

SOIL-TRANSMITTED HELMINTHIASIS AMONG CHILDREN IN PULAU KETAM, WEST MALAYSIA

KAN S. P.
MANMOHAN SINGH
SARJEET SINGH

SUMMARY

Only 8.4% of 1,286 Chinese boys and girls from the ages of 5–12 years in Pulau Ketam were infected with soil-transmitted helminths. The majority of these children had single infections with Trichuris or Ascaris alone. Mixed infections made up less than 5% of all infected cases. The worm burdens of infected children were very low. There was no definite pattern of distribution of infection among children of different ages and no differences in the distribution of infection between boys and girls. The main factors for the low prevalence and intensity of infection were the absence of suitable soil for the development and survival of infective helminth stages and the lack of contact with contaminated soil on this island. These two factors acted as very effective barriers to the transmission of soil-transmitted helminths on Pulau Ketam.

INTRODUCTION

While numerous studies have demonstrated the high prevalence and wide distribution of soil-transmitted helminthiasis among several communities in Malaysia,¹ little data is available regarding

soil-transmitted helminthiasis among isolated populations, like those on islands off the shores of Peninsular Malaysia. Previous studies on some islands off the coast of Terengganu and Pahang along the east coast of Peninsular Malaysia showed prevalences of 93.8% to 98.1%.^{2,3}

The present study surveys the prevalence, distribution and intensity of soil-transmitted helminthiasis among children in Pulau Ketam, an island off the west coast of Peninsular Malaysia.

The island and the population

Pulau Ketam is an island about 10 km from Port Klang (Fig. 1). This is an island of mangrove swamps which is totally submerged by the sea for several days each month. As a result, the entire island with over 2,000 houses and shops, six schools, three main streets and side-lanes is built on elevated platforms of wooden planks, about 2 metres above sea-level. These wooden platforms are supported by concrete pillars or stilts sunk into the seabed. The main streets are about 2 metres wide whereas the side lanes are about 1 metres wide. There are also two wooden bridges connecting the narrower parts of the island. Transport on the island is either by bicycle or on foot.

The population of 28,000 residents from over 2,000 households is entirely Chinese; the main occupation being fishing and trapping of crabs as well as preparation of dried or salted fish, prawns, squids and other seafood for export. Several others deal in hard timber (*cengai*) which is in frequent demand by the residents to replace or repair rotted or decaying planks of the buildings. A small number own and rent out motor

Kan S.P., BSc (Hons), PhD
Associate Professor
Department of Parasitology

Manmohan Singh, BSc, MSc
Lecturer, Department of Parasitology
Faculty of Medicine
University of Malaya
59100 Kuala Lumpur

Sarjeet Singh
Field Officer, Department of Statistics, Malaysia

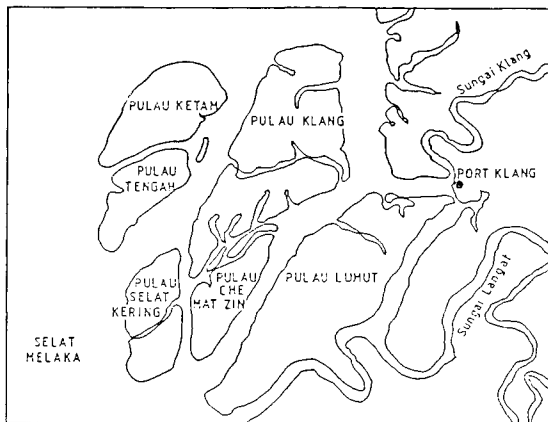


Fig. 1 Pulau Ketam, off the west coast of Peninsular Malaysia.

boats while others ply small rowing boats for transport of cargo and passengers to and from ferries to the mainland.

The island has two kindergartens, three primary schools and one secondary school. There is a government clinic staffed by a trained nurse whilst a doctor pays a visit twice or thrice weekly. A private clinic is also run by two medical practitioners who commute daily to the island from Klang. Cases that need hospitalization are referred to the Klang General Hospital or even the University Hospital, Kuala Lumpur. The island on stilts also has a bank, a post-office and a police station manned by ten policemen.

Food supply

Except for fish and other seafood, all other basic foodstuff — including staples, wet and dry provisions, meat, poultry, vegetables and fruits are transported by ferry or barges from Klang. Due to the shortage of space, the only form of small-scale animal husbandry seen is the rearing of a few pigs, chickens and ducks within small enclosures on elevated platforms. Besides the absence of suitable soil, there is also an acute shortage of fresh water thereby rendering any attempts in vegetable-growing or home cultivation impossible. Thus, except for fish which provides the main source of protein, other meats, vegetables and fruits are very expensive and usually only consumed in small quantities.

Water

The only source of water is rain water which is collected in pipes skirting the edges of roofs to drain into large metal containers. This source of water is both unreliable and inadequate. The water stored in the containers is not treated before use. When a drought occurs for two months or more, fresh water has to be transported by boat from the mainland and rationed to a few gallons daily for each household for all purposes of cooking and washing.

Toilets

Toilets are built on raised platforms and human excreta is dropped directly into the sea below. When the tide comes in, this may be washed away. Between then, the excreta leaves a strong and unpleasant odour.

Garbage disposal

Facilities for the disposal of garbage and refuse are completely absent. There is absolutely no land for the burying or burning of garbage which is consequently dumped in heaps into the sea below the houses. Some of these garbage heaps become land-logged and are consequently not removed by the tides; besides, they attract a lot of pests.

Pests

As seafood (fish, prawns, squids) are dried on platforms all the time, this attracts a lot of rats which abound on this island. Flies are also plentiful, especially around the garbage heaps.

MATERIALS AND METHODS

Stool examination

Plastic stool packets with pressed seals were distributed to all school children in the kindergartens and the primary schools. Each stool packet was labelled with the name, age, sex and class of the child. Consent forms and instructions were given to each child prior to stool collection. Samples returned were examined by

the Kato thick smear method for helminth eggs and egg counts of positive stools were done with the modified Katz' technique. The infected children were treated with single doses of 400 mg albendazole.

RESULTS

The overall prevalence of soil-transmitted helminthiasis and the prevalence and intensity of infection with *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms among 1,286 Chinese children (672 boys, 614 girls) from the ages of 5–12 (mean: 8.4 years) are shown in Table I. Only 8.4% of the children examined were infected, with 4.0% having *Ascaris*, 4.7% having *Trichuris* and 0.2% having hookworms. The worm load of these infected children, as estimated from egg counts, was extremely low – all the egg counts being way below 1,000 eggs/g of stool (epg). Thus, both prevalence, and intensity of soil-transmitted helminthiasis are very low among children in Pulau Ketam.

Among the 108 infected children, 103 (or 94.5%) of them were infected with one type of helminth, that is, single infections (Table II). Among these single infections, *Trichuris* was more common (54.4%) than *Ascaris* (45.6%). Only 3.7% of the infected children had double infections with two types of helminths and only one had triple infection with *Ascaris*, *Trichuris* and hookworms.

TABLE I
PREVALENCE AND INTENSITY OF SOIL-
TRANSMITTED HELMINTHIASIS AMONG
CHILDREN IN PULAU KETAM

	Number infected	Percentage infected (%)	EPG (range)
Soil-transmitted helminths	108	8.4	—
<i>Ascaris lumbricoides</i>	52	4.0	261(19-1406)
<i>Trichuris trichiura</i>	61	4.7	71(19-814)
Hookworms	2	0.2	149(56-241)

Total number of children examined : 1,286

TABLE II
TYPES OF HELMINTIC INFECTIONS AMONG
CHILDREN IN PULAU KETAM

Types of infections	Number infected	Percentage infected (%)
Single infection	103	95.4
Double infection	4	3.7
Triple infection	1	0.9
Total	108	100.0

TYPES OF SINGLE INFECTIONS:

Helminth	Number infected	Percentage of single infections (%)
<i>Ascaris lumbricoides</i>	47	45.6
<i>Trichuris trichiura</i>	56	54.4
Total	103	100.0

The distribution of soil-transmitted helminthiasis according to age and sex is shown in Table III. Except for children from the ages of nine to 12, the prevalence of infection among the rest of the children was below the overall prevalence of 8.4%. There was also no significant difference in the distribution of infection between boys and girls.

DISCUSSION

The prevalence and intensity of soil-transmitted helminthiasis among children in Pulau Ketam is very low (8.4%). The majority of these infections were single infections (94.5%) and mixed infections were rare. This contrasted very dramatically with prevalences of infections observed in other islands like Pulau Pinang and Pulau Perhentian Kecil off Terengganu, and Pulau Tioman off Mersing, where over 90% of the inhabitants examined had multiple soil-transmitted helminthiasis.^{2,3} However, Pulau Ketam is a very unique island as it has hardly any soil for helminth eggs to

TABLE III
DISTRIBUTION OF SOIL-TRANSMITTED
HELMINTHIASIS ACCORDING TO AGE AND SEX

Age (yrs)	Number examined	Number infected	Percentage infected (%)
5	13	1	7.7
6	236	16	6.8
7	186	12	6.5
8	186	15	8.1
9	267	27	10.1
10	132	9	6.8
11	142	17	12.0
12	124	11	8.9
<hr/>			
Total	1,286	108	8.4
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SEX:			
Males	672	57	8.5
Females	614	51	8.3
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Total	1,286	108	8.4

develop into infective stages. Despite the large population and considerable overcrowding, the inhabitants have practically no contact with contaminated soil as the entire island is built on stilts.

The source of infection among children may be from the vegetables which are bought from the mainland but these are generally eaten in small amounts as they are expensive. However, due to the shortage of water, the washing of vegetables or any food and utensils cannot be expected to be thorough. Thus, contamination of food and drink can still occur due to inadequate washing and cleaning. Rats, flies and other pests which are frequently seen in rubbish heaps and other polluted areas may transmit some of the infective helminth eggs.

Thus, despite the appallingly poor environmental sanitation due to lack of facilities for sanitary disposal of sewage and garbage, chronic shortage of potable water and probably poor nutritional status due to the high cost of all food except fish, soil-transmitted helminthiasis are still very low among children in this island. The primary factors contributing to this low prevalence would be the lack of adequate soil for the development of infective stages and the lack of contact with the soil. These factors more than compensate for the extremely poor environmental sanitation, which, in other communities, would have permitted soil-transmitted helminths to thrive and become rife and rampant, as had been reported in other islands, urban slums and estate communities.²⁻⁵

ACKNOWLEDGEMENT

This study was carried out with a research grant (No. 30269) from the World Health Organization and Vote F/207 from the University of Malaya.

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