

SOIL-TRANSMITTED HELMINTHIC INFECTION AMONG PEOPLE OF DIFFERENT SOCIO-ECONOMIC LEVEL (THE PREVALENCE AND INTENSITY OF INFECTION)

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Penyelidikan tentang prevalensi dan intensitas dari "Soil transmitted helminthic infection" pada tiga golongan penduduk dengan perbedaan tingkat ekonomi-sosial telah dilakukan di Mundu, Cirebon, Jawa Barat.

Dimulai dari penduduk dengan golongan ekonomi-sosial yang relatif terbaik sampai yang terburuk, maka prevalensi untuk *Ascaris lumbricoides* adalah: 31,5 persen, 59,0 persen dan 80,0 persen; *Trichuris trichiura*: 43,8 persen, 74,9 persen dan 98,5 persen; cacing tambang 21,7 persen, 44,1 persen dan 81,5 persen, sedang *Strongyloides stercoralis* ditemukan hanya 0 persen, 0 persen dan 5,1 persen. Intensitas infeksi dari *A. lumbricoides* menunjukkan angka-angka: 8935, 18514 dan 20581; *T. trichiura*: 348,993 dan 2225 dan pada cacing tambang 407,677 dan 1461 telur per satu gram tinya. *A. lumbricoides* dan *T. trichiura* menunjukkan prevalensi maupun intensitas yang lebih tinggi pada wanita, sedang cacing tambang baik prevalensi maupun intensitasnya adalah lebih tinggi pada pria. Berdasarkan pembagian menurut umur, maka prevalensi dan intensitas *A. lumbricoides* dan *T. trichiura* didapatkan tertinggi pada umur-umur dibawah 14 tahun, sedang cacing tambang pada umur lebih tinggi dari 15 tahun.

Previous survey conducted in different parts of Indonesia aimed at determining the prevalence of soil-transmitted helminthic infection revealed a considerable range of infection depending on the area and species of the parasites involved. *Ascaris* ranged from 34 to 92 per cent, trichuriasis from 23 to 91 per cent and hookworm infection from 23 to 67 per cent (Roesin and Saroso, 1974). Infection of *Strongyloides stercoralis* was low (Lie Kian Joo et al. 1938, Sri Oemijati, 1956).

In Java and South Sulawesi (Cross et al. 1970, Cross et al. 1972) *A. lumbricoides* seemed to be the most prevalent species en-

countered, followed by *T. trichiura* and hookworm. In Kresak (Clarke et al. 1973 a) and Jogjakarta (Clarke et al. 1973 b) *T. trichiura* had the highest infection rate followed by *A. lumbricoides* and hookworm. However, studies in Central Sulawesi (Hadidjaya et al. 1973, Carney et al. 1974 a, Carney et al. 1974 b) and West Sumatera (Roesin et al. 1975), showed that hookworm infection had the highest rate followed by *A. lumbricoides* and *T. trichiura*.

Prevalences of *A. lumbricoides* and *T. trichiura* were observed higher in females than in males (Cross et al. 1972, Clarke et al. 1973 b, Carney et al. 1974 b, Carney et al. 1974 c), while for hookworm infection the figure was higher in males than in females.

If the prevalence was broken down to age groups, people below 19 years had the highest infection rate for *A. lumbricoides* and *T. trichiura*. While for hookworm the highest rate was found in those over 30 years (Cross et al. 1972, Carney et al. 1974 a, Carney et al. 1974 b).

This study was carried out in connection with the treatment trial which also appears in the same issue.

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In estimating how far the socio-economic conditions influenced the acquisition of parasitic infection, studies were carried out on three groups of people of different socio-economic level. These three groups were compared in terms of prevalence and intensity of soil transmitted helminthic infection.

MATERIALS AND METHODS

Mundu, the study area lies about 45 km. west of Cirebon, on the north coast of West Java. It is in the sub-district of Karangampel, Regency of Indramayu. Group I and Group II were workers of Pertamina Oil company and their families. Group III were mostly farmers taken from inhabitants living in the adjacent area to the oil company's housing complex.

Group I consisted of 203 individuals (121 males and 82 females) from 71 families with ages varying from 1 month to 46 years. The company provided these workers with houses which had pre-fabricated walls, cemented floors, roofs made of wood, toilets, electricity and tap water supply in an area of 200 square meters. Each house had a small and well kept garden. Individuals belonging to this group used foot-wear. They were better educated and reasonably got higher wages than the other two groups. Group II consisted of 195 individuals (104 males and 91 females) from 77 families with ages varying from 2 months to 48 years. They were not provided with houses by the company. Group III consisted of 216 individuals (125 males and 91 females) from 65 families with ages varying from 1 to 65 years. Group II and III lived in almost the same surroundings and environment, which was about 1 km. away from the housing complex of the oil company. There houses were made of brick, wood bamboo or a combination of these materials. The roof was either of tiles or palm leaves. Neither toilets no tap water supply was available. A few families used well water, but most people used river water as a source of domestic water supply. Promiscuous defaecation in the nearby small river, ponds, field or bushes around the

house was a common practice. Most of them did not wear shoes. Group II also work for the oil company, but they belonged to a much lower grade than Group I. Group III which belonged to the lowest socio-economic group were mainly farmers, food peddlers, etc.

Stool samples were requested from each individual and placed in marked plastic containers for submission and examination early the following morning. Two slides of Kato's modified thick smear (Katz *et al.* 1973) with an average weight of 27.5 mg. each were prepared, examined and the eggs per slides were counted (Sri Margono *et al.* 1974). Modified Harada Mori culture technique (Kosin *et al.* 1973) was used for identification of hookworm and *S. stercoralis* larvae.

Table 1 Prevalence and intensity of soil transmitted helminthic infection in three groups of people of different socio-economic level

G R O U P	Prevalence rate (%)			Intensity (EPG)*		
	I	II	III	I	II	III
<i>A. lumbricoides</i>	31.5	59.0	80.0	8,935	18,514	20,581
<i>T. trichiura</i>	43.8	74.9	98.5	348	993	2,225
Hookworm	21.7	44.1	81.5	407	677	1,461
<i>S. stercoralis</i>	0.0	0.0	5.1			
Number of Individuals	203	195	216	203	195	216

* EPG = eggs per gram of stool.

RESULTS

The prevalence rate of infection in Group I, II and III were found to be 31.5 per cent, 59.0 per cent and 80.0 per cent for *A. lumbricoides* 43.8 per cent, 74.9 per cent and 99.0 per cent for *T. trichiura* whereas for hookworm the rates were 21.6 per cent, 44.1 per cent and 81.5 per cent respectively. *S. stercoralis* was found only in Group III and the infection rate was 5.1 per cent. Egg counts for *A. lumbricoides* revealed an intensity of 8,935, 18,514 and 20,581 eggs per gram (EPG); *T. trichiura* 348, 993 and 2,225 EPG and hookworm 407, 677 and 1,461 EPG of stool sample in Group I, II and III respectively (Table 1).

Table 2 shows the prevalence and intensity of infection according to sex. *A. lumbricoides* was observed to be more common in females belonging to Group I and III, but was of the opposite trend in the other two groups.

Females were found to be more commonly and heavily infected with *T. trichiura*. However, hookworm infection were more common and heavier in males. *S. stercoralis* was more prevalent in males.

Table 2 Prevalence and intensity of soil transmitted helminthic infection by sex in three groups of people of different socio-economic level (% and EPG)

GROUP	I				II				III			
	Prevalence		Intensity		Prevalence		Intensity		Prevalence		Intensity	
	M	F	M	F	M	F	M	F	M	F	M	F
<i>A. lumbricoides</i>	28.9	35.4	12,362	4,792	49.0	32.8	16,856	19,831	70.4	93.4	19,747	20,958
<i>T. trichiura</i>	37.2	56.1	251	443	67.3	83.8	760	1,206	87.2	100.0	1,814	2,712
Hookworm	24.8	17.0	211	91	48.1	40.0	887	382	84.8	76.9	1,854	891
<i>S. stercoralis</i>	0.0	0.0	—	—	0.0	0.0	—	—	5.6	4.4	—	—
No. individuals	121	82	121	82	104	91	104	91	125	91	125	91

Table 3 Prevalence of soil transmitted infection by age in three groups of people of different socio-economic level

Age group	0-4	5-9	10-14	15-19	20-24	25-29	30-34	Over 35
I								
<i>A. lumbricoides</i>	34.5	20.0	50.0	—	40.9	26.6	34.6	25.0
<i>T. trichiura</i>	16.0	43.3	80.0	—	59.0	48.8	38.5	33.3
Hookworm	5.5	20.0	33.3	—	45.4	31.1	26.9	0.0
<i>S. stercoralis</i>	0.0	0.0	0.0	—	0.0	0.0	0.0	0.0
No. individuals	(55)	(30)	(10)	(0)	(22)	(45)	(28)	(12)
II								
<i>A. lumbricoides</i>	50.0	76.1	57.1	58.3	70.8	57.1	80.0	41.6
<i>T. trichiura</i>	47.5	95.2	100.0	75.0	81.2	88.5	86.6	75.0
Hookworm	10.0	47.6	42.8	50.0	54.2	62.9	53.3	41.6
<i>S. stercoralis</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
No. individuals	(40)	(21)	(7)	(12)	(48)	(35)	(15)	(12)
III								
<i>A. lumbricoides</i>	84.0	92.1	85.7	72.7	100.0	88.8	82.3	67.1
<i>T. trichiura</i>	72.0	96.0	100.0	90.0	100.0	88.8	94.1	96.0
Hookworm	52.0	82.3	90.4	100.0	33.3	77.7	100.0	84.2
<i>S. stercoralis</i>	0.0	3.9	4.7	0.0	0.0	0.0	17.6	6.5
No. individuals	(25)	(51)	(21)	(11)	(3)	(9)	(17)	(78)

Table 3 shows the prevalence rate of infection according to age groups. It was interesting to note that the most heavily parasitized age group for *A. lumbricoides* in Group I, II and III were 10-14, 5-9 and 5-9 years; *T. trichiura* were 10-14, 10-14 and 10-14 years, while for hookworm were 20-24, 25-29 and 15-19 years. *S. stercoralis* was found mainly in individuals above the age of 30 years.

The youngest individuals found infected

with *A. lumbricoides*, *T. trichiura*, hookworm and *S. stercoralis* were 1 year, 8 months, 8 months and 7 years respectively.

Table 4 shows the average intensity of infection by age group. The highest intensity of *A. lumbricoides* and *T. trichiura* were found in the age group of 5-9, 10-14 and 5-9 years, but age groups 30-34, 10-14 and above 35 years for hookworm in Group I, II and III respectively.

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Result of multiple parasitic infection is summarized in table 5. Multiple infections were common in Group II and rare in Group I.

Table 6 shows the species of hookworm encountered in all three groups studied.

Necator americanus infection was found to be more common than *Ankylostoma duodenale* for all groups. Mixed infections of the two species of hookworm was more common than *A. duodenale* infection alone. This mixed infections was very common in Group III.

Table 4 Intensity of soil transmitted helminthic infection by age in three groups of people of different socio-economic level

GROUP	Age group	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	Over 35
I	<i>A. lumbricoides</i>	7,992	39,963	21,358	—	2,629	3,029	927	691
	<i>T. trichiura</i>	131	524	404	—	441	431	171	82
	Hookworm	72	84	72	—	145	407	509	0
No. of individual		(55)	(30)	(10)	(0)	(22)	(45)	(26)	(12)
II	<i>A. lumbricoides</i>	14,620	47,512	55,601	5,712	7,348	5,319	3,971	11,679
	<i>T. trichiura</i>	1,033	1,643	3,291	418	745	494	385	1,883
	Hookworm	1,462	338	3,054	364	389	658	527	782
No. of individual		(40)	(21)	(7)	(12)	(48)	(35)	(15)	(12)
III	<i>A. lumbricoides</i>	20,978	32,979	29,273	18,644	4,945	6,061	10,853	11,210
	<i>T. trichiura</i>	1,319	4,600	2,705	2,291	255	791	1,058	1,178
	Hookworm	564	1,145	1,108	1,145	73	131	1,076	2,225
No. of individual		(25)	(51)	(21)	(11)	(3)	(9)	(17)	(76)

Table 5 Multiple infection of soil transmitted helminthic infection in three groups of people of different socio-economic level

GROUP	I		II		III	
	No. Pos.	%	No. Pos.	%	No. Pos.	%
Infection with 4 parasites : <i>A. lumbricoides</i> , <i>T. trichiura</i> hookworm and <i>S. stercoralis</i>	0	0	0	0	9	4.2
Infection with 3 parasites : <i>A. lumbricoides</i> , <i>T. trichiura</i> and hookworm	15		52		133	
<i>T. trichiura</i> , hookworm and <i>S. stercoralis</i>	0	12.2	0	31.3	2	63.1
Infection with 2 parasites : <i>A. lumbricoides</i> , <i>T. trichiura</i>	28		48		24	
<i>A. lumbricoides</i> , hookworm	3	34.9	1	40.4	5	26.2
<i>T. trichiura</i> , hookworm	12		18		27	
Infection with 1 parasites : <i>A. lumbricoides</i>	18		15		7	
<i>T. trichiura</i>	35	52.8	28	28.3	5	6.5
Hookworm	12		4		2	
Total Positives	123	100.0	166	100.0	214	100.0

Table 6 Prevalence of *N. americanus* and *A. duodenale* in three groups of people of different socio-economic level

GROUP	I		II		III	
	No. Pos.	%	No. Pos.	%	No. Pos.	%
<i>N. americanus</i>	21	77.8	50	80.7	57	37.0
<i>A. duodenale</i>	0	0.0	1	1.61	13	8.4
<i>N. americanus</i> and <i>A. duodenale</i> (both)	6	22.2	11	17.7	84	54.4
Total hookworm infection	27	100.0	62	100.0	154	100.0

DISCUSSION

The results of this study were consistent with the results of other studies conducted in other parts of Indonesia (Carney *et al.* 1971 a, Clarke *et al.* 1973 b, Cross *et al.* 1970). Hence, *A. lumbricoides* was the most prevalent parasitic encountered, followed by *T. trichiura*, hookworm and *S. stercoralis*. Infection with *A. lumbricoides* and *T. trichiura* were found more common in females, however hookworm and *S. stercoralis* infection were more in males. Individuals with ages less than 14 years old were found to be more infected by *A. lumbricoides* and *T. trichiura*, while for hookworm and *S. stercoralis* individuals which were mostly infected were those of the ages over 15 years and 30 years, respectively. *N. americanus* was the dominant species of hookworm encountered in this study area.

Comparing Group I, II and III, it was obvious that the increase of prevalence and intensity of soil transmitted helminthic infection from group to group were consistent with the different socio-economic level. The lower the socio-economic level the higher the prevalence and intensity of the infection.

Prevalence and intensity of infection by sex group showed that the prevalence and intensity of *A. lumbricoides* infection were less in males. Both prevalence and intensity of *T. trichiura* higher in females. In hookworm infection there was no difference in prevalence between males and females, but the intensity of infection was higher in males. It could be summarized that either the prevalence or the intensity of infection were found highest in

younger age group in *A. lumbricoides* and *T. trichiura*, but in the older groups for hookworm. Multiple infection was increasing from group with a lower to a higher socio-economic level.

SUMMARY AND CONCLUSION

Studies on soil-transmitted helminthic infection were conducted in Mundu, West Java, in three groups of people of different socio-economic strata. The results obtained were parallel to those reported in previous survey conducted in Java, Sulawesi and Sumatera.

A definite trend of increase in both prevalence and intensity of infection was observed in groups with lower socio-economic level. *A. lumbricoides* and *T. trichiura* were found to be more common in females and in the younger age groups. The other two parasites, hookworm and *S. stercoralis* were found of the same prevalence in males and females and more common in older age groups.

Multiple parasitic infection was encountered more often in people living in areas under poor conditions. *N. americanus* was found to be more dominant than *A. duodenale* in the area studied.

It was observed that the lower the educational background, the poorer the environmental sanitation, etc., or the lower the socio-economic level, the more was the opportunity to get infection of soil-transmitted helminths.

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