suggesting strong cluster effect. Majority of the infestation was due to hook worms (6.3 %), ascaris (1.2 %), *Trichuris trichiura* (0.8 %). There was a clear urban (4.8 %) and rural (9 %) differentiation with prevalence of hookworms being more in rural, ascaris and trichuris in urban areas. In present study as it was a residential school no clear cut rural, urban and tribal variations could be made because most of the time of students was spent in the school.

In Pandya et al.¹¹ which is a hospital based cross sectional study done among children between 2 - 12 years age group, an overall prevalence rate of intestinal parasitic infections was found to be of 17.8 % and among them helminthic infections were 8.9 % which is much less than present study. In contrast to the present study majority of the subjects were having hook worm infection with a prevalence of 3.96 % followed by ascaris 2.97 %, nana 0.9 % and taenia 0.9 %.

In Ganguly et al.¹² study done in various districts of Uttar Pradesh among 5 – 10 year-old children it showed a very high prevalence of STHI's, 75.6 %, ascaris (69.6 %) being highest followed by hook worms and *Trichuris trichiura* 22.6 % and 4.6 % respectively. Present study results are consistent with various other studies with high and low prevalence rate of ascaris and *T. trichiura* respectively. Study subjects with more than one STHI's was found to be 8.17 %.

In present study the overall prevalence of anaemia and underweight was high, 97 % and 63.5 % respectively, it was observed that almost 100 % of the stool positive children were suffering with anaemia. The prevalence of anaemia and underweight in stool positive children was found to be 100 %. Actually the prevalence of underweight was reciprocally more among stool negative (56 %) compared with stool positive (31.5 %) in contrast to the study done by Pandya et al.¹¹ Gujarat where malnutrition was found to be significant risk factor for getting STHI's (OR: 2.63, P = 0.05) this may be due to the high proportions of underweight and anaemia among adolescent girls in India. Practices like nail biting and pica are more in stool positive children but the difference was not statistically significant (P = 1).

In other studies like KATTULA et al.¹⁰ Poor living conditions, house with cow dung flooring or residing in a field hut and improper hygienic and sanitary practices like habitually eating food that has fallen on the ground or open air defecation or improper nail trimming were found to be significant risk factors for having infection. In Yadav and Prakash et al. study it was observed that children who used direct tap water, who did not trim nail and who washed hands with mud were having high percentages of STHI's.⁹

In the present study about 17.7 % of the study subjects were practicing open air defecation in contrast to study done by Pandhya et al.⁶ it was found to be 72 % and was associated with high prevalence of STHI's (89 %) this may be due to poor personal and food hygiene habits such as eating raw / unwashed vegetables, malnutrition, absence of handwashing before eating and after defecation, lack of toilet facility, poor sewage network coverage, and poor environmental conditions, such as living in crowded houses, and above all lack of mother's education lead to increased susceptibility to infection.¹¹

In the present study it was revealed that only 21 % of the infected students' symptoms of loss of appetite or abdominal pain. In contrast to Yadav and Prakash et al.⁹ study the occurrence of parasitic infestation was 98 % in symptomatic children.

CONCLUSIONS

In this study there was a high prevalence (19.8 %) of soil transmitted helminthic infections i.e. one in every 5th child was having the infection and irrespective of the stool positivity there was high prevalence (96 %) of anaemia and underweight (61 %) among these adolescent school girls. As this was a residential school, the habits of children like washing hands before eating and after defecation with soap was good and practices like nail biting and pica were comparatively less. In spite of Swachh-Bharat Abhiyan launched by our honourable prime minister, in the present study it was observed that the prevalence of open-air defecation was found to be 17.7 % in homes of the children.

Recommendations

In addition to biannual deworming, emphasis should be made on improving the sanitary conditions at home, giving health education and behaviour change communication to children regarding transmission of these STHI's. Health education should be directed towards inculcating proper hygienic practices like hand washing, avoidance of nail-biting, avoidance of open-air defecation, since the present-day children are building blocks of our future. This indicates a comprehensive approach to overcome this preventable burden.

Limitations

In this study we used conventional techniques like saline and iodine mount which would have actually underestimated the prevalence of the STHI's. Using concentration techniques

and estimating the egg count / gram of stool will give more accurate results and actual identification to determine the prevalence of these infections.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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