ORIGINAL ARTICLE

The Prevalence and Intensity of Soil-Transmitted Helminthiasis Among Pre-school Children in Orang Asli Resettlement Villages in Kelantan

A Zulkifli, MPH*, A A Khairul, PhD, A S Atiya, MPH**, B Abdullah, MLT*, A Yano, PhD*****
***School of Medical Sciences, Universiti Sains Malaysia, Kota Bharu, Kelantan, **Faculty of Medicine, University of Malaya, Kuala Lumpur, *** Department of Parasitology, School of Medicine, Chiba University, Japan**

Summary

A study of the prevalence and intensity of soil-transmitted helminthiasis among pre-school children aged 0 to 7 years from an Orang Asli village resettlement scheme in Gua Musang, Kelantan was undertaken. The overall prevalence of soil transmitted helminthic (STH) infections was 56.0%. The predominant helminth found was *Ascaris lumbricoides* while the commonest type of infection was a mixed infection with *Ascaris lumbricoides* and *Trichuris trichiura*. The prevalence rates of Ascaris, Trichuris and hookworm infections were 47.5%, 33.9% and 6.2% respectively. The intensity of Ascaris infections were 64.5% light, 27.3% moderate and 8.3% heavy whilst the intensity of Trichuris infections were 80.5% light, 18.3% moderate and 1.2% heavy. However, the intensity of hookworm infections were 86.7% light, 13.3% moderate and no heavy infection. The prevalence of helminthiasis (STH) shows an-age dependent relationship, with the lowest prevalence in 0 - <1 year age group and highest in the 6 - <7 year age group.

Key Words: Helminthiasis, STH infections, Pre-school children, Orang Asli, Kelantan

Introduction

Soil-transmitted helminthiasis (STH) continues to be prevalent in Malaysia despite tremendous improvements achieved in the health status of the country. It is still highly endemic in the rural areas, especially among communities with a low socioeconomic background[1,2,3,4]. STH has been shown to depress growth, physical fitness and cognitive ability, especially among children[5,6]. Several studies have demonstrated a high prevalence of STH among the Orang Asli community in Malaysia[7,8,9]. Norhayati *et al* in a recent study found a prevalence rate of 62.9% *Ascaris lumbricoides* infections, 91.7% *Trichuris trichiura* infections and 28.8% hookworm infections among children 1 - 13 years living in Orang Asli resettlement villages[10].

The government has embarked on resettling the Orang Asli communities in villages, where their culture of hunting, gathering and shifting agriculture is replaced with more permanent cash crop agriculture such as rubber and oil palm cultivation. Facilities such as houses, clinics and schools are provided. It is planned that the Orang Asli communities will be permanently settled so that their socioeconomic and health problems can be better addressed[11]. However, soil-transmitted

helminthiasis is said to be more prevalent in resettlement villages compared to the traditional villages despite the better health care facilities available[12]. The nomadic Orang Asli who practice shifting agriculture would not have stayed long enough in any place to contaminate the soil sufficiently to sustain the endemicity of infection in the area. However, the resettled Orang Asli, who grow crops on a more permanent basis, will contaminate the area and bring about high rates of STH infections and re-infections.

In the STH control program in Malaysia, mass chemotherapy is still being given to schoolchildren and carried out through the School Health Program. However, pre-school children aged under 5 years may be more vulnerable to lighter worm burdens than older children, and the nutritional consequences of malnutrition in terms of morbidity and mortality may be greater[13]. This is also the age where the rate of growth is highest and where they are more mobile. The older pre-school children will be left more on their own as the mother will need to give more care to the younger siblings. Most of them would not be brought to the local clinic anymore after two years old.

The health risks of STH infections are highest for this group of children and yet most of them will miss out from the school based mass chemotherapy. It is for these reasons that this study to determine the prevalence and intensity of STH infections among the Orang Asli pre-school children was carried out. The results may help determine the need for expanding the scope of the STH Control Program to include the pre-school children living in such high risk communities.

Materials and Methods

The study was conducted among the Orang Asli pre-school children aged 1 to 7 years from the Kuala Betis resettlement scheme in Gua Musang, Kelantan. The Kuala Betis Orang Asli resettlement scheme is a group of villages set up to resettle the Orang Asli from the jungles in Kelantan. It is situated about 40 kilometres from Gua Musang. There are 10 villages scattered in the resettlement scheme. Most of the people work as rubber tappers, labourers, farmers and gathering and selling of forest products. Almost all the houses in these villages had no electricity, no treated pipe water and no toilet facilities. The villagers use river water, either through the gravity-feed system or taken directly from the nearby river. Most of the villagers defecate between bushes or in the river. There is an Out-Patient Clinic operated by the Department of Aboriginal Affairs and also a Klinik Desa operated by the Ministry of Health.

Children who give a history of having taken anthelminthic medication two months prior to stool examination were excluded from this study. The anthelminthic are usually brought over the counter or prescribed by the clinics. The weight and height of the children were measured and containers for faecal samples were given. The faecal samples were collected on the following day. A total of 348 preschool children were examined but only 259 (74.4%) faecal samples were returned. The consistency of the faeces were noted as hard, soft, diarrhoeic or watery and were preserved with 10% formalin. The stools were examined for the presence of *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm eggs. If positive, the worm load (eggs per gram of stool) was determined using a modified Stoll's technique, with a correction factor based on the consistency of the stools. The worm load was then categorised into the intensity of infection - negative, mild, moderate and heavy infection according to the WHO (1987) classification[14].

The data was entered and analysed using Epi-Info Version 6 software[15].

Results

The overall prevalence of soil transmitted helminthiasis (STH) among the pre-school children in this community was 56.0%. The predominant helminth was *Ascaris lumbricoides*, while the commonest type of infection was a mixed infection of *Ascaris lumbricoides* and *Trichuris trichiura*. The prevalence rate of *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm infections were 47.5%, 33.9% and 6.2% respectively. (Table I)

The prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* infections shows an age dependent relationship,

Table I
The Prevalence of Soil Transmitted Helminthiasis Among the Orang Asli Pre-school Children in Kuala Betis RPS, Kelantan

Helminth/s	Sex		Total	Prevalence (%) (n=259)
	Male	Female		
1. *Ascaris lumbricoides* and *Trichuris trichiura*	34	30	64	51.0
2. *Ascaris lumbricoides* only	18	25	43	16.6
3. *Trichuris trichiura* only	11	8	22	8.5
4. *Ascaris lumbricoides* and hookworm	7	2	9	3.5
5. Hookworm only	1	1	2	0.8
6. *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm	4	2	6	2.3
7. Overall (*Ascaris lumbricoides* or *Trichuris trichiura* or hookworm)	76	69	145	56.0

with the lowest prevalence among the 1 - 2 years age group and highest in the 6 - 7 years age group. However, hookworm infections does not seem to be related with age. (Fig. 1)

The intensity of *Ascaris lumbricoides* infections were 64.5% light; 27.3% moderate and 8.3% heavy whilst the intensity of *Trichuris trichiura* infection were 80.5% light; 18.3% moderate and 1.2% heavy. However, the

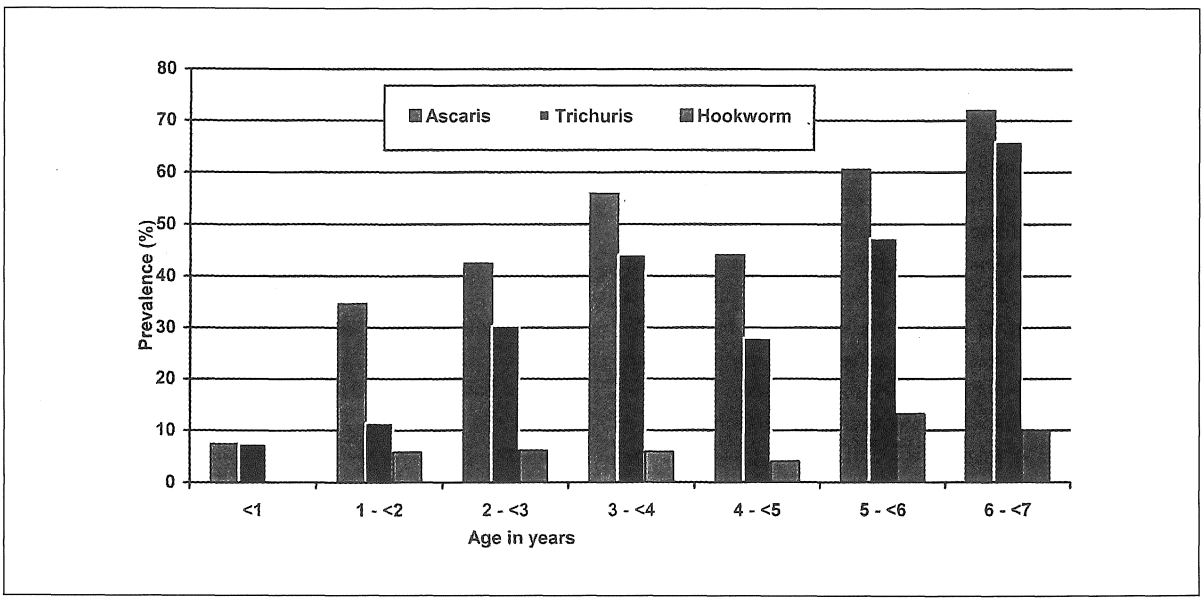

Fig. 1: The prevalence of soil transmitted helminthiasis by age among the Orang Asli pre-school children in Kuala Betis RPS, Kelantan.

intensity of hookworm infections were 86.7% light and 13.3% moderate with no heavy infections.

Discussion

There is considerable variation in the prevalence of soil-transmitted helminthiasis (STH) among the orang asli children in Malaysia. Ariff *et al* found an overall prevalence of 79.8% STH among orang asli children below 12 years in traditional villages in Kelantan[16], while Osman *et al* found only 30.2% Ascaris lumbricoides and *Trichuris trichiura* infections among children 0 - 7 years in traditional orang asli villages[3]. In the current study, the STH prevalence rate of 56.0% is low compared to some of these studies. This study focussed on pre-school children only, and the prevalence of STH is highest among the school-age children, especially *Ascaris lumbricoides* and *Trichuris trichiura* infections[17]. However, the health risk may be more among the pre-school children as several studies from developing countries have shown that growth faltering usually occurs after 3 months of age[18,19,20]. The greatest deficits have often been reported for the second and third years of life[21]. The pre-school children are also left out in most of the STH control program, which is targeted at schoolchildren and usually delivered through the school health care program.

Ascaris lumbricoides and *Trichuris trichiura* were the most frequently encountered helminths with hookworm being relatively uncommon. This is again similar to findings in the other studies except for the very low prevalence of hookworm infection. There are a number of possible reasons for this. Hookworm infection is relatively uncommon in children compared to adults[22]. Hookworm ova also disintegrate more rapidly than *Ascaris lumbricoides* ova and *Trichuris trichiura* ova. The prevalence and intensity of hookworm infections may be underestimated if there is a lot of disintegration of the ova. For STH intensity surveys, it is recommended that the Kato-Katz technique be used where the counting of ova is done immediately[23]. It was not possible to obtain fresh stool samples in this study although every possible attempt was made to collect and preserve the faecal samples on the following day.

In this study, the prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* infections increase as the age of the child increases from 1 to 7 years. This is in line with the epidemiology of STH, which usually begins when the child starts to crawl and explore the environment[12,24]. The observed low prevalence rates in children aged less than a year, are likely to be due to their relative immobility and less exposure to environmental contamination. The prevalence of STH infections is closely related to environmental factors and socioeconomic conditions. In the Kuala Betis RPS, both water supply and environmental sanitation are poor. It is difficult to maintain a good level of hygiene, and will be favourable to contamination of the environment by the STH ova. The children living in these villages will be at a high risk of infection and re-infection of STH.

Heavy infections are normally associated with morbidity, although other factors such as nutrition, immunity and other concurrent infection play a role. In this study, 8.3% of the children suffered from heavy *Ascaris lumbricoides infections* and 1.2% heavy *Trichuris trichiura* infections. There was no heavy hookworm infection. However, morbidity may be higher given the poor socioeconomic and environment state of these communities. Ali et al found the prevalence of underweight ranges from 28.2% to 61.8% in a few orang asli villages[3]. STH can cause and aggravate malnutrition, especially in children and epidemiological evidence now show that malnutrition and infection will have multiplicative effects on child mortality[25]. The high prevalence of STH in these communities and their potential public health concern merits serious consideration.

Mass chemotherapy targeted to children has been shown to be effective in STH control. However, a number of studies have shown that chemotherapy is not effective unless the frequency and the coverage are adequate[26]. The cost-effectiveness depends on the prevalence of STH in the community. The World Health Organisation recommends mass treatment of schoolchildren when surveys indicate that the prevalence of STH exceeds 50% and this should also apply to the pre-school children[27]. The prevalence of STH in this study was 56.0%, thus justifying mass chemotherapy based on the

WHO criteria. It will help reduce the morbidity due to STH, especially malnutrition and it's effect on mortality among the children in the community.

This study shows STH infections is highly prevalent among the Orang Asli pre-school children in Kuala Betis RPS in Gua Musang, Kelantan. Targeted mass anthelminthic treatment to the schoolchildren should be continued. However, the scope should be expanded to include the pre-school children in the community as they are also at risk from STH. In addition, an integrated approach towards STH control, which should include the improvement of environmental sanitation, personal hygiene and nutritional status in these villages, will be more effective in the long-term control of STH in these high risk communities.

References

1. Kan S.P., Guyattt H.L., Bundy D.A.P. Geohelminth infection of children from rural plantations and urban slums in Malaysia. Trans R Soc Trop Med Hyg 1989; 83: 817-20.
2. Wahab AR. The prevalence and intensity of soil transmitted helminths in some rural villages in northern peninsular Malaysia. Southeast Asian J Trop Med Public Health 1994; 25(2): 296-9.
3. Osman A, Zaleha MI. Nutritional status of women and children in Malaysian rural population. Asia Pacific J Clin Nut 1995; 4: 319-24.
4. Mahendra RS, Sein KT, Khairul AA *et al.* Intestinal helminthiasis in relation to height and weight of early primary schoolchildren in north-eastern Peninsular Malaysia. Southeast Asian J Trop Med Pub Health 1997; 28: 314-20.
5. Stephenson LS. Helminth parasites, a major factor in malnutrition. World Health Forum 1994; 15: 169-72.
6. Crompton DWT. Ascariasis and childhood malnutrition. Trans R Soc Trop Med Hyg 1992; 86: 577-9.
7. Bisseru B, Aziz A. Intestinal parasites, eosinophilia, haemoglobin and gamma globulin of Malay, Chinese and Indian schoolchildren. Med J Malaya 1970; 25: 29-33.
8. Che Ghani BM, Oothuman P. Patterns of soil-transmitted helminth infections in relation to types of water supply, housing facilities and availability of latrines in rural areas of peninsular Malaysia. In: Collected Papers on the Control of Soil-Transmitted Helminthiasis Vol V, (Editors) Yokogawa M, *et al*, APCO Tokyo, 1991; 64-71.
9. Karim R, Rahmah N, Khairul AA *et al.* Parasitic infections in the aboriginal community at Temengor, Hulu Perak, Malaysia. Malayan Nature J 1995; 48: 425-32.
10. Norhayati M. Zainuddin B, Mohammod CG *et al.* The prevalence of Trichuris, Ascaris and hookworm infections in orang asli children. Southeast Asian J Trop Med Public Health 1997; 28(1): 161-8.
11. Endicott KM. The impact of economic modernisation of the orang asli (aborigines) of northern Peninsular Malaysia. In: Jackson JC, Rudner M eds. Issues in Malaysian Development, AASA Southeast Asian Publication Series No.3, 1979.
12. Kan SP. *Ascaris lumbricoides* infections in Malaysia In: Crompton, Nesheim MC, Pawlowski ZS (eds) *Ascaris* and its public health significance Taylor & Francis 1985; 69-82.
13. Hall A, Orinda V, Bundy DAP *et al.* Promoting child health through helminth control - a way forward? Parasitology Today 1997; 13(11): 411-2.
14. World Health Organisation. Prevention and control of intestinal parasitic infections. Geneva; World Health Organisation. WHO Tech Report Series 1987; 749.
15. Dean AG, Dean JA, Coulombier D *et al.* Epi Info Version 6: a word processing, database, and statistics program for public health. Centers for Disease Control and Prevention, Atlanta, Georgia, USA, 1996.
16. Ariff T, Nazi MZ, Rizam MZ *et al.* Health status of aboriginal children in Post Brooke, Kelantan. Mal J Child Health 1997; 9 (1): 60-5.

17. United Nations Children Fund (UNICEF). Promoting Child Development Through Helminth Control Programmes - Report of Workshop 24 - 25 Feb 1997. UNICEF, New York.

18. Condon-Paoloni D, Cravioto J, Johnstone FE, *et al.* Morbidity and growth of infants and young children in a rural Mexican village. Am J Pub Health 1977; 67: 651-6.

19. Waterlow JC. Observations on the natural history of stunting. In: JC Waterlow (ed) Linear growth retardation in less-developed countries, Nestle Nutrition Workshop Series, Vol 14, New York: Vevey Raven Press. 1988: 1-12.

20. Lopez de Romana G, Brown KH, Black RE, Kanashiro H Longitudinal studies of infectious diseases and physical growth of infants in Huascar, an underprivileged peri-urban community in Lima, Peru. Am J Epidemiology 1989; 129: 769-84.

21. Rivera J, Martorell RM. Nutrition, infection and growth part 1; Effects of infection on growth. Clin Nutr 1988; 1: 156-62.

22. Chan MS, Bradley M, Bundy DAP. Transmission patterns and the epidemiology of hookworm infection. Int J Epidemiology 1997; 26(6): 1392-400.

23. World Health Organisation. Intestinal protozoan and helminthic infections. World Health Organisation Tech Rep Series 666, Geneva: WHO, 1981; 7-43.

24. Bundy DAP, Cooper ES. *Trichuris* and trichiuriasis in humans. Advances in Parasitology 1989; 28: 107-73.

25. Pelletier DL. The potentiating effects of malnutrition on child mortality: epidemiologic evidence and policy implications. Nutrition Reviews 1994; 52(12): 409-15.

26. Guyatt HL, Chan MS, Medley GF *et al.* Control of Ascaris infection by chemotherapy; which is the most cost-effective option? Trans R Soc Trop Med Hyg 1995; 89: 16-20.

27. World Health Organisation. Health of school children. Treatment of intestinal helminths and schistosomiasis. WHO/SCHISTO/95.112, WHO/CDS/95.1 1995.