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SOIL TRANSMITTED NEMATODES IN CHILDREN IN BUEA HEALTH DISTRICT OF CAMEROON

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ABSTRACT

Objective: **To investigate the prevalence, intensity of infection and control of soil-transmitted nematodes in primary school pupils of urban, suburban and rural localities.**
Setting: **Buea Health District.**
Design: **A cross section experimental study.**
Subjects: **Three hundred and forty primary school children.**
Intervention: **Mebendazole treatment complemented with health education.**
Results: **The overall prevalence rate of soil-transmitted nematodes in the Buea Health District was 59.1%. The infection rate was significantly different in the urban, suburban and rural localities of the health district ($P<0.01$), with the rural area having the highest rate of infection. *Ascaris lumbricoides* was the most predominant parasite. The intensity of infection with the various helminth species was not significantly different between children of urban, suburban and rural localities. Mebendazole treatment significantly reduced the intensities of infection with *Ascaris* and *Trichuris* ($P < 0.05$). The treatment, however, was ineffective against hookworm infection. Re-infection rate with *Ascaris* and *Trichuris* was slower in children who additionally received health education than in those who received only anthelminthic treatment.**
Conclusion: Ascaris lumbricoides, Trichuris trichiura **and hookworms are the predominant nematodes reported in children of urban, suburban and rural localities in the health district. Health education is advocated as a complement to chemotherapy in the control of soil-transmitted nematodes.**

INTRODUCTION

In the 1993 World Development Report, intestinal helminths ranked first as the main cause of disease burden in children aged 8-14 years(1). Children in Africa(2) including Cameroon(3) are the most affected. Poor hygienic conditions, low standards of sanitation and poor socio-economic conditions have been advanced as the major causes of increase in soil-transmitted nematodes(4) and are obvious predisposing factors to helminthic infections.

Periodic chemotherapy, ideally in the context of efforts to promote sanitation, is the key intervention in current intestinal nematode control strategies. Morbidity and worm load have been found to decrease considerably where health care has been efficiently integrated with education programmes(5).

The present study was designed to investigate the prevalence, intensity of infection and control of soil-transmitted nematodes in primary school pupils of urban, suburban and rural localities in the Buea Health District.

MATERIALS AND METHODS

Study Area: The Buea Health District (4°3'N, 9°9'W) is essentially a rural area in which is located the administrative capital of the South West Province of Cameroon. It is situated within the rainforest zone and ranges in altitude from 500m above sea level to over 1000m. The mean ambient temperature is 20°C and the mean relative humidity is 88.9%. Six primary schools were chosen for the study, two each in the urban, suburban and rural localities.

Subjects: Three hundred and forty class five pupils aged between eight and 15 years were recruited for the study after parental consent. One hundred and twenty-six of these children were attending schools in the urban locality, 129 in the suburban and 85 in the rural locality.

Prevalence and intensity of infection: Prior to anthelminthic treatment, fresh faecal samples were collected from the children in labelled wide-mouthed plastic containers. The Kato-Katz thick smear technique was used for the quantitative estimation of the eggs of *Ascaris lumbricoides* and *Trichuris trichiura* per gram of faeces(6) while the test tube filter paper technique was employed for the quantitative estimation of the infection intensity of hookworm larvae(7).

Anthelmintic treatment and health education: Mebendazole (at a dose rate of one 100mg tablet chewed in the morning and evening for three days) was administered to each of the two hundred and one participating children who tested positive for one or more of the soil-transmitted nematode species after pre-treatment faecal examination. Faecal samples were again collected at one and two months post-treatment. Eighty-six children in two of the schools (one in the urban and the other in the suburban locality) received additional health instructions which were repeated to them once a week in a hygiene class.

Statistical analysis: The prevalences of soil-transmitted nematodes in children of the three localities were compared by X^2 test while the intensities of infection were compared using analysis of variance on the faecal egg counts after $\log_{10}$ (N+1) transformation. Efficacy of treatment was assessed by paired t-test on the pre and post-treatment faecal egg counts. X^2 test was used to compare the post-treatment reinfection rate in pupils who received only treatment and those who additionally received health instructions.

RESULTS

Prevalence of infection: The prevalence of soil-transmitted nematodes in class five children from primary schools in the urban, suburban and rural localities of the Buea Health District prior to treatment is shown in Table 1. The infection rate was significantly different in the urban, suburban and rural areas of the health district (P<0.01). The rural area had the highest rate of infection with *Ascaris lumbricoides, Trichuris trichiura* and hookworms. A. *lumbricoides* was the most predominant parasite, followed in diminishing order by *T. trichiura* and hookworm.

Within the three localities, there was no significant difference in infection rate of each helminth species between the males and females (P > 0.05), although *T. trichiura* generally appeared to be more prevalent in males (45.6%) while hookworms were more prevalent in females (3.6%) (Table 1).

Intensity of infection: The intensity of infection with soil-transmitted nematodes in children from schools in the urban, suburban and rural areas of the health district is shown in Table 2. Prior to anthelmintic treatment, the intensity of infection was not significantly different between children in the urban, suburban and rural schools (P>0.05). However, *Ascaris* load was higher in children of urban and suburban schools than in those of rural schools. On the other hand, *Trichuris* and hookworm infections had higher intensities in children of suburban and rural schools than in those of urban schools. There was no significant difference between males and females in the intensity of infection with the various species of helminths, although overall, females were generally more heavily infected (Table 2).

Efficacy of mebendazole treatment and impact of health education: Following mebendazole treatment, the mean prevalence of *Ascaris* dropped from 45.6% to 16% one month after treatment, that of *Trichuris* reduced from 41.2% to 28.3%, while that of hookworm changed from 3.2% to 5.0%. The prevalence rate of *Ascaris* one month after treatment was significantly lower (P<0.05) in children of the three localities compared to the pre-treatment rate. The prevalence of *Trichuris* was reduced but not significantly different from the pre-treatment rate, while that of hookworms did not appear to have been affected by treatment.

Table 1

Prevalence of soil-transmitted nematodes in pupils attending primary schools in the urban, suburban and rural localities of the Buea Health District, Cameroon

Locality	Sex of Pupils	Prevalence of infection (%)			
		Ascaris Lumbricoides	*Trichuris trichiura*	Hookworms	All helminths
Urban	Male	33.9	32.3	0	48.4
	Female	34.3	31.3	1.6	50.0
	M&F*	34.1	32.5	1.6	49.2
Suburban	Male	52.2	52.2	4.3	65.2
	Female	47.0	37.3	2.4	59.0
	M&F	48.1	42.6	3.1	61.2
Rural	Male	56.4	59.0	5.1	69.2
	Female	60.9	47.3	8.7	71.7
	M&F	58.8	52.9	5.9	70.6
Entire area	Male	44.9	45.6	2.7	60.9
	Female	46.1	37.8	3.6	60.1
	M&F	45.6	41.2	3.2	59.1

*M & F = Males and females together.

Table 2

Intensity of soil-transmitted nematode infections in primary school children of the Buea Health District, Cameroon

Locality	Sex of Pupils	Intensity of infection (epg. faecas *Ascaris Lumbricoides*	*Trichuris trichiura*	Hookworm
Urban	Male	2042 ± 6961	34 ± 80	0
	Female	2893 ± 13625	47 ± 135	1 ± 6
	M&F*	2481 ± 10860	41 ± 111	0.3 ± 4
Suburban	Male	3122 ± 8780	194 ± 628	2 ± 9
	Female	2904 ± 8255	179 ± 637	1 ± 6
	M&F	3084 ± 8803	190 ± 629	1 ± 9
	Male	1974 ± 4535	115 ± 197	2 ± 8
Rural	Female	1583 ± 4273	185 ± 728	3 ± 15
	M&F	1767 ± 4378	152 ± 542	3 ± 12
Entire area	Male	2444 ± 7476	110 ± 368	1 ± 8
	Female	2596 ± 9757	137 ± 553	1 ± 9
	M&F	2531 ± 8841	125 ± 482	1 ± 9

*M & F = Males and females together.

Table 3

Impact of mebendazole treatment combined with health education on the control of soil-transmitted nematode infections in primary school children of the Buea Health District

				Prevalence of infection (%)								
				Ascaris lumbricoides			*Trichuris trichiura*			Hookworm		
Locality	School	Health control method	No.of Pupils	Pre-treatment	One month post-treatment	Two months post-treatment	Pre-treatment	One month post-treatment	Two months post-treatment	Pre-treatment	one month post-treatment	Two months post-treatment
Urban	G.S Buea town Grps a & b	Chemotherapy & Health Education	53	47.2	8.7	20.9	43.5	21.7	44.2	1.9	1.3	2.3
	G.S. Buea Town Grp.C	Chemotherapy only	27	33.3	27.3	40.9	33.3	50.0	40.9	3.7	4.3	3.1
Suburban	G.S. Muea Grp a	Chemotherapy Health Education	33	39.4	10.0	21.6	39.4	10.0	25.0	0	0	0
	G.S. Muea Grp b	Chemotherapy only	35	62.9	20.0	29.2	65.7	16.7	29.2	5.7	6.0	8.3

A similar trend was observed in the intensities of infection, where *Ascaris* and *Trichuris* loads were significantly reduced ($P < 0.05$) at one month after treatment whereas hookworm infection continued to build up throughout the study period.

The post-treatment prevalence rates of soil-transmitted nematodes in children who had only chemotherapy and those who additionally received health education are shown in Table 3. The results reveal that reinfection with *Ascaris* and *Trichuris* following anthelmintic treatment was slower in children who additionally received health instructions than in those who received only anthelmintic treatment. This difference persisted for at least two months post-treatment.

DISCUSSION

Ascaris lumbricoides, Trichuris trichiura and hookworms are the predominant soil-transmitted nematodes that have been reported in Cameroon(3, 8). These were present in most children of the urban, suburban and rural localities of the health district, with the rural area having the highest prevalence rate of all the three species. This corroborated the report by Albonico *et al*(5) which showed that these nematodes are more prevalent in the rural areas than in the urban areas. Urbanization appears to have contributed to the decrease in soil-transmitted nematode infections through the availability of adequate methods of disposal of faeces, increased level of general awareness, and

improved sanitation in general. The more frequent exposure to infective stages in the rural area as indicated by the higher prevalence rate of infection might have led to acquisition of some degree of resistance in the host, thus leading to a lower helminth load in rural dwellers than in urban dwellers.

The difference in the prevalence rate between the sexes was not significant. This corroborated with similar observations by other workers(8-9); Igbinosa *et al*(10) however reported that males were more infected than females. The variation in the observations may be attributed to the different activities carried out by males and females in the respective areas where the studies were carried out.

Our study revealed that mebendazole at 100mg twice daily for three days was very effective against *ascariasis*, less effective against *trichuriasis*, and completely ineffective against hookworm infection. Abonico *et al.*(11) also found mebendazole less effective for treatment of *trichuriasis* and hookworm infection. Cure rates of 95-100% have been achieved in patients with ascariasis(12). Anthelmintic drug resistance in human hookworms has been reported by De Clercq *et al.*(13).

It was clear from the results obtained in this study that chemotherapy combined with health education had a positive impact in limiting post-treatment re-infection rate. Albonico *et al.*(5) remarked that health education is only effective as a long-term and not short-term goal in the control of soil-transmitted nematodes. Health education, when properly planned out and executed, may significantly reduce reinfection rate among school children. Health education charts used as teaching aid should emphasise the need for proper washing of hands after using the toilet and 'before eating, proper washing of fruits and vegetables eaten raw, drinking water only from a safe source, and avoiding walking or playing barefoot. An integrated control programme that incorporates chemotherapy, proper sanitation and health education is advocated.

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