

Soil-Transmitted Helminthiasis, Nutritional Status, and Hemoglobin Levels of School-Age Children in Makassar

Nurfachanti Fattah¹, Nesyana Nurmadilla^{2,*}, Irmayanti³, Asrini Safitri²

¹Department of Parasitology, Faculty of Medicine, Universitas Muslim Indonesia, Makassar, Indonesia

² Department of Nutrition, Faculty of Medicine, Universitas Muslim Indonesia, Makassar, Indonesia

³Department of Clinical Pathologist, Faculty of Medicine, Universitas Muslim Indonesia, Makassar, Indonesia

*Corresponding Author. E-mail: nesyana.nurmadilla@umi.ac.id, Mobile number: +628114129099

ABSTRACT

Introduction: Soil-transmitted helminthiasis (STH) is common in areas with poor sanitation. In Indonesia, the prevalence of the disease is still high ranging from 16–72%, despite the elimination efforts that have been done. This study aimed to determine the prevalence of STH, nutritional status, and hemoglobin levels of elementary school-age children in of slum area in Makassar.

Methods: This was an observational study with a cross-sectional approach. Subjects were 33 elementary school-age children in one of the slum areas in Makassar, South Sulawesi, Indonesia. Stool samples were collected and examined using the Kato-Katz method. Hemoglobin levels were examined with the Azidemet hemoglobin method using capillary blood samples. Assessment of nutritional status was carried out anthropometrically using weight for height, height for age, and body mass index (BMI) for age as indicators.

Results: The prevalence of STH in this study was 27%, all of them had low nutritional status. As many as 15% and 45% of subjects were severely wasted and wasted, respectively, based on the weight for height indication, 61% were wasted based on the BMI for age indicator, and 12% were stunted based on the height for age indicator. Ten percent of the subjects had low hemoglobin levels, none of them had STH.



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Address:

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Email:

greenmedicaljournal@umi.ac.id

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Conclusion: The STH prevalence of school-age children in one of the slum areas in Makassar is still high. Subjects with STH also experienced low nutritional status.

Keywords: STH; nutritional status; hemoglobin level, school-age children; Makassar

Introduction

Neglected tropical diseases (NTDs) are a disease that affects more than 1 billion people and occur mostly in tropical and subtropical regions. The diseases are called neglected because it does not get attention like other diseases. Twenty diseases include in the NTDs group, one of them is Soil-Transmitted Helminthiasis (STH) (1).

There are more than 1.5 billion people who suffer from STH worldwide. The disease is common in the tropics and subtropics, especially in sub-Saharan Africa, China, and East Asia (2). In Indonesia, complete data on the prevalence of STH is challenging to find. However, there are data on the prevalence of STH from several cities in Indonesia which ranging from 16% to 72% (3)(4)(5)(6)(7).

STH is transmitted through worm eggs in human feces which will contaminate soil in poorly sanitized environments. The most common types of worms found in STH are roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), and hookworms (*Necator americanus* and *Ancylostoma duodenale*) (2).

Clinical manifestations of STH are generally mild and non-specific and some are asymptomatic. Lack of appetite, abdominal pain or discomfort, diarrhea, and weight loss are some of the common clinical manifestations in STH. Anemia in STH may occur and is caused by intestinal mucosal bleeding or generalized inflammation (8).

Anthropometry is a measurement of nutritional status by comparing body size (weight, height, body mass index, head circumference, etc) with predetermined standards. (9). Several anthropometric indicators can be used to determine adults' nutritional status, such as weight, height, and body mass index (BMI). In children, weight, height, and BMI indicators are adjusted according to age (9). This study aimed to determine the prevalence of STH, nutritional status, and hemoglobin levels of elementary school-age children in a slum area in Makassar.

Methods

This study was an observational study with a cross-sectional approach. The study was conducted in March–April 2020 in an elementary school in one of the slum areas in Makassar, South Sulawesi, Indonesia.

The sample collecting method was total sampling. The research subjects were all elementary school students present during the study and expressed their willingness (or represented by their parents) to participate by signing the informed consent form. The exclusion criteria in this study were students experiencing diarrhea during data/sample collection.

Before data collection, students and their parents received an explanation about the research procedure. After the explanation, the student's weight and height were measured and their blood was taken to check hemoglobin levels. Then, capillary blood collection and hemoglobin level examination were carried out by trained laboratory workers using the Azidemet hemoglobin method (10). The results of hemoglobin levels are compared with normal hemoglobin values for children by age (11).

All anthropometric measurements were carried out by trained enumerators using calibrated instruments. Each measurement was carried out twice and the average value was calculated. If there was a difference greater than 0.2 kg or 0.2 cm in two measurements, the same enumerator made a third measurement. BMI was calculated by dividing the child's weight in kilograms by the square of height in meters. The measurement results are plotted into Z score tables.

Before going home, each student received equipment for stool collection, i.e. stool pots, stool scoops, and gloves. Students and parents are asked to fill the bench pot with a student stool which is approximately the size of a teaspoon. The pot filled with feces, was immediately given to the laboratory assistant to be examined in the laboratory on the same day using the Kato-Katz method. The results of the stool examination were qualitative.

The data obtained from the research subjects were processed using the Statistical Package for Social Sciences (SPSS) 20 program.

This research has received approval from the Health Research Ethics Commission of the Universitas Muslim Indonesia and the Ibnu Sina Hospital of the UMI Waqf Foundation with the registration number UMI012002047.

Result

A total of 33 boys and girls aged 7-13 years were included in this study. The data on the characteristics of the subjects are presented in the following table.

Table 1. Characteristics of the Subjects (N = 33)

Characteristics	n	%
Sex		
Girl	20	61%

Boy	13	39%
STH		
Positive	9	27%
Negative	24	73%
Nutritional status (Weight for height)		
Obese	0	0%
Normal	13	39%
Wasted	15	45%
Severe wasted	5	15%
Nutritional status (Body mass index for age)		
Obese	0	0%
Normal	13	39%
Wasted	20	61%
Severe wasted	0	0%
Nutritional status (Height for age)		
Tall	0	0%
Normal	29	88%
Stunted	4	12%
Severe stunted	0	0%
Hemoglobin levels		
Normal	30	90%
Low	3	10%

A total of 27% of the subjects were identified as having STH, and 67% of them (having STH) were wasted (BMI for age), 22% were stunted (height for age), 33% were wasted (weight for height), and 33% were severely wasted (weight for height). None of the subjects with STH had low hemoglobin levels.

Table 2. Nutritional status of STH identified subjects (N = 9)

Characteristics	n	%
Nutritional status (Weight for height)		
Obese	0	0%
Normal	3	33%
Wasted	3	33%
Severe wasted	3	33%
Nutritional status (BMI for age)		
Obese	0	0%
Normal	3	33%
Wasted	6	67%
Severe wasted	0	0%
Nutritional status (Height for age)		
Tall	0	0%
Normal	7	78%
Stunted	2	22%

Severe stunted	0	0%
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Discussion

Ascaris lumbricoides is spread almost all over the world, especially in areas with poor sanitation (12). *Ascaris* worms live in the human intestine. *Ascaris* worm eggs come out with feces from a person with Ascariasis (8). Therefore, soil contamination by *Ascaris* eggs occur if the patient defecates on the soil. The entry of *Ascaris* mature eggs in the human body can occur in several ways, namely (2): 1) A person consumes vegetables or fruit contaminated with *Ascaris* mature eggs (vegetables or fruit is not washed and appropriately cooked), 2) A person consumes water that has been contaminated with *Ascaris* eggs, and 3) Children play on soil contaminated with *Ascaris* mature eggs and then eat or touching their mouth without washing their hands first.

STH affects the digestion of food. Cumulatively, STH (*A. lumbricoides*) can cause a loss of nutritional needs due to a lack of calories and protein as well as the occurrence of blood loss due to damage to the intestinal mucosa by hookworms (*Necator americanus* and *Ancylostoma duodenale*). Besides inhibiting physical development, intelligence, and work productivity, STH can also reduce the body's immunity so that the body is susceptible to other diseases (2).

Patients with STH are generally asymptomatic or only show mild symptoms such as abdominal discomfort or abdominal pain. In severe conditions, many adult worms in the intestine will cause intestinal obstruction which will inhibit the absorption of food. This condition causes nutritional disorders in people with worms (13). In this study, it was found that all subjects who experienced STH had low nutritional status.

This study also found that 67% of subjects who did not experience STH also had low nutritional status. This may be due to the inadequacy of the subject's nutritional intake. STH, which occurs in patients who have previously experienced malnutrition, will further aggravate the condition of malnutrition.

The majority of subjects had normal hemoglobin levels and only 3 (10%) subjects had low hemoglobin levels. Two of the three subjects who had low hemoglobin levels also had low nutritional status (BMI for

age) while one other subject had low BMI for age and height for age. None of the three subjects were infected with STH. It was indicated that this low hemoglobin might be due to malnutrition rather than STH.

Conclusion

The high prevalence of STH among elementary school-aged children in one of the slum areas in Makassar city indicates that there are still many STH cases in Makassar. Apart from medical treatment, preventive efforts such as education on clean and healthy living behavior must continue to be encouraged to reduce the prevalence of STH to a minimum.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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