MALNUTRITION AND HELMINTH INFECTIONS AMONG PRE-SCHOOL CHILDREN IN ORANG ASLI RESETTLEMENT VILLAGES IN KELANTAN

Zulkifli A[1], Khairul Anuar A[1], Atiya AS[2], Yano A[3]

[1]Department of Parasitology, [2]Department of Social and Preventive Medicine, University Malaya, 50603 Kuala Lumpur, Malaysia; [3]Department of Parasitology, Chiba University School of Medicine, Chiba 260-8670, Japan.

ABSTRACT: A survey of malnutrition and helminth infections among 268 pre-school children living in the Kuala Betis Orang Asli resettlement villages in Kelantan. The prevalence of helminth infections was 47.4%, with *Ascaris lumbricoides* being the most common helminth (43.9%), followed by *Trichuris trichiura* (29.7%) and hookworm (6.3%). The prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* infections increased with age, with the higest prevalence found in the 6-7 yeas age group. The overall prevalence of stunting, underweight and wasting were 61.7%, 60.4% and 17.5% respectively. Both stunting and underweight were significantly higher among the infected children. Factors associated with helminth infections in the pre-school children were older age group, poor water supply and households with more than 5 members. Routine regular deworming is recommended based on the World Health Organisation recommendations for schoolchildren. *(JUMMEC 1999; 2: 99-103)*

KEYWORDS: Helminth infections, Malnutrition, Orang asli, Malaysia

Introduction

Both malnutrition and helminth infections are still widely prevalent in developing countries, especially in the disadvantaged communities (1). Although the mortality of helminth infection is low, the consequences include malnutrition and poor growth of the infected children (2). Most children in many developing countries suffer either undernutrition or malnutrition at some time during the first 5 years of life (3). The children typically start to acquire the infections as soon as they begin to crawl and explore their environment (4). In disadvantaged communities, where the basic needs for food, housing, clean water supplies and good sanitation are not met, the poor growth of the children occurs once they start weaning between 6 to 24 months. The most critical period then, to prevent malnutrition and thereby reduce malnutrition related problems, is during the preschool period. The contribution of helminth infections to malnutrition of the children in such disadvantaged communities has to be determined as there are now effective, safe and inexpensive anthelmintic drugs available for mass presumptive treatment of children.

The study is a one year prospective, placebo-controlled, double blinded study on the impact of helminth infections on the nutritional status of pre-school children in Kuala Betis, Kelantan The primary purpose of this study was to determine whether there is an causal relationship between helminth infections and malnutrition among the pre-school children in a disadvantaged community in Malaysia. In this paper, we report on the baseline cross-sectional survey, looking into helminth infections and the association with several socio-economic and nutritional parameters among the pre-school children in Kuala Betis, Kelantan.

Materials and methods

The study area, Kuala Betis, is an orang asli resettlement community, consisting of several villages situated near to each other. The orang asli were resettled in these villages from the interior. There were also a few malay settlers living nearby in a malay village. Most of the villagers were rubber tappers, with a poor socio-economic background. The sanitation in these villages was also poor, and the river was their main source of water. There were very few toilets available and the villagers normally use the nearby bushes.

A total of 397 pre-school children were examined at baseline but only 268 (67.5%) faecal samples were re-

Corresponding address:
Zulkifli A,
Department of Parasitology., Faculty of Medicine, University of Malaya,
50603 Kuala Lumpur, Malaysia.

turned. Only the results from the 268 children with faecal samples were used for the analyses. The age of the child was determined from the birth documents of the child. The clinic records were checked for the age of the child if the birth document was unavailable. The weight was taken with the children naked or in underpants and without shoes using a Seca electronic weighing scale and was recorded to the nearest 0.1 kg. The height was measured to the nearest 0.1 cm using a measuring tape. The child was made to stand against a straight wall with a tape suspended 2 meters from the floor. For children less an 2 years, the recumbent length was measured using a locally made length board. The weight and height of the children were compared with the National Centre for Health Statistics (NCHS) reference values using the Anthro software (5). Children were classified as stunted, underweight or wasted if the z-score for height-for-age, weight-for-age and weight-for-height respectively was less than 2 standard deviation (SD) below the NCHS median.

Containers for faecal samples were given to each child and were collected on the following day. The consistency of the faeces was noted as either hard, soft, diarrhoeic or watery and was then 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 (6). Data entry and analysis were done using the Epi-Info Version 6 computer program (7). Statistical analyses of comparisons of proportions were tested with the Chi square-test. Probability less than 5% for null hypothesis was considered significant.

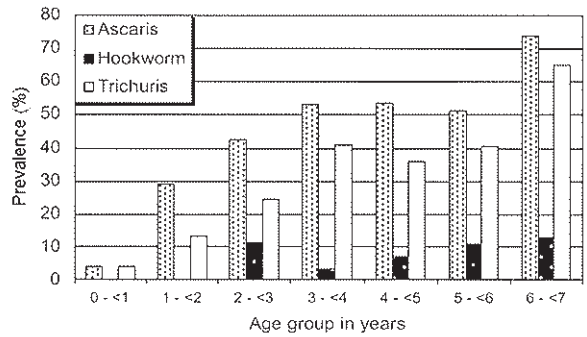

Fig. 1. Prevalence of helminth infections among pre-school children by age in Kuala Betis, Kelantan

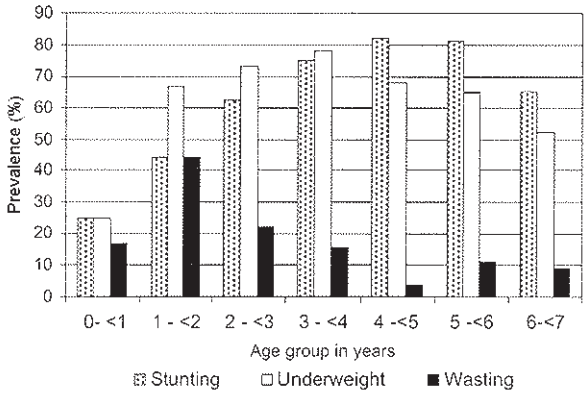

Fig. 2. Prevalence of stunting, underweight and wasting among pre-school scildren by age in Kuala Betis RPS, Kelantan

Results

The overall prevalence of helminth infections among the pre-school children in Kuala Betis was 47.4%. The most common helminth was *Ascaris lumbricoides* (43.9%), followed by *Trichuris trichiura* (29.7%) and hookworm (6.3%). The prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* infections show an age dependent relationship, with the lowest prevalence in the age group 0-1 year and highest in the 6-7 years age group. However, hookworm infections appears not to be related with age, although the number of infections detected is too small to make any conclusion (Fig. 1).

The overall prevalence of stunting, underweight and wasting among the pre-school children in Kuala Betis, Kelantan were 61.7%, 60.4% and 17.5% respectively. The lowest prevalence of malnutrition was found in the 0-1 year age group while the highest prevalence of stunting and underweight were found in the 3-4 and 4-5 years age group. The prevalence of stunting and underweight increased rapidly in the older age groups, accounting for more than 50% of the children after 2 years of age. There also seem to be a decreasing trend in the prevalence of stunting and underweight after 4-5 years, although it is not certain whether this trend will continue during the school-age years. The prevalence of wasting, however was higher in the younger age group, with a peak in the 1-2 years age group (Fig. 2).

Table 1 show the comparison between the infected children, who were stool positive, and controls, who were stool negative for helminth ova. There were no significant differences between the gender and racial composition of the infected and control children. However, the mean age between the 2 groups was significantly different, with the infected children being much older than the control children. There were significantly more infected children from households with more than 5 persons. There were also significantly more infected children sourcing water from the river, as opposed to having pipe water among the control children. However, there was no difference between the father's occupation, either as rubber tapers, working with the government or doing small businesses.

Since there was a significant difference in age between the infected and control group, comparison of anthropometric indices was confined to height-for-age (HAZ), weight-for-height (WHZ), weight-for-age (WAZ) z scores and the mid upper arm circumference (MUAC). There were no significant difference in the mean HAZ, WHZ,WAZ z-scores and MUAC between the infected and control children. However, there were significant differences in the prevalence of stunting and underweight between the two groups. More infected children were stunted and underweight compared to the controls. However, there was no significant difference in the prevalence of wasting between the two groups.

An analysis between nutritional status and the intensity of the 3 helminthic infections was done (Table 2). Malnutrition was defined as positive if any of the z-scores for height-for-age, weight-for-age and weight-for-height is less than -2.0. The helminth infections were divided into two categories, uninfected/mild infections and moderate/heavy infections. However, there was no significant association between the intensity of infection and the prevalence of malnutrition found.

Discussion

There is a high overall prevalence of helminth infections (47.4%) among the pre-school children in Kuala Betis, with *Ascaris lumbricoides* as the most common helminth (43.9%), followed by *Trichuris trichiura* (29.7%) and hookworm (6.3%). The prevalence are comparable to those found in previous studies. Kan *et al* found the prevalence of *Ascari lumbricoides*, *Trichuris trichiura* and hookworm infections to be 24.3%, 26.2% and 3.4% respectively among pre-school children in the rural areas of Malaysia (8). In a study on pre-school Orang Asli children, the prevalence of *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm was 41.9%, 53.6% and 11.7% respectively (9) while a more recent study in a similar group, found a prevalence of 30.2%, 30.2% and 9.4% for *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm respectively (10). Orang asli children in resettlement villages are known to have a higher prevalence and intensity of helminth infections compared to those living in traditional villages, because the soil can become adequately contaminated due to the more permanent nature of the villages (11).

Helminth infections are common in disadvantaged communities, especially if there is poor water supply and sanitation facilities. In the Kuala Betis resettlement villages, the water supply was mainly from the river, and sanitation facilities were poor. This study found significant association between helminth infections with age, poor water supply and households with more than 5 members. Infected children were at an older age to the control children. The children start being infected at an age when they become mobile and move around the compound. The prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* infections was noted to increase as the children grows older. School-age children are known to have the heaviest infections of *Ascaris lumbricoides* and *Trichuris trichiura* (12). Poor water supply and many family members are typical of the poor socio-economic status of the community. The high prevalence of hookworm in these children may be attributed to the lack of proper shoes and their behaviour of not wearing them in the villages. The situation is made worse by the improper defecation by these children, which is usually done near their houses.

Table 1. Selected characteristics of pre-school children in Kuala Betis, Kelantan

Variables	Worm positive (n=127)	Worm negative (n=141)
1. Gender - male	78	55
- female	71	64
2. Race - Malay	11	11
- Orang asli	138	108
3. Mean age in months (S.D)	56.1 (31.3)	32.9 (23.0) **
4. Water supply:		
- piped	21	37 *
- others (river, rain)	128	82
5. Father's occupation		
- government, business	33	38
- rubber tapers	107	78
6. Houseold size - <5	52	32
- >5	67	117 **
7. Anthropometric parameters – mean (S.D)		
- HAZ	- 2.0	-2.1
- WHZ	- 0.8	-1.0
- WAZ	- 1.9	-2.3
- MUAC	12.2	9.5
8. Nutrition - normal		
- stunting	94 (74.0%)	71 (50.4%) *
- underweight	91 (71.7%)	71 (50.4%) *
- wasting	22 (17.3%)	25 (17.7%)

Chi square value * $p<0.05$ ** $p < 0.01$

Table 2. Malnutrition and helminth infection among pre-school children in Kuala Betis, Kelantan.

Worm infection	Malnutrition (+)	(-)	p-value
Ascaris lumbricoides			
- Moderate / Heavy	34	14	n.s
- Nil / Mild	161	59	
Hookworm			
- Moderate / Heavy	8	2	n.s
- Nil / Mild	187	71	
Trichuris trichiura			
- Moderate / Heavy	25	12	n.s
- Nil / Mild	170	61	

There is also a high prevalence of malnutrition (stunting- 61.7%, underweight- 60.4%, wasting- 17.5%) found in these children. Zamaliah *et al* found the prevalence of stunting among rural pre-school children was 26%, while 31.5% were underweight and 3.8% wasted while Zawiah *et al* found the prevalence of stunting was 31.7%, underweight was 44.3% and wasting was 16.2% in a rural agriculture scheme (13, 14). Osman and Zaliha found the prevalence of stunting was higher in Orang Asli than in the Malays, where the prevalence was from 66.7% - 80% compared to 25.5% - 41.2% (10). The prevalence of underweight in these children was from 28.2% - 61.8%. The prevalence of malnutrition found in this study was high, comparable to those found by Osman and Zaliha (10). Stunting and underweight reflects the disadvantaged conditions, chronic or repeated infections, and inadequate food intake (15). The orang asli are among the disadvantaged communities in Malaysia. The change from a culture of 'hunting and gathering' to 'rubber planting and tapping' has taken a considerable toll on the health and nutrition status of these orang asli community (16). The low price of rubber and the diminishing food source from the jungle due to logging activities, have also contributed to the problem. The impoverished state of the Orang Asli communities during the period of resettling may have contributed to the high prevalence of wasting (17.5%) found. In contrast to stunting, wasting is of a more recent onset with relatively constant prevalence, usually less than 5% (17).

The prevalence of stunting and underweight were significantly more among the infected children. However, it is well established that the severity of disease is dependent on the intensity of the helminth infection. What is the extent to which the helminth infections contribute to malnutrition of these children? Univariate analysis between the intensity of infection and malnutrition found in this study did not show any association. Thus, helminth infections may be a covariate for socio-economic status, and by itself, may not be an important contributor to malnutrition in these pre-school children. Under these circumstances, the nature of the study design becomes crucial because detection of causation rather than association is required. The possibility of a causal association will be determined by prospective studies, where the change or improvement in growth following treatment of the helminth infections are measured, while not changing the other parameters of the relationship. It should also be noted that there are other effects of helminth infections, such as poorer cognitive function and learning ability, which may be of equal importance for economic and social development of the orang asli community. The World Summit for children in 1990 has set a target of achieving basic primary education for at least 80% of the children by the year 2000 (18). It was also recognised that providing access to schooling will only result in improved education if these children have the capacity to benefit from the schooling made available to them. For many children in the developing world, these few years of basic education may be the only formal education they will ever receive.

Thus, there is ample justification for the control of helminth infections among the pre-school children in these communities where both helminth infections and malnutrition are prevalent. The argument, that deworming is irrelevant to the control of helminth disease because children becomes re-infected is difficult to sustain in the face of remarkable catch-up growth achieved by children after a single treatment in a number of studies (19). The United Nations Subcommittee on Nutrition endorsed the recommendation that in areas where the prevalence of mild-moderate underweight in children is greater than 25%, and where intestinal helminths are known to be widespread, high priority should be given to deworming programs (20). The World Health Organisation has also recommended regular mass treatment for schoolchildren where the prevalence of helminth infections exceeds 50%, and in areas where the prevalence of underweight exceeds 25%, a high priority should be given (21). The same criteria can also be applied to pre-school children, since from a nutritional perspective, pre-school children may be more vulnerable to growth problems for the same worm burdens as compared to schoolchildren (22).

A child growing up in such disadvantaged communities, which cannot meet basic needs for food, housing, clean water supplies and good sanitary systems, such as the Orang Asli resettlement villages in Kuala Betis, Kelantan, will need to be given adequate support during the adjustment period in changing their traditional lifestyle. School going children have the advantage of having school-based health care, including supplementary feeding programs and periodic health monitoring by the health care team. The pre-school children have a more limited access to heath care, especially in the disadvantaged communities. It is important for the government to provide adequate resources to make the pre-school children in such communities healthier and more ready to learn when they start schooling (23). A comprehensive primary health care programme has been suggested for the Orang Asli, which include family planning, periodic deworming, vitamins and mineral supplements and food supplements to the Orang Asli children (16). Surveillance of the nutritional status will detect growth failure early, so that intervention, which include the provision of supplementary food, can be given. Such programs for the community control of malnutrition and helminth infections will require a coordinated effort, and contributions from the various sectors.

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