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Factors of soil-transmitted helminths infections in children who live in the surrounding of the final disposal landfill of Sukawinatan, Palembang

Indri Ramayanti[1*], **Ahmad Ghiffari**[1,2]

[1] Department of Parasitology, Faculty of Medicine, Universitas Muhammadiyah Palembang, Palembang, Indonesia
[2] Institute of Occupational Medicine-Social Medicine-Environmental Medicine, Goethe University, Postgraduate Students of Medical Faculty, Frankfurt am Main, Germany

E-mail : indrifkump@gmail.com

Abstract. Soil-Transmitted Helminths (STH) is a group of nematodes that infect people and transmitted through soil media. STH occurs especially among pre-school and school-aged children, and commonly related to environmental sanitation and personal hygiene. The study objected to determine the factors related to the incidence of STH in children 5-15 years who lived surrounding the Sukawinatan district of Palembang city. The observational analytic using the cross-sectional design, consisted of 110 subjects sampled by consecutive sampling. Data on environmental sanitation and personal hygiene were obtained by questionnaires, while infection status using the Kato-Katz faecal technic. The results were analyzed using Chi-square test ($\alpha = 0.05$), showed that 24.5% of population where infected with STH. A number of 1-24-2 children were infected with hookworm-*Ascaris lumbricoides-Trichuris trichiura* infection, respectively. Based on statistical test results, the association of STH infection with variables were: waste disposal ($p = 0.268$), water facilities ($p = 1.000$), sewage disposal ($p = 0.224$), latrine ($p = 0.021$), hand washing prior to meal ($p = 0.001$), hand washing after defecate ($p = 0.028$), use of footwear ($p = 0.013$), and nail hygiene ($p = 1.000$). Concluded that the significant factors related to STH were use of latrine, hand washing behaviour, and use of footwear. Further research will be necessary to successfully eliminate this neglected tropical disease.

1. Introduction

Soil Soil-Transmitted Helminths (STH) has globally infected an estimated 438.9 million-819.0 million-464.6 million people, with hookworm-*A. lumbricoides-T. trichiura* respectively [1]. The vast majority of STH infections occurred in poor countries where access to sanitation and clean water are limited, as well as low personal hygiene [2]. Southeast Asia is an area of the country with the highest prevalence of STH infections during the first four decades [3]. In 2014, approximately 269 million preschool children thought to be infected STH in 102 countries [4–6].

The prevalence of STH in Indonesia is ranging between 60%-90% depending on condition of environmental sanitation [7–11]. In South Sumatra province, prevalence of STH at the primary school were of 38.8%-40.3%-41.0% infection of hookworm-*A. lumbricoides-T. Trichiura S*TH are found in areas with the community groups with low personal hygiene and less environmental sanitation [12–14]. The environmental factors that comprised with STH are type of use of latrine, sewage disposal,

waste disposal and water supply [2,15]; while the personal hygiene are habits of hand washing, cutting nails regularly, and the use of footwear [6,16].

The area of the final disposal landfill of Sukawinatan are lacking of good sanitation; while the personal hygiene of children who live surrounding the landfill are also deteriorating. This study provided information on the incidence of STH infections in children aged 5-15 years around the landfill Sukawinatan Palembang, and its relationship with environmental factors and the personal hygiene.

2. Methods

This observational analytic with cross-sectional study design was conducted in March until May 2017, located in the Sukawinatan sub district in Palembang South Sumatra province. The population were children aged 5-15 years (N = 110 samples) selected by consecutive sampling, who were not taking any worm medication within 1 month prior to study and willing to become respondents by signing the parents' approval. Ethical approval obtained from the Ethics Committee of the Faculty of Medicine, University of Muhammadiyah Palembang.

2.1. Measuring instruments

Measuring instrument used in this study was a microscope and questionnaires. Respondents' stools were examined using the Kato-Katz technique, while questionnaires were used to obtain data on environmental sanitation (clean water supply, garbage disposal, sewage disposal, latrines) and personal hygiene (hand washing behaviour with soap before eating, hand washing with soap after defecation, the use of footwear, and hygiene of nails).

2.2. Statistics Analysis

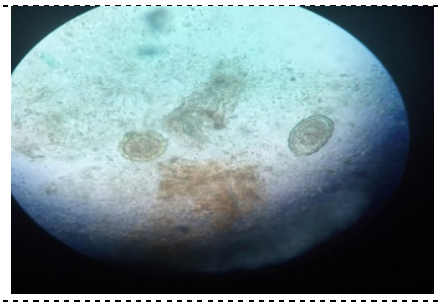
The data obtained were analysed using SPSS program and displayed in tabular form. The relationship between the dependent variable and independent variables were determined by Chi-square test (α = 0.05).

3. Results

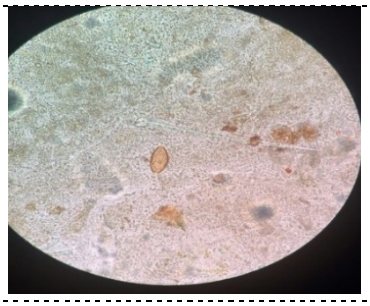
The results were the positive STH stool samples' infection and the analysis of its' relationship to environmental sanitation and personal hygiene variables.

3.1. Microscopic examination

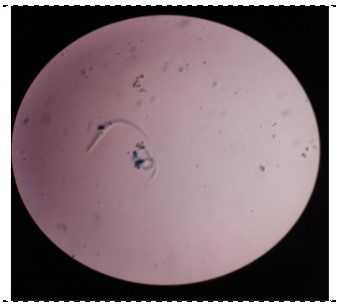
Picture 1-2-3 showed the STH, in form of eggs and larvae.



Picture 1. *Ascaris lumbriocides* eggs (40X).



Picture 2. *Trichuris trichiura* egg (10X).



Picture 3. Hookworm larvae (10X)

Table 1 showed the percentage of STH, which dominantly infected with *Ascaris lumbricoides*, followed by *Trichuris trichiura*, and hookworm.

3.2. Questionnaire

The significant factors of environmental sanitation and personal hygiene with STH infections were the latrines cleanliness, hand washing behaviour, and used of footwear. With the Fischer' exact test below

0.2, it can be concluded the significant of the relationship between the variables and the STH infections prevalence.

Table 1. The frequency distribution, species of STH, and the percentage (N=110).

Soil-Transmitted helminth	Infected	Percentage %
All STH	27	24.5
Hookworm	1	0.9
Ascaris lumbricoide	24	21.8
Trichuris trichiura	2	1.8

Table 2. The relationship of STH infections with environmental sanitation and personal hygiene factors (N=110).

Variables	Good		Bad		*Odd ratio*	*Fisher test* (%)
	Infected	Not	Infected	Not		
Clean water facilities	24	71	3	12	-	1.000
Garbage waste	11	44	16	39	-	0.268
Sewers waste	13	51	14	32	-	0224
Latrines cleanliness	15	65	12	18	2.89	0.021
Handwashing Prior to Meal	13	67	14	16	4.5	0.001
Handwashing After Defecation	17	69	10	14	2.9	0.028
Using Footwear	23	82	4	1	14.3	0.013
Cutting Nails Regularly	25	74	2	9	-	1.000

4. Discussions

Worm infections are commonly infecting people whose activity mostly contact with ground, such as children of preschool and school age [5,16]. The symptoms often overlooked because of the slow manifestation and even asymptomatic such as mild abdominal pain, anxiety, nausea, vomiting, diarrhoea, constipation, and loss of appetite [13].

The results showed that environment factors risk to worm parasite infection. Although there was not a significant difference in STH infection prevalence between children who have a good of sewage waste, garbage waste, and clean water facilities; children with bad latrine facilities had almost three-time risk of being infected as compared with children with a good latrine facility. The life-cycle of STH matched the infection density, as the infective form of infection started as eggs which passed from the stools. The participant who was tested positive with infection had a poor latrine condition. The findings in this study are of relevance helminth biology, as they highlight the close relationship between the transmission of STH with infection status [17]. Environment factors plays crucial determinants of the distribution of helminth infections [18].

The results showed that personal hygiene factors doubled the risk to worm parasite infection. Although there was not a significant difference in STH infection prevalence between children who did not cut their nails regularly [19]; children with bad habits while hand washing and using no footwear had almost fifteen-time risk of being infected as compared with children with a good one. Lack of attitude such as forgetting to wear sandals, or failing to wash hands after defecating or before eating; will led to soil transmitted helminth [8]. The result is inconsistent with other study in Malaysia on parasitic disease, where there was no significant difference in personal hygiene with prevalence and intensity with STH infection [20]. Washing hands properly is one of the most effective ways to prevent the spread of disease [21]. Adding soap has been shown to reduce the incidence of parasitic worm infections. The most important moment where the hands should be washed with soap and water is when after defecation, after cleaning a child defecation [2,9].

The use of personal protective equipment such as footwear can break the chain of transmission of soil-transmitted helminth. Walking bear footed can affect the incidence especially in children who often play in the media ground [22,23].

Air pollutioning a slum landfill neighbourhood would higher the risk of STH infection. Cockroaches and housefly were found to be a potential physical transmitter and significantly contribute to the spread of food borne parasitic diseases [24]. The potential mechanical vector for

parasite infection as its role in disease transmission should be not being under rated. *A. lumbricoides* eggs on the flies could be carry and spread to other places up to 20 miles to unsanitary sites [25]. Further research regarding vector of mechanical transmission in landfill should be investigated. It becomes urgently for on improving the existing standard of environmental sanitary condition.

5. Conclusions

There is a significant relation of STH to the cleanliness of latrines, the washing hands with soap before eating and after defecation and the use of footwear in the study. Further research should proceed on how to lower the incidence of STH with better environmental sanitation and change of personal hygiene behavior.

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