

Original Research Article

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Prevalence of Soil Transmitted Helminthic Infection and Associated Risk Factors in Children in a Teaching Hospital

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ABSTRACT

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The main objective of the study is to estimate prevalence of soil transmitted helminthic infection and factors associated with hookworm infections. Stool samples were collected from children admitted in wards, ICU's and school camps and subjected to wet mount by iodine and saline. They were also subjected to concentration technique by formalin ethyl acetate solution. Thirty three children were positive for hookworm infection whereas 9 were positive for *A. lumbricoids* and 1 child for *T. trichura*. The prevalence of soil transmitted helminthes in rural areas was 5.6% where as in urban areas was 3.8%. Our study showed a prevalence of 79% of anaemic cases among helminthic infected patients. Multiple approaches including health education, improving existing sanitary practices and regular preventive chemotherapy are needed to control the burden of soil transmitted helminthes.

Introduction

The soil transmitted helminthes i.e., *Ascaris lumbricoids*, *Ancylostoma duodenale* and *Necator americanus* and *Trichuris trichura* are among the most common gastrointestinal worm infestations in humans in both tropical and subtropical countries. The World Health Organization estimates that more than two billion of the world's population is infected with soil transmitted helminthes (World Health Organization, 2012). Helminthic infections result in delayed physical growth and impaired cognitive development in children (Curtale *et al.*, 1999; Ostan *et al.*, 2007). In India the reported prevalence of soil transmitted helminthes ranges from 12.5% to

66% with varying prevalence rates for individual parasites (Ramesh *et al.*, 1991; Singh *et al.*, 1991; Singh *et al.*, 1993). The risk of acquiring helminthic infections is due to various biological, social, behavioral and environmental factors like poverty, lack of personal hygiene and substandard living conditions. This study was undertaken to find out the prevalence and also risk factors associated with soil transmitted infections in school children in South India.

Materials and Methods

This prospective cross sectional study was conducted at Mallareddy Institute of Medical Sciences over period of 2 years from June

2013 to May 2015. 450 stool samples of children between 5 years to 15 years were collected from Paediatric wards of Mallareddy hospital and by camps conducted in schools by our hospital around Suraram village. A child was enrolled into study only after parent provided written informed consent. All the enrolled children were provided with a screw capped plastic container to collect their stool sample. All stool samples were transferred to the laboratory within 4 hours of collection. Laboratory procedure: Saline and Iodine wet preparations were examined for the presence of Nematode ova (Fig. 1). Approximately 5g of stool was taken and subjected to concentration by formalin ethyl acetate technique. 10% formalin was added to the stool sample and mixed well. 5 ml of the fecal suspension was strained through wetted cheese cloth kept over a disposable funnel in to 15 ml conical centrifuge tube. 0.85% saline was added to tube to fill it up. The tubes were centrifuged at 1000rpm for 10 minutes. Sediment was removed and 10ml of 10% formalin was added to the deposit and mixed well. 4 ml ethyl acetate was added and shaken well and centrifuged once again at 1000rpm for 10 mins. The sediment was removed and few drops of 10% of formalin were added to the deposit. Wet mount was made from this suspension and seen under the microscope.

The complete blood picture of all the patients was taken to check for anaemia and eosinophil count. Haemoglobin estimation with cyanmethemoglobin method was performed for all the patients.

Statistical Analysis: Data were analysed by stata 10.0 software and X^2 tests were used.

Results and Discussion

A total of 450 children from Paediatric wards, intensive care and 13 schools were screened of whom 43 children had helminthic infections. Thirty three children were positive for

hookworm infection whereas 9 were positive for *A. lumbricoids* and 1 child for *T. trichura*. Among 28 boys, 20 were anaemic while among 15 girls, 14 were anaemic.

The prevalence of soil transmitted helminthes in rural areas was 5.6% where as in urban areas was 3.8%, this difference was not significant. Prevalence of helminthes differed significantly between rural and urban areas. Hookworm infestations were more prevalent among rural children whereas *A. lumbricoids* and *T. trichura* were more prevalent among urban children. Our study found 32 out of 450 stool samples positive for hookworms and 9 out of 450 stool samples positive for *A. lumbricoids* (Kang *et al.*, 1998). Our results show the prevalence of Hookworm to be 7.2% which is consistent with other studies. A study from Vellore found 22.8% of all stool samples positive for hookworm (Kattula *et al.*, 2014). In this study rural to urban difference in the prevalence of soil transmitted helminthes was observed with *Ascaris* and *Trichuris* more prevalent among urban children and hookworm among rural children. It has been suggested that *A. lumbricoids* and *T. trichura* are more prevalent in urban areas (Crompton and Savioli, 1993) and that the higher prevalence can be attributed to overcrowding, lack of adequate water and improper sanitation (Brooker *et al.*, 2006).

In rural areas, people residing in huts in fields, far away from the village are socioeconomically deprived and children walk barefoot through faecal fields that surround the village because open air defaecation is a common practice (Gopal *et al.*, 2009). It has been observed that even if only a few individuals in the household used a toilet, the contamination of immediate environment and farmlands surrounding the household was less intense than around households without a functional toilet (Ziegelbauer *et al.*, 2012) (Table 1–3).

Table.1 Distribution of helminthic parasites

Parasite	No. of patients	Percentage %
/A. lumbricoids	9	20.88
A. duodenale	32	74.24
N. americanus	1	2.32
T. trichura	1	2.32

Table.2 Presence of anaemia and eosinophilia among patients

Boys	28	Girls	15
High eosinophil count	21	High eosinophil count	12
Anaemic	20	Anaemic	14

Table.3 Patients in rural and urban areas

Helminthic parasite	Rural patients	Urban patients	Total
Hookworms	18	14	32
<i>A. lumbricoids</i>	6	3	9
<i>T. trichura</i>	1	0	1

Fig.1 Ova of *A. duodenale*



It has been postulated that intestinal parasites spread through poor hygienic practices, evidenced by contaminated finger nails, and unclean hands (Ismid and Rukmono, 1983; Hoa *et al.*, 2010). In this study, children with long or untrimmed nails were found to have higher risk of soil transmitted infection.

Anaemia was the most common complication among the children. Our study showed a prevalence of 79% of anaemic cases among helminthic infected patients. Helminthic infection may occur in community in clusters or may be isolated. The presence of infections in clusters can be mainly attributed to the fact

that most parents in the category were uneducated and slum dwellers. The hygiene in these schools was not properly maintained. The same was noted by Kattula *et al.*, (2014) in their study in Vellore and by Alemu *et al.*, (2014) in Ethiopia. It has been observed that mass treatment with a single dose of albendazole will eliminate a modest proportion of hookworms. A 3 day regimen is unlikely to have high compliance, and a change in the regimen is therefore unlikely to happen in the foreseeable future (Alemu *et al.*, 2011).

At the end of the survey team conducted counseling sessions on the following:

Hand washing habits before taking food and after defaecation.

Insisted the school administration to get in contact with the governmental authorities in their respective blocks for timely and regular dissemination of the IFA (three monthly every year and albendazole tablets, annually).

The girls found with infections were appropriately treated with a broad spectrum antihelminthic.

Multiple approaches including health education, improving the existing sanitary practices and regular preventive chemotherapy are needed to control the burden of soil transmitted helminthes. Hookworms are notorious in being asymptomatic while causing severe blood loss from the patient and making them anaemic. Mass treatments of these infections are known to be quite effective in bringing down the numbers of the helminthes. School children should be made conscious of food and hygiene habits and appropriate health programmes like deworming should be rightly and stringently implemented with regular monitoring to address the problem of not just

STH but associated problems of anaemia and underweight.

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