Acta Tropica, 48(1991)247–249
Elsevier

ACTROP 00117

Short Communication

Patterns of hookworm and *Ascaris* infection in Dar es Salaam

J.Z.J. Killewo[1], S. Cairncross[2], J.E.M. Smet[3], L.F. Maikwano[1] and H. van Asten[4]

[1]*Faculty of Medicine, University of Dar es Salaam, Tanzania,* [2]*London School of Hygiene and Tropical Medicine, London, U.K.,* [3]*International Reference Center for Water Supply and Sanitation, The Hague, The Netherlands, and* [4]*World Health Organization, Dar es Salaam, Tanzania*

(Received 3 October 1989; revised manuscript received 7 May 1990; accepted 28 May 1990)

Key words: Hookworm; *Ascaris*; Transmission; East Africa

Stool samples were collected for parasitological examination from a spatially stratified random sample of 194 households throughout Temeke District, a peri-urban area in Dar es Salaam, Tanzania. Specimens were either examined on the same day or stored at +4°C until examination on the next working day. They were prepared by the formol-ether concentration method and the Kato Katz technique (Katz et al., 1972) was used to count the number of helminth eggs in each 50 g sample. A single microscopist (LM) examined every sample.

Details of household composition, sanitation and socio-economic characteristics were ascertained by interview and a structured observation schedule. The economic status of households was assessed by enquiring, and where possible observing, whether they owned any of a series of articles including a kerosene stove, a radio, a bicycle and a motorcycle. A weight was given to each item in accordance with its cost and rarity in Temeke at the time of the survey (late 1985), and a score derived by adding up the weights for all the items owned.

Of the population of 1168 covered by the survey, faecal samples were examined for only 621, or 53% of the total. However, there was no significant difference between the mean economic scores of those who submitted samples and those who did not.

Every family interviewed had access to a latrine of some kind, but the majority shared them, usually with other tenants of the same landlord. All but a very few were simple pit latrines; three out of four had a cement floor. 95% of children aged

Correspondence address: Dr. S. Cairncross, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, U.K.

five and above and practically all able-bodied adults used them. 18% of latrine floors were observed to be soiled with faeces.

Ascaris infection showed a significant degree of clustering by household. Table 1 compares the numbers of households with one or more cases of infection with the numbers to be expected on the basis of a random distribution among the population. The households with more than one member infected with *Ascaris* usually included an infected child; out of 8 infected children under 10 years of age, 7 were in such households. By contrast, only 6 out of 17 infected persons of 10 years or over were in multiple-case households. The difference is statistically significant (Fisher's exact test: $p < 0.05$).

Thus, the pattern of *Ascaris* infection indicated a considerable degree of transmission from children to other members of the household. Transmission of *Ascaris* is of course not direct, but occurs through contamination of the environment. However, no association was visible between *Ascaris* infection and any of the following environmental factors: number of households sharing the latrine; latrine floor of earth or in poor condition; piped water on the plot; site set aside for defecation by small children; hygienic disposal of small children's faeces. Prevalences were slightly, but not significantly higher in those households using water (as opposed to paper) for anal cleansing, those with more occupants per room, those whose latrine pit had recently overflowed, and those whose latrine floor was soiled with faeces.

Hookworm infection showed no clustering by household (Table 1). Nor was the prevalence greater among larger households or households sharing their latrine with many others. It follows that most of the transmission of this parasite in the study area was between households rather than within them, and therefore that the domestic environment was not the main area where transmission occurred. The fact that infection was not associated with the number of households sharing the latrine, nor with a range of other environmental variables, also supports the conclusion that the household, and the latrine in particular, was not the primary focus of transmission in the area.

Hookworm infection was significantly associated with low economic status, although ascariasis showed no such association (Table 2). This association does not appear to be a result of education; there was no significant correlation between hookworm infection and the educational status of the household head, nor with the respondent's knowledge of worms. There are two other possible causes. First, poorer people are more likely to be engaged in agriculture, a common source of exposure to hookworm infection (Feachem et al., 1983). Second, the wearing of shoes is less

TABLE 1

Clustering of cases of infection by household

No. of households with:	0 cases	1 case	2 cases	3 or more
Hookworm				
Expected	102.4	32.6	5.2	0.67
Observed	104	30	6	1
Ascaris				
Expected	118.2	20.8	1.9	0.1
Observed	124	12	2	3

TABLE 2

Prevalence of hookworm and *Ascaris* infection by economic score (wealthier households have higher score)

Score	*N*	Hookworm		*Ascaris*	
		No. +ve	(%)[a]	No. +ve	(%)
0–9	68	10	(14.7)	0	(0.0)
10–19	290	28	(9.7)	14	(4.8)
20–29	176	4	(2.3)	9	(5.1)
30–39	56	2	(3.6)	2	(3.6)
40	30	0	(0.0)	0	(0.0)
missing	1	1		0	
Total	621	45	(7.2)	25	(4.0)

[a] $p < 0.01$ (trend test).

common among the poorer families. Hookworm in Dar es Salaam is almost entirely *Necator americanus* (Rowland, 1966) against which shoes should give complete protection.

Among children attending school, only 2/90 (2%) were infected with hookworm, while among non-attenders, the prevalence was 18/150 (12%). The difference is statistically significant ($p < 0.05$) and occurs within each 5-year age range of the population aged 5 to 19 years. No programme of chemotherapy of school children is carried out in Dar es Salaam, and sanitation at most schools is notoriously poor and frequently non-existent. A check for the possibility of confounding by economic status showed that the mean economic score of those attending school was not significantly different from that of the population at large – a consequence of Tanzania's commitment to free education.

The link with schooling is best explained by the fact that most schools in the city require that pupils should wear shoes. Observation of children leaving local schools confirmed that most of them complied, whereas during observation near their homes, hardly any of the non-school attending children were seen to wear shoes.

Acknowledgement

The financial support of the Swiss Government through IRCWD is gratefully acknowledged.

References

Feachem, R.G., Bradley, D.J., Garelick, H. and Mara, D.D. (1983) Sanitation and disease. John Wiley, Chichester, U.K.

Katz, N., Chaves, A. and Pellegrino, J. (1972) A simple device for quantitative stool thick smear technique in schistosomiasis mansoni. Rev. Inst. Med. Trop. Sao Paulo 14, 397–400.

Rowland, H.A.K. (1966) Anaemia in Dar es Salaam and methods for its treatment. Trans. R. Soc. Trop. Med. Hyg. 60, 143.