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Epidemiological study of soil transmitted helminths infestations in population of Darbhanga region of Bihar

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Abstract- To determine the prevalence of Soil Transmitted Helminths (STHs) *Ascaris lumbricoides* (Roundworm), *Trichuris trichiura* (Whipworm) and *Ancylostoma duodenale* (Hookworm) infection in population of Darbhanga district of Bihar. During the period of January to December 2022, we conducted a random epidemiological survey of STH infection. Stool samples were examined in the Pathological labs for STH eggs. We examined the prevalence of infection and its relationship with age and sex. 1777 persons were tested positive for STH eggs out of 2100 examined. The overall prevalence rate of various STH infections was 84.62 %. The prevalence of STH infection was highest in the 0-10 yrs age group (92.06%) followed by 11-20 yrs (90.26%). In both these age groups maximum of the subjects were infected by *Ascaris lumbricoides*. Prevalence of *Ascaris lumbricoides*, *Trichuris trichiura* and *Ancylostoma duodenale* was 31.71%, 29.76% and 23.14% respectively. *Ascaris* was most prevalent causing infection in all age groups except 41-50 yrs age group in which *Trichuris* was most prevalent (31.40 % in comparison to *Ascaris* 25.60 % and *Ancylostoma* 23.89%). In 0-10 yrs age group, number of males infected by *Ascaris lumbricoides* was little more than females infected by the same. Such a high rate of infection results from contaminated drinking water, open air defecation, poor socio-economic condition, and poor sanitation, bare-foot movement and warm humid conditions. Washing vegetables in contaminated water of ponds can spread the eggs of STHs. Supplying pure drinking water, providing better sanitation facilities and constructing toilets in rural areas so as to curb the menace of open air defecation can significantly reduce the burden of this disease. We should also concentrate on providing efficient health education at district level.

Key words: Soil transmitted helminths, prevalence, infection, poor socio-economic condition, sanitation facilities, parasitic nematode

INTRODUCTION

The Soil transmitted helminths STHs are a group of parasitic nematode worms causing human infection through contact with parasite eggs or larvae that thrive in the warm and moist soil of the World's tropical and sub-tropical countries.¹ Commonest STHs reported are *Ascaris lumbricoides* (Roundworm- 20%), *Trichuris trichiura*

(Whipworm- 10%) and *Ancylostoma duodenale* (Hookworm- 18%).² Studies show that people most infected with these parasites are rural residents of developing countries like Africa^{3,4} and Asia⁵⁻⁸. In India, prevalence ranges from 12.5% to 66% with varying rates of individual STH.⁹⁻¹² Meta analysis done in India also showed high rural prevalence of STH.¹³

These infections are endemic and are greatest cause of illness and disease.¹⁴ Despite their profound effect on literacy, economics and public health, they remain largely

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neglected by the medical and international community.¹⁵ High prevalence of these infections is closely related with lack of sanitation, lack of access to safe drinking water, improper food preparation, improper hygiene, impoverished health services and lack of education.¹⁶ Studies show profound effect of STH infection on school performance, attendance and future economic productivity.^{17,18}

Such infections might also increase host susceptibility to other illnesses such as malaria, tuberculosis and HIV infection.^{19,20} There is evidence that individuals with multiple helminth infections have even heavier infections with soil-transmitted helminths.²¹ No genes till yet are identified for control of human helminth infections. However, recent genome scan have identified a locus possibly controlling *A. lumbricoides* intensity on Chr 1 and 13.

Ascaris in large amount can cause lactose intolerance and mal-absorption of Vitamin A and other nutrients.²² *Ancylostoma* leads to intestinal blood loss leading to iron deficiency and protein malnutrition.^{23,24} *Trichuris* can cause colitis. Long-standing colitis produces a clinical disorder that resembles inflammatory bowel disease, including chronic abdominal pain and diarrhoea²⁵. The lower worm threshold is associated with cognitive deficits, and higher threshold is associated with significant clinical consequence such as anaemia.²⁶

The finding of the present study may provide useful information for such integrated strategies to overcome the public health burden of intestinal parasitic infections in the Darbhanga region of Bihar.

MATERIALS & METHODS

Study area: This study was carried out in the Darbhanga district of Bihar nearly 100 km from the state capital Patna. It lies along latitude 26° 10' 0" north and longitude 85° 54' 0" east. It has humid subtropical climate.

Annual average relative humidity of Darbhanga is 68%. Monthly average maximum temperature of Darbhanga ranges from 22-38°C. Monthly average minimum temperature of Darbhanga ranges from 9-27°C. Average yearly rainfall of Darbhanga is 1182 mm.

Experiment: Reports of pathological labs were examined to find the STH infection rate. 2100 people were examined for STH eggs out of which 1777 were found positive. Both urban and rural population were tested. Age of subjects varied from 0-80 yrs.

Sample collection: Samples were examined for whole year. Personal data of each participant such as age, sex and economic status were obtained using questionnaire. Temperature, humidity and rainfall were recorded for the whole year.

Examination: All the tests were performed according to simple test tube floatation method. 3 gm of faecal sample kept in beaker with 50 ml floatation and fluid (NaCl 400 gm, Water 100 ml, Sugar 500 gm) and stirred. Resulting faecal suspension was strained in another beaker and poured into test tubes. Cover slip was placed over each for 20 min, then lifted and placed on a glass slide and examined under microscope for helminths ova.

RESULTS

Out of the population sampled N=2100, 1059 were males and 1041 females out of which 1777 subjects (898 males and 879 females) were found positive for infection. Study showed an overall prevalence of 84.62 %. Roundworm infected 31.71% of subjects followed by Whipworm 29.76% and Hookworm 23.14%. *A. lumbricoides* had highest prevalence rate followed by *T. trichiura*.

The rate of infection was high all through the age groups ranging from 75.46% to 92.06%. Highest infection rate was seen in 0-10 yrs age group (92.06%) followed by 11-20 yrs age group (90.26%). Sex of the subjects did not

Table 1: Age Stratified Prevalence of infections with soil transmitted helminths in Darbhanga region of Bihar

Age group	No. of People Examined	Infected		Roundworm		Whipworm		Hookworm	
		No.	%	No.	%	No.	%	No.	%
0-10 Yrs	126	116	92.06%	46	36.50%	39	30.95%	31	24.60%
11-20 Yrs	359	324	90.26%	123	34.26%	115	32.03%	86	23.96%
21-30 Yrs	304	245	80.59%	96	31.58%	90	29.61%	59	19.41%
31-40 Yrs	273	206	75.46%	82	30.04%	67	24.54%	57	20.88%
41-50 Yrs	293	237	80.89%	75	25.60%	92	31.40%	70	23.89%
>50 Yrs	745	649	87.11%	244	32.75%	222	29.80%	183	24.56%
TOTAL	2100	1777	84.62%	666	31.71%	625	29.76%	486	23.14%

Table 2: Data of infections with STHs gender wise across all the six age groups

Age Group		No. of People Examined	Infected with RW		Infected with WW		Infected with HW	
			Number	%	Number	%	Number	%
0-10 Yrs	Males	56	22	39.29%	15	26.79%	15	26.79%
	Females	70	24	34.29%	16	22.86%	24	34.29%
11-20 Yrs	Males	178	59	33.15%	44	24.72%	56	31.46%
	Females	181	64	35.36%	42	23.20%	59	32.60%
21-30 Yrs	Males	147	52	35.37%	27	18.37%	48	32.65%
	Females	157	44	28.03%	32	20.38%	42	26.75%
31-40 Yrs	Males	138	33	23.91%	28	20.29%	38	27.54%
	Females	135	49	36.30%	29	21.48%	29	21.48%
41-50 Yrs	Males	145	33	22.76%	36	24.83%	46	31.72%
	Females	148	42	28.38%	34	22.97%	46	31.08%
>50 Yrs	Males	395	132	33.42%	100	25.32%	114	28.86%
	Females	350	112	32.00%	83	23.71%	108	30.86%

influence the rate of STH infection in our study as both the sexes were affected equally (84%).

DISCUSSION

The STHs infection is one of the world’s most important causes of physical and intellectual growth retardation. Its prevalence varies in different countries and geographical regions. Variation could be seasonal also.²⁷ People with low socio-economic status living in remote areas are at higher risk.^{28,29} Geo Helminths are more prevalent among children living underunhygienic and poorly sanitised conditions and their impact on morbidity and mortality is more severe in malnourished populations.³⁰ The nutritional impairment caused by Soil Transmitted Helminth is recognized to have a significant impact on growth and physical development.^{31,32} In the last decade, an increasing number of international initiatives have established the aim either to reduce or to eliminate the disease burden caused by STHs in the resource poor regions of the World.³³ The STH infection life cycle follows a general pattern. The parasites in adult stages inhabit part of host intestine (*A. lumbricoides* and hookworm inhabit small intestine, *T. trichiura* inhabits the colon), reproduce sexually and produce eggs which are passed in human faeces and deposited in the external environment. Adult worms survive for several years and produce large number of eggs. Infection occurs through accidental ingestion of egg. Adequate moisture and relatively high atmospheric humidity leads to faster development of ova.³⁰

In Darbhanga, the climate is like a heaven for STH parasites and this is the reason of such high prevalence of STHs. Children of age group 0-10 yrs, and 11-20 yrs have shown most cases of infection. The reason is lack of

maintenance of proper hygiene and ingestion of contaminated food and water. Regular drug treatment represents the main approach for infection control in areas where infections are intensely transmitted. The selection of delivery strategy and the frequency of treatment should be based on analysis of available epidemiological data. In our case, the treatment should be targeted to age group 0-20 years. Health education aims at improving health and increasing awareness about benefits of maintaining proper sanitation and hygiene. Providing information on the disease and possible adoption of preventive measures frequently results in an increase in knowledge but not necessarily results in behavioural change. Reduction in the faecal contamination of soil can be achieved by recommending the use of latrines, developing self-protection from re-infection and promoting personal/family hygiene.

CONCLUSION

STH infection will remain a worldwide public health threat for as long as poverty persists in the developing world. The reason of such a high prevalence in Darbhanga may be due to poor socio-economic condition, poor sanitation, lack of clean drinking water, open-air defecation, bare-footed movement, warm and humid climate, drinking water contamination, lack of health education. The government agencies should appropriately recognise the effect of these infections on health and education of children and adequate measures should be taken to curb the menace. One of the strategies to control the spread of infections can be distribution of Anthelmintic drugs in Schools for children and at work places for adults so that everyone can be dewormed. Large scale deworming is necessary to

reduce the worldwide morbidity of these infections but without improving water supplies and sanitation, this approach cannot be relied upon for sustainable reduction in frequency and intensity of infection.

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