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BURDEN OF SOIL TRANSMITTED HELMINTHIASES FROM MIDDLE AND UPPER ASSAM: A RETROSPECTIVE STUDY FROM A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Soil-transmitted helminthic (STH) infection is a significant public health concern in India and a leading cause of morbidity, particularly in resource-constrained regions. Human transmission occurs through eggs or larvae in faeces, which contaminate soil in areas with poor sanitation. Infection results in intestinal blood loss leading to iron deficiency anaemia and protein malnutrition, impaired physical and cognitive development, abdominal pain and diarrhoea.

Aims & Objectives: To study the six-year prevalence trend of STH infections in middle and upper Assam region from the records of patients attending JMCH.

Materials & Methods: This retrospective cross-sectional study was done by collecting data from records of STH isolates from January 2017 to November 2022. Data were analyzed using EpiInfo and chi square test to analyze the association between different variables using p value < 0.05 as statistically significant.

Results: From a total of 1352 stool samples received over 6 years, 200 (14.8%) were positive for intestinal parasites among which STH were 102 (51%). Six different parasites were reported with *Ancylostoma duodenalae* being the predominant (59.8%) followed by *Trichuris trichura* (22.5%) and *Ascaris lumbricoides* (19.6%). Further, 2% recorded co-infection with 3 parasites and 6.5% with 2 parasites. The prevalence was higher in males (86%) than females (14%) (p=1.27) and 40-60 years age group showed highest prevalence.

Conclusion: Intestinal infection due to Hookworm was the most common STH identified in this study. Improvement in sanitation, periodical deworming and health education schemes are indispensable for the prevention and control of STH.

Keywords: Soil-transmitted helminthes, hookworm infestation, intestinal parasites

INTRODUCTION

Soil-transmitted helminthiases (STH) are caused by infection with intestinal parasites (*Ascaris lumbricoides* and *Trichuris trichiura*), hookworms (*Necator americanus* and *Ancylostoma duodenale*) and parasitic roundworms (*Strongyloides stercoralis*).[1] Human transmission occurs through eggs or larvae in faeces, which contaminate soil in areas with poor sanitation.[1] Infection

results in intestinal blood loss leading to iron deficiency anaemia and protein malnutrition, impaired physical and cognitive development, abdominal pain and diarrhoea.[1,2]

The World Health Organization (WHO) estimates about 1.5 billion people or 24% of the world's population are infected with STH excluding infection with *S. stercoralis* which is about 600 million.[4] In 2016, 6300 deaths and about 3.5 million disability-adjusted life years (DALYs) loss were reported.[1] Overall, South Asia accounts for approximately one-quarter of the world's cases of soil-transmitted helminthiases, with India having the largest number of cases as well as the highest number of children requiring preventive chemotherapy for STH.[5]

A. Lumbricoides, *T. trichiura* and hookworm do not multiply in the human host, but *S. stercoralis* reproduce in the host causing dermatological and chronic malnutrition and in immunocompromised individuals, its uncontrolled multiplication can be fatal.[3,4] There is no direct person to person transmission, or infection from fresh faeces as eggs take around 3 weeks to mature.[4] Morbidity is related to the number of worms harboured, heavier infections can cause a range of symptoms including intestinal manifestations (diarrhoea and abdominal pain), malnutrition, general malaise, weakness, impaired growth and intestinal obstruction.[4]

In 2020, WHO brought forth a new road map for neglected tropical diseases which identifies critical gaps and specifies actions required to reach the targets set for 2030, including control of morbidity due to *S. stercoralis*, established through global consultation.[1] This comprises of scientific understanding, developing rapid diagnostics and effective intervention with expanded sanitation in endemic areas and mass drug administration.[1]

To fully understand the current STH epidemiology, especially for hookworm infections known to increase and plateau in adulthood, community-wide data are required, in view of which, the current study was done to assess the burden of intestinal helminthic infection among patients of all age groups attending a tertiarycare hospital.

AIMS AND OBJECTIVES

1. Identification of helminthic ova present in the stool of patients of all age groups attending a tertiarycare hospital

2. To find the prevalence of different helminthic infections at different age group.

METHODS AND METHODOLOGY

1. Participants and Study design

The study was carried out at the department of Microbiology, Jorhat medical college and hospital (JMCH), Assam. JMCH caters to the health care needs of the population of Jorhat which includes various tea-estates as well as with the neighbouring four districts of Sibsagar, Golaghat, Majuli and Lakhimpur.

Data from stool samples of all age groups sent to the parasitology laboratory for routine diagnostic screening from 1st January 2017 to 30th November 2022 were analyzed.

Approval of the Institutional Ethical Committee (H) of Jorhat Medical College and Hospital was taken to carry out the study. Demographic details of the patients were obtained from the computerized database of the hospital.

Samples were collected in laboratory prescribed clean, dry, leak-proof-labeled containers. On receipt, all samples were screened macroscopically for colour, consistency, presence of adult worms, blood and mucus. Then they were examined by direct saline and iodine mount for the presence of eggs/larvae of intestinal helminths and findings were recorded.

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2. Statistical Analysis

Prevalence (with 95% confidence intervals) of intestinal parasitic infections was determined and stratified based on gender and different age groups. Data were analyzed using EpiInfo and the *Chi*-square test was used to determine any association of intestinal parasitic infections with sex and age range. Proportion distribution of different intestinal parasites in positive samples was analyzed by *Chi*-square test for trend. P-value less than 0.05 or less was considered as statistically significant.

RESULTS

The study encompassed 1352 stool samples which were received during the 6-year period from 1st January 2017 to 30th November 2022. **Table I** gives the prevalence of samples positive for all types of intestinal parasites. The overall prevalence was higher in males (86%) than females (14%) (p=1.27) (**Figure 1**). STH comprised of 102(51%) (**Table II**). Six different parasites were reported. The prevalence of *Hookworm* was the highest (59.8%), followed by *Trichuris trichura* (22.5%) and *Ascaris lumbricoides* (19.6%) (**Figure 2**). Polyparasitic infections were prevalent as many as 2% recorded co-infection with 3 parasites and 6.5% with 2 parasites (**Table III**). 40-60 years age group showed highest prevalence (**Figure 3**). **Table IV** gives the gender and age-group prevalence of STH infections in the study subjects. There was no statistically significant gender specific difference in the prevalence of infection. An age-specific difference was noted for Ascaris lumbricoides (**Table V**), hookworm (**Table VI**) and Trichuris trichiura (**Table VII**) infection with more prevalence in adults. Such significance was not noted for Strongyloides (**Table VIII**). Overall seasonal variation is shown in **Figure-4** where the peak months were from April to July.

Table I: **Overall prevalence of intestinal parasites**

Total Samples	Positive for Intestinal parasites	Percentage of positive samples
1352	200	14.8%

Figure 1- Gender-wise distribution of parasitic infection

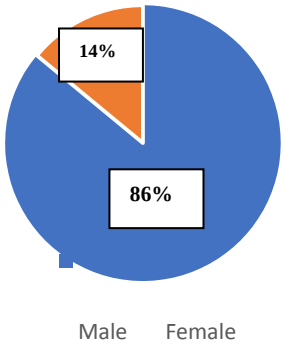

Table II: **Prevalence of STH among samples positive for intestinal parasites**

Type of Intestinal parasites	Number of Positive samples	Percentage of positive samples
Soil-transmitted helminths	102	51%
Intestinal protozoa	98	49%

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Figure 2 : Prevalence of STH in all age-groups

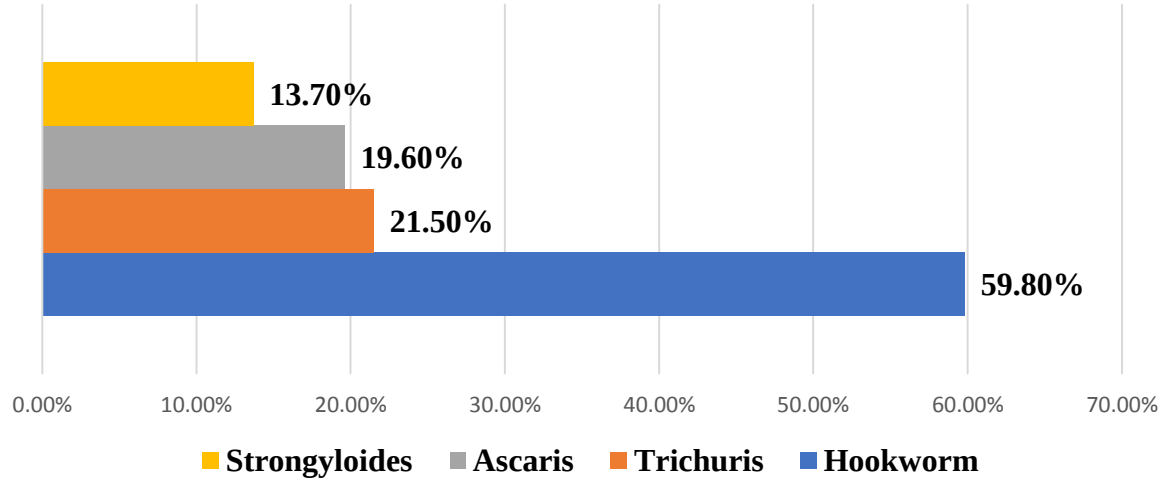

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Table III: Age-wise prevalence of poly-parasitic infections

Age group (in years)	Infection with 2 parasites (%)	Infection with 3 parasites (%)
<= 20	4 (2%)	1(0.5%)
21-40	4(2%)	1(0.5%)
41-60	3(1.5%)	1(0.5%)
>=60	2(1%)	1(0.5%)
All Ages	13(6.5%)	4(2%)

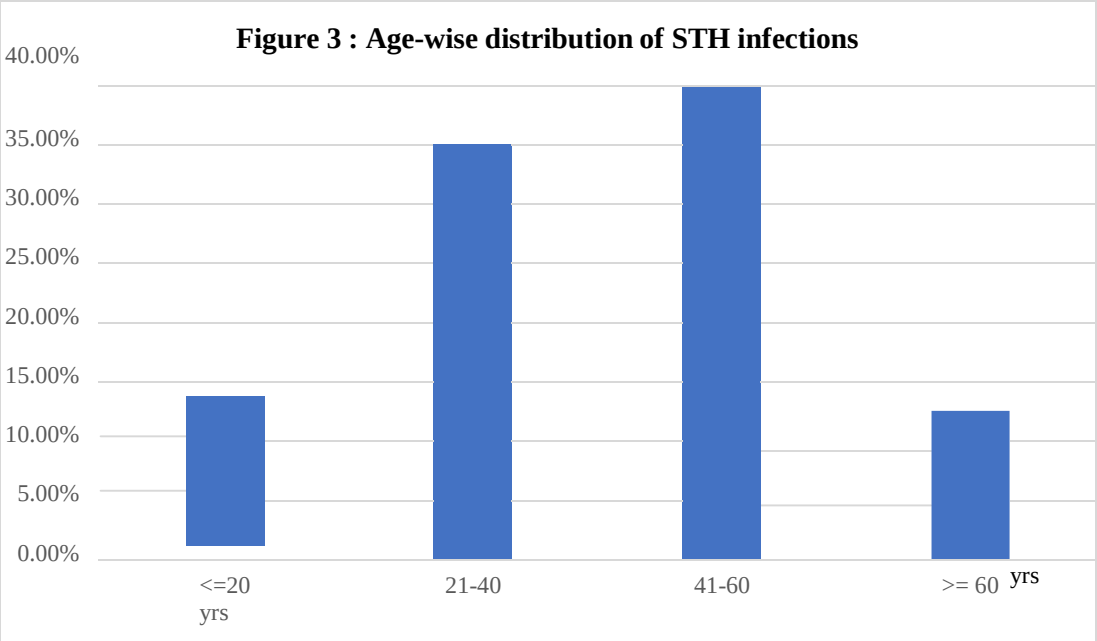


Table IV: **Age-wise and gender-wise distribution of helminthes**

			Prevalence of STH (%)				
Age group (in years)	Sex	Number of Samples	Hookworm	Trichuris	Ascaris	Strongyloides	
<=20	M	9	2	5	5	1	P value >0.05
	F	5	2	2	1	1	
21-40	M	27	15	6	4	6	
	F	9	6	2	2	1	
41-60	M	26	14	7	2	4	
	F	12	8	1	5	1	
>= 60	M	9	9	-	-	-	
	F	5	5	-	1	-	

Table V: Age-wise distribution of *Ascaris lumbricoides*

Age group	Prevalence	p value	OR
<= 20 years	6	0.019	4.6
>20 years	14		

Table VI: Age-wise distribution of Hookworm

Age group	Prevalence	p value	OR
<= 20 years	4	0.03	0.254
>20 years	57		

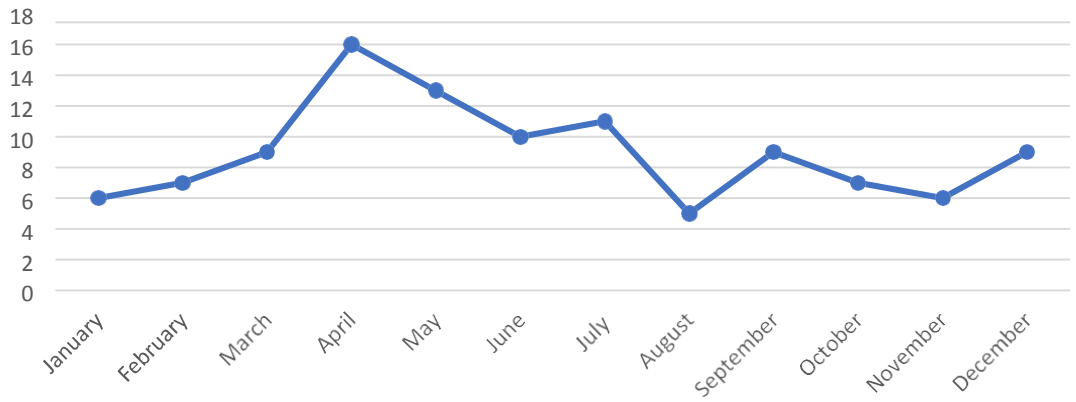
Table VII: Age-wise distribution of *Trichuris trichiura*

Age group	Prevalence	p value	OR
<= 20 years	7	0.0086	5.3
>20 years	16		

Table VIII: Age-wise distribution *Strongyloides stercoralis*

Age group	Prevalence	p value
<= 20 years	2	Not significant
>20 years	12	

Figure 4: Overall seasonal variation of STH infections



DISCUSSION

Overall prevalence of intestinal parasites is 14.8% from all stool samples received over the six-year period. This was higher than reports from South India[4] but lower than reports published from various parts of Assam[5,6]

The highest prevalence of intestinal parasites of 37.2% was seen in the age group 40-60 years closely followed by 35.3% in 20-40 years age group. A higher proportion of samples from male patients was found to be positive compared to females (86% vs. 14%) but statistically insignificant. This may be attributed to increased exposure to certain parasites in males because of occupation and activity and hormonal and immunomodulatory effects of testosterone in males which increases their susceptibility to certain parasitic infections.[4]

Among the STH, the highest prevalence was that of Hookworm (59.8%) followed by *Trichuris trichiura* (21.5%) and *Ascaris lumbricoides* (19.7%). These results show similarity with reports from South India[6] and Assam[7.] However, it was inconsistent with a review literature conducted from various regions of India[8] and studies from upper Assam region.[5,6,9]

A significant correlation was found between adult age group and infection with hookworm, *Ascaris lumbricoides* and *Trichuris trichiura*. Other studies showed higher prevalence of hookworm infection in adultscompared to children.[7,9]

Prevalence of poly-parasitic infections was also high as 6.5% recorded co-infection with 2 parasites whereas 2% recorded co-infection with 3 different parasites. Such evidence of poly-parasitic infections was alsoseen in studies conducted in other parts of Assam.[6,9]

There was seasonal variation in the prevalence, the peak months being April to July. These peaks corresponded to the months of high humidity levels and rainfall in our setting. Although our study was from ahospital setting, this seasonality was likely also a reflection of the picture in the community.

CONCLUSION

In conclusion, this study showed overall higher prevalence of hookworm infestation. Significant seasonality and poly-parasitic infections were also recorded. WHO has targeted STH for elimination as a public health problem in the new road map for neglected tropical diseases (2021-2030) These findings have public health implicationsas there is paucity of data on the prevalence and intensity of STH from this particular region of Assam. Further, this study was of long duration and samples analyzed comprised of all age groups. This is particularly important as for the effective control of STH in a community and information is required about prevalence on the whole population. Further, WHO has included control of *Strongyloides* in the target for 2030 for which estimation of the burden is a necessary action. Effective intervention i.e., mass drug administration should be integrated with education of hygienic practices. Lastly, provision of adequate sanitation and waste management facilities plays a major role in avoiding re-infection and interrupting transmission of STH infections.

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Conflicts of interest
There are no conflicts of interest.

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