

# SOIL—TRANSMITTED HELMINTHIASIS AMONG INDIAN PRIMARY SCHOOL CHILDREN IN SELANGOR, MALAYSIA

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## SUMMARY

*A survey of a total of 1,157 Indian primary school children from eight schools from urban and rural areas in and around Kuala Lumpur showed an overall prevalence of infection with soil-transmitted helminthiasis of 89.02%. The prevalence and intensity of infection were consistently high among both school boys and girls throughout the six years of primary school. The predominant helminth was Trichuris trichiura — both as single and mixed infections. The commonest type of helminthic infection among urban primary school children was mixed infections with Trichuris trichiura and Ascaris lumbricoides. Hookworm infections, both as single or mixed infections, were more common among school children from rubber and oil palm estates in the rural areas.*

## INTRODUCTION

Numerous surveys of soil-transmitted helminthiasis among school children,<sup>1</sup> children from semi-rural farms and villages,<sup>2</sup> paediatric in-patients from general hospitals in Kuala Lumpur<sup>3</sup> and Penang<sup>4</sup>

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and children from urban slums, estates, semi-rural new villages and urban flats in and around Kuala Lumpur<sup>5</sup> revealed that children, especially among those in the toddler age group to their mid-teens — are the highest risk group for soil-transmitted helminthiasis — both in terms of exposure to infection and frequency of re-infection.

The present study was carried out to determine the prevalence of infection with soil-transmitted helminths according to age, sex and type of helminthic infections among Indian school children from eight primary schools in and around Kuala Lumpur.

## MATERIALS AND METHODS

Plastic stool packets labelled with the name, age, sex and class of each pupil were distributed to the entire enrollment of eight primary schools — four in urban areas around Kuala Lumpur (Saraswathy, Jalan Fletcher, Sentul and Jalan Daman-sara) and four within rubber and oil palm estates in Selangor (Seafield, Razak, Ebor and Bukit Lan-chung). A total of 1,157 stool samples was collected and examined for soil-transmitted helminthiasis. The ages of these school children (both boys and girls) ranged from seven to twelve years (mean: 8.8 years). They were all Indian children.

Stool samples were examined for helminth eggs with the Kato thick smear method and egg counts of positive stools were made with Katz' technique.

## RESULTS

Table I shows the prevalence of soil-transmitted helminthiasis among Indian primary school children from the eight schools. Soil-transmitted helminthiasis was very prevalent among both urban and rural school children, ranging from 69.8% to 100% (overall prevalence: 89.02%). There was little difference in the prevalence of infection among school boys and girls with prevalence of 92.04% and 89.64% respectively (Table I). In two of the four estate schools (Seafield and Ebor), girls were slightly less frequently infected than boys.

The prevalence of infection among primary school children from standards one to six (7–12 years) was consistently high with hardly any difference in the distribution of infection among the different ages (Table II). The overall prevalence of infection among seven-year-olds was 83.4%. This prevalence increased steadily to 92.0% among the 12-year-olds. In Razak school within the rubber estate, all the children in the five primary classes were infected.

The prevalence of infection with the three common soil-transmitted helminths — *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms among pupils from the various schools is shown in Table III. In all the eight schools, *Trichuris* was the predomi-

nant helminth where 85.2% to 100% of all infected children had the parasite. *Ascaris* infection appeared to be more common among urban school children (overall prevalence: 75.6%; range: 64.5% to 85.7%) than rural school children (overall prevalence: 38.9%; range: 16.3% to 46.3%). Hookworm infection was much more prevalent among rural school children (overall prevalence: 42.4%; range: 37.2% to 46.3%) than those from the urban schools (overall prevalence: 2.9%; range: 0.7% to 7.2%). The intensity of infection with all the three helminths was evaluated according to egg counts (Table III). Despite the marked differences in the prevalence of ascariasis and hookworm infection among urban and rural school children, there was no clear-cut difference in the intensity of infection among these children. The average egg counts of both rural and urban school children infected with *Ascaris* were 10,487 EPG and 12,039 EPG respectively and those for hookworms were 298 EPG and 304 EPG respectively. On the other hand, urban school children tend to be more heavily infected with *Trichuris* (average egg count: 2,566 EPG) than rural school children (average egg count: 1,576 EPG), though the prevalence of trichuriasis among urban and rural school children was uniformly high — 90.7% and 92.7% respectively.

The prevalence of single, double and triple infections with one, two and three species of helminths

TABLE I  
PREVALENCE OF SOIL-TRANSMITTED HELMINTHIASIS AMONG  
PRIMARY SCHOOL BOYS AND GIRLS

Schools	Total Examined	Total Infected	Percentage Infected	Male (% infected)	Female (% infected)
Saraswathy	219	194	88.6	88.5	88.6
Jalan Fletcher	97	93	95.9	97.8	94.1
Sentul	123	122	99.2	100	98.5
Jalan Damansara	296	279	94.3	92.5	95.7
Seafield	232	162	69.8	74.6	64.9
Razak	95	95	100	100	100
Ebor	49	43	87.8	94.1	84.4
Bukit Lanchung	46	42	91.3	91.7	90.9
Total (Overall)	1157	1030	(89.02)	(92.40)	(89.64)

**TABLE II**  
**PREVALENCE OF SOIL-TRANSMITTED HELMINTHIASIS AMONG PRIMARY SCHOOL CHILDREN OF DIFFERENT AGES**

Schools	7 years			8 years			9 years			10 years			11 years			12 years		
	No <sup>a</sup>	No <sup>b</sup>		No <sup>a</sup>	No <sup>b</sup>		No <sup>a</sup>	No <sup>b</sup>		No <sup>a</sup>	No <sup>b</sup>		No <sup>a</sup>	No <sup>b</sup>		No <sup>a</sup>	No <sup>b</sup>	
	Ex	(+)	%(+)	Ex	(+)	%(+)	Ex	(+)	%(+)	Ex	(+)	%(+)	Ex	(+)	%(+)	Ex	(+)	%(+)
Saraswathy	39	31	79.5	26	23	88.5	34	32	94.1	39	36	92.3	38	34	89.5	43	38	88.4
Jalan Fletcher	12	10	88.3	11	10	90.9	19	19	100	22	21	95.5	17	17	100	16	16	100
Sentul	20	19	95.0	17	17	100	15	15	100	22	22	100	20	20	100	29	29	100
Jalan Damansara	40	39	97.5	38	35	92.1	64	62	96.9	50	49	98.0	54	50	95.6	50	44	88.0
Seafield	45	27	60.0	28	19	67.9	59	43	72.9	51	36	70.6	49	37	75.5	-	-	-
Razak	17	17	100	17	17	100	15	15	100	29	29	100	17	17	100	-	-	-
Ebor	12	10	83.3	13	12	92.3	8	7	87.5	16	14	87.5	-	-	-	-	-	-
Bukit Lanchung	8	8	100	22	19	86.4	11	10	90.9	5	5	100	-	-	-	-	-	-
Total (Average)	193	161	(83.4)	169	152	(89.9)	225	203	(90.2)	234	212	(90.6)	195	175	(89.7)	138	127	(92.0)

<sup>a</sup>No Ex - Number examined.

<sup>b</sup>No (+) - Number with positive stool samples.

**TABLE III**  
**PREVALENCE AND INTENSITY OF INFECTION WITH *ASCARIS*, *TRICHURIS* AND HOOKWORMS AMONG PRIMARY SCHOOL CHILDREN**

Schools	Total number of infected pupils	<i>Ascaris lumbricoides</i>			<i>Trichuris trichiura</i>			Hookworms		
		Number infected	Percent infected	Average EPG	Number infected	Percent infected	Average EPG	Number infected	Percent infected	Average EPG
<b>Urban schools:</b>										
Saraswathy	194	135	69.6	17,562	179	92.3	1,653	14	7.2	295
Jalan Fletcher	93	60	64.5	8,083	87	93.5	1,119	2	2.2	86
Sentul	122	86	70.5	12,828	107	87.7	7,099	2	1.6	556
Jalan Damansara	279	239	85.7	6,251	251	90.0	785	2	0.7	270
Total (average)	688	520	(75.6)	(10,487)	624	(90.7)	(2,566)	20	(2.9)	(298)
<b>Rural schools:</b>										
Seafield	162	75	46.3	9,902	138	85.2	615	66	40.7	438
Razak	95	33	34.7	19,425	94	98.9	2,927	44	46.3	233
Ebor	43	7	16.3	7,108	43	100	1,255	16	37.2	204
Bukit Lanchung	42	18	42.9	9,323	42	100	1,086	19	45.2	87
Total (average)	342	133	(38.9)	(12,039)	317	(92.7)	(1,576)	145	(42.4)	(304)

respectively among primary school children is shown in Table IV. With the exception of Seafield and Ebor schools, double infections with two species of helminths were the commonest type of helminthic

infection among both urban and rural school children. This was followed by single infections with one species of helminth alone. Triple infections with all three species of helminths were more

common among rural school children (11.6% to 21.4%) than those from urban schools (1.6% to 4.6%). Among the kinds of single infections with only one species of helminth, single infections with *Trichuris* alone were more common and accounted for 55.2% to 100% of all single infections reported among both urban and rural school children (Table IV).

Single infections with *Ascaris* alone were more common among urban school children (15.4% to 44.8%) whereas among rural schools, only Seafield school had *Ascaris* as single infections. Single infections with hookworms alone were found in two urban and two rural schools. Double infections with *Ascaris* mixed with *Trichuris* formed 95.7% to 100% of all double infections found among urban school children whereas only 15.4% to 56.1% of all double infections among rural school children were due to mixed infections with *Ascaris* and *Trichuris*. Double infections with *Ascaris* and hookworms were negligible among both urban and rural school children while 39.4% to 84.6% of all double infections among rural school children were due to *Trichuris* mixed with hookworms.

## DISCUSSION

The overall prevalence of soil-transmitted helmin-

thiasis among Indian primary school children (89.02%) in the present study was much higher than that observed among a general population of over 25,000 children and adults from urban slums, rural estates, new villages and from flats where only 39.6% of the entire population surveyed was infected.<sup>5</sup> The higher prevalence of infection observed in the present survey reflected the higher risks to infection that this particular age group of children (7– 12 years) were exposed to. In addition, Indians had been shown to have consistently higher prevalence of soil-transmitted helminthiasis than other races.<sup>1,3,4,5</sup> Among the eight primary schools surveyed, Seafield school had the lowest incidence of infection (69.8%). That was probably due to the fact that this school was run by one of the larger rubber estates in the area and the management made provisions for comparatively better and perhaps more adequate medical attention than the other estates. Besides, Seafield school was also one of the more assessible estate schools and it occasionally received visits from health officers for periodic deworming.

*Trichuris trichiura* was the most common soil-transmitted helminth, both as single or mixed infections, among this population of primary school children. This has also been shown to be so among other populations of children, school children and

TABLE IV  
PREVALENCE OF DIFFERENT TYPES OF HELMINTHIC INFECTIONS AMONG PRIMARY SCHOOL CHILDREN

Schools	Types of infection (%)			Types of single infection (%)			Types of double infection (%)		
	Single	Double	Triple	<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>Ascaris</i>	<i>Ascaris</i>	<i>Trichuris</i>
							+ Trichuris	+ Hookworm	+ Hookworm
<b>Urban schools:</b>									
Saraswathy	35.1	60.3	4.6	19.1	79.4	1.5	95.7	0.9	3.4
Jalan Fletcher	41.9	55.9	2.2	15.4	84.6	2.6	100	0	0
Sentul	41.8	56.6	1.6	29.4	70.6	0	100	0	0
Jalan Damansara	24.0	76.0	0	44.8	55.2	0	99.1	0	0.9
<b>Rural schools:</b>									
Seafield	43.8	40.7	15.4	12.7	70.4	16.9	56.1	4.5	39.4
Razak	38.9	42.0	18.9	0	97.3	2.7	37.5	0	62.5
Ebor	58.1	30.2	11.6	0	100	0	15.4	0	84.6
Bukit Lanchung	33.3	45.2	21.4	0	100	0	47.4	0	52.6

paediatric in patients.<sup>1,3,5</sup> The commonest type of helminthic infections among rural school children surveyed in the present study was *Trichuris* mixed with *Ascaris*, as was also reported in other surveys.<sup>5,6</sup> As was expected, hookworm infection was more common among rural school children. That was because children living in the rural estates usually had some form of small-scale vegetable gardening near their homes that would require regular tending by them. One of the sources of fertilizers for these garden plots was human excreta. In contrast, urban children had less opportunity to work in vegetable plots near their homes as most homes in urban slums were usually crowded together with little or no space between them to carry out any sort of small-scale vegetable gardening.

Thus, it can be concluded that soil-transmitted helminthiasis is a considerable public health problem among some populations of Indian primary school children. Almost 90% of all primary school children from eight urban and rural schools in Selangor was infected with soil-transmitted helminths. Most of these school children lived in highly endemic areas such as urban slums and poorly constructed houses along labour lines within rubber and oil palm estates. Within these communities, transmission of soil-transmitted helminthiasis was rapid and continuous and there was constant and frequent exposure to infection and re-infection (Kan, personal observation). An integrated approach towards parasite control involving firstly, periodic deworming of all members of all households; secondly improvement of environmental sanitation and personal hygiene and thirdly, improvement of nutritional status, especially among young children, would be highly effective in alleviating the problem of soil-transmitted helminthiasis among these school children.

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