

**RELATIONSHIP BETWEEN *SOIL-TRANSMITTED HELMINTHS* (STH)
EGG CONTAMINATION IN YARD SOIL TO HELMINTHIASIS
INFECTION IN CHILDREN ELEMENTARY SCHOOL IN
GAMPONG JAWA KUTA RAJA SUB-DISTRICT
BANDA ACEH CITY**

^{1*}Rahmayanti,² Siti Hadijah,³ Erlinawati

^{1,2,3} Department of Medical Laboratory Technology, Health Polytechnic of
Ministry of Health Aceh, Indonesia

*Email: yantiasyan2017@gmail.com

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ABSTRAK

Soil-Transmitted Helminths (STH) adalah jenis cacing usus yang menginfeksi manusia yang ditularkan melalui tanah yang terkontaminasi cacing parasit seperti cacing gelang (*Ascaris lumbricoides*), cacing cambuk (*Trichuris trichiura*), dan cacing tambang (*Ancylostoma duodenale* dan *Necator americanus*). Infeksi STH memiliki efek merugikan bagi anak-anak, bisa mengkhawatirkan untuk kelangsungan hidup mereka, serta perkembangan mental dan fisiknya. Tanah merupakan salah satu perantara infeksi kecacingan, karena tanah permukaan merupakan tempat hidup telur cacing yang dapat bertahan dalam waktu yang lama. Tinjau dari penderita kecacingan merupakan sumber penting untuk kontaminasi tanah. Penelitian ini merupakan penelitian observasional analitik dengan rancangan *cross sectional* dengan teknik pengambilan sampel secara *purposive sampling*, yang dilakukan pada 50 anak usia sekolah dasar di Gampong Jawa, Kecamatan Kuta Raja, Kota Banda Aceh. Pemeriksaan kejadian cacingan pada anak dilakukan dengan pemeriksaan feses (metode *Kato-Katz*). Dan pada pemeriksaan sampel tanah menggunakan *floatation methode*. Hasil pemeriksaan tanah pada penelitian ini menunjukkan bahwa tanah halaman rumah anak yang tercemar oleh telur STH sebesar 26% dan tanah yang tidak tercemar oleh telur STH sebesar 74%. Dengan pencemaran STH tertinggi adalah telur *Ascaris lumbricoides* sebesar 43,5%. Hasil pemeriksaan feses pada anak menunjukkan bahwa sebanyak 10 orang (20%) terinfeksi STH dan 40 orang (80%) tidak terinfeksi STH. Berdasarkan uji statistik *Chi Square*, didapatkan nilai p-value 0,002 yang menunjukkan bahwa terdapat hubungan yang signifikan antara pencemaran tanah halaman rumah oleh STH terhadap infeksi kecacingan pada anak. Hal ini dapat disebabkan oleh faktor-faktor seperti personal hygiene dan sanitasi lingkungan yang kurang baik.

Kata Kunci: Pencemaran tanah, STH, infeksi kecacingan

ABSTRACT

Soil-Transmitted Helminths (STH) are a type of intestinal worm that infects humans through soil contaminated with parasitic worms such as roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), and hookworms (*Ancylostoma duodenale* and *Necator americanus*). STH infections have detrimental effects on children, which can be worrisome for their survival as well as their mental and physical development. Soil is one of the intermediaries for helminthiasis infection because surface soil is a place where worm eggs can survive for a long time. Feces from people with helminthiasis are an important source of soil contamination. This study is an analytical observational study with a *cross-sectional* design and *purposive sampling* technique with 50 elementary school-aged children in Gampong Jawa, Kuta Raja District, Banda Aceh City. Examination of the incidence of worms in children is done by examining feces (*Kato-Katz* method). The examination of soil samples using the *floatation method*. The results of the soil examination in this study showed that the soil in the children's yard was polluted by STH eggs by 26% and the soil that was not polluted by STH eggs by 74%. The highest STH contamination was *Ascaris lumbricoides* eggs at 43.5%. The results of fecal examination in children showed that as many as 10 people (20%) were infected with STH and 40 people (80%) were not infected with STH. Based on the *Chi Square* statistical test, a p-value of 0.002 was obtained, indicating that there is a significant relationship between soil pollution in the yard by STH and helminthiasis infection in children. This could be caused by factors such as poor personal hygiene and environmental sanitation.

Keywords: Soil contamination, STH, helminthiasis infection

PENDAHULUAN

Soil-transmitted helminths (STH) infection remains a global health problem. More than 1.5 billion people, or 24% of the world's population, are infected with STH worldwide [1]. In Indonesia, the prevalence of helminthiasis is still high, at 45-65%. In certain areas with poor sanitation, the prevalence of helminthiasis can reach 80%. [2].

Soil-transmitted helminths (STH) refer to intestinal worms that infect humans and are transmitted through soil contaminated with parasitic worms such as roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), and hookworms (*Ancylostoma duodenale*) and *Necator americanus*. [3]. STH infections are transmitted through eggs excreted in the feces of an infected person. [4][1].

Adult worms live in the intestines and produce thousands of eggs every day. In areas with inadequate sanitation, these eggs will contaminate the soil in various ways. Eggs can adhere to vegetables, which are then ingested without being washed, peeled, or cooked properly. Eggs can be swallowed from contaminated water sources, and eggs are ingested by children who play on contaminated soil and then put their hands in their mouths without washing their hands. [1].

STH infections are common in schoolchildren. School-aged children between 5 and 15 years of age in most developing countries are at the highest risk of chronic helminthiasis infection and helminthiasis-related morbidity. [5]. STH infections have detrimental effects on children, which can be worrisome for their survival as well as their mental and physical development. [6]. These infections also negatively affect the nutritional status and development of children. [7].

Soil is one of the intermediaries for helminthiasis infection because surface soil is a place where worm eggs can survive for a long time. Feces from people with helminthiasis are an

important source of soil contamination. [8]. Soil plays an important role in the STH life cycle. Eggs need time to incubate in soil in a warm, moist environment to become infective. [9].

According to WHO data, more than 267 million preschool-aged children and more than 568 million school-aged children live in areas where these parasites are intensively transmitted and require treatment and prevention interventions. [1]. Gampong Jawa is one of the areas in the city of Banda Aceh, adjacent to the sea and rivers; therefore, most of the people in this Gampong are fishermen. Gampong Jawa consists of five hamlets. The total number of people in this village is 983 families.

In two hamlets in Gampong Jawa, namely Dusun Tgk. Muda and Dusun Tuan di Banda, many people still do not have family latrines, so they still use public latrines. The number of public latrines is still very far compared to the number of people in this hamlet. Therefore, people, including children in this hamlet still defecate in any place, such as the yard of the house and the field around the house. Besides that, clean water facilities are still lacking.

The specific objectives of this study were to determine the prevalence of helminthiasis in elementary school children, the prevalence of soil contamination by STH eggs in the home yard on helminthiasis infection in elementary school children, and to determine the relationship of STH egg contamination in home yard soil on helminthiasis infection in elementary school children in Gampong Jawa, Kuta Alam Subdistrict Banda Aceh City.

The urgency of this study is that researchers can provide information to the community based on the results of the research obtained later on the relationship between STH-contaminated soil and the incidence of helminthiasis infection in children, so as to change behavior in the community in a better direction by implementing PHBS (Clean and Healthy Living Behavior). As for the government, this study can support government programs related to deworming by reducing the prevalence of worms to below 10% in each district or city.

RESEARCH METHOD

Type of Research

This type of research is analytical observational using a cross-sectional design, which is, making observations or measuring variables at one specific time. [10]. The method of collecting data at one time with the aim of finding the relationship between the independent variable (soil pollution by STH eggs) and the dependent variable (the incidence of helminthiasis). [11].

Place and Time of Research

This research was conducted in Gampong Jawa, Kuta Raja sub-district, Banda Aceh. Data collection was in the form of feces collection and soil sampling in the yard of the respondent's house. The examination of feces and soil samples was carried out at the Microbiology Laboratory of the Department of Medical Laboratory Technology III, Poltekkes Kemenkes Aceh. This research was conducted from June to July 2023.

Population and Sample

The population in this study were elementary school-aged children in Gampong Jawa, Kuta Raja Sub-

district, Banda Aceh who met the inclusion criteria.

The sample in this study was determined by the purposive sampling method. A total of 50 primary school-aged children from Gampong Jawa Village, Kuta Raja Sub-district, Banda Aceh City were selected based on the inclusion criteria.

The inclusion criteria in this study are:

- a. Students and parents who are willing to take part in the study and have filled out an inform consent sheet.
- b. Students who have not taken deworming medication within the last 6 months.
- c. Parents who are willing to take soil samples in their yard.
- d. Land around the house where children often play.
- e. Land around the house that is close to garbage disposal, feces and latrines.

The exclusion criteria in this study are:

- a. Students whose yard is cement.

- b. Soil that cannot be inspected, such as soil that is too small in quantity and soil that is waterlogged.
- c. Home location that is difficult to reach.

Fecal Examination

Tools and Materials

Glycerin, 3% malachite green, distilled water, microscope, glass object, 2 x 3 cm cellophane tape, hand scun (rubber gloves), flannel, paper lens, small towel, sample bottle, stick or toothpick, oil paper, tissue, soap and detergent, scissors, mask, bucket, and waterproof marker.

Work Procedure

- a. Wear gloves to reduce the chance of infection with various diseases.
- b. Write the code number on the object glass with a marker according to what is written on the stool pot.
- c. Remove the feces with a stick the size of a mung bean seed and place it on an object glass.
- d. Cover with cellophane soaked in Kato's solution, and smooth the feces under the cellophane with a rubber bottle cap or object glass.

- e. The preparation is left for 20-30 minutes.
 - f. Examine with a weak magnification of 100x (objective 10x and ocular 10x); if necessary, it can be enlarged to 400x (objective 40x and ocular 10x).
 - g. Fecal examination results are positive if one or more STH eggs are found and negative if no STH eggs are found. [12].
- 2) Prepare a plastic bag and code the location and date of sampling with a permanent marker.
 - 3) Scrape the surface soil at the location $\pm 40 \times 40 \text{ cm}^2$ using a cement scoop of ± 100 grams.
 - 4) Put the sample in different plastics according to the picking location and labeling.
 - 5) Put the sample in an icebox and take it to the laboratory.

Soil Inspection

Soil samples from the children's yard were examined. The examination aims to determine the presence or absence of worm eggs in these soils.

Tools and Materials

Closed plastic, label paper, spoon, centrifugator, icebox, refrigerator, centrifuge tube, pipette, tea strainer, object glass, microscope, soil sample, and NaCl solution.

Work Procedure

Sampling Method

Once the location point is determined, do the following:

- 1) Clear the spot with an earth fork of branches, grass, and gravel.

Inspection technique

- 1) Weigh a soil sample that has been cleaned of gravel and leaves (dry grass) as much as 5 grams.
- 2) Put this soil into centrifuge tubes
- 3) Then dissolved with NaCl in a centrifuge tube, until the solution reaches the neck of the tube.
- 4) Each centrifuge tube has one sample point
- 5) Close each centrifuge tube and wait for 30 minutes. If there are worm eggs and worm larvae in the soil, the eggs and larvae have floated and stuck to the cover glass.
- 6) The object glass is placed on a flat and level surface, the code written on the plastic sample clip is written

- with a permanent marker on the tip of the object glass.
- 7) Take the cover glass using tweezers and place it over the object glass.
 - 8) The preparations are then examined under a microscope, at first with a 10x magnification; if eggs or larvae are found, they are enlarged with a 40x magnification for clarity.
 - 9) Check all samples received.

Data Collection

1. Primary Data

The primary data in this study was the collection of yard soil and feces from elementary school children from Gampong Jawa, Kuta Raja sub- district, Banda Aceh.

2. Secondary Data

Secondary data in this study were obtained from data on the number

of primary school-age children who live in Gampong Jawa, Kuta Raja sub-district, Banda Aceh.

Data Analysis

To analyze the relationship between yard soil pollution and STH infection, a Chi Square test was used (X^2) with a significant level of $\alpha = 0.05$. [13].

RESULTS AND DISCUSSION

Research Results

Characteristics of Research Subjects

This research was conducted from June 2023 to July 2023 in Gampong Jawa Kec. Kuta Raja, Banda Aceh. The number of respondents during the study was 50. Research subjects who met the inclusion and exclusion criteria were given informed consent to be approved by parents before distributing questionnaires.

Table 1. Frequency Distribution of Research Subjects Based on Gender

Gender	Number (N)	Percentage (%)
Male	21	42
Female	29	58
Total	50	100

Table 2: Frequency Distribution of Research Subjects Based on Age

Age	Number (N)	Percentage (%)
6 - 8 years	33	66
9 - 10 years	15	30
Total	50	100

Table 1 shows that more than half of the research subjects were male as many as 21 people (42%) and 29 people (58%) were female. Whereas in table 2 in terms of research age, research

subjects aged 6-8 years were 33 people (66%), while 9-10 years old were 15 people (30%), and 11-12 years old were 2 people (4%).

Soil Pollution Level

Table 3. Frequency Distribution of Home Yard Soil Contamination by STH Worm Eggs in Gampong Jawa, Kuta Raja Sub-district, Banda Aceh

Soil Pollution	Number (N)	Percentage (%)
Positive	13	26
Negative	37	74
Total	50	100

In table 3 shows that out of 50 houses in Gampong Jawa, Kuta Raja sub- district, Banda Aceh that have a soil contamination level by STH is 34%.

Childhood Helminth Infection Rate

Table 4. Frequency distribution of *Helminthiasis* Infection among children in Gampong Jawa, Kuta Raja sub-district, Banda Aceh

Helminth Infection	Number (N)	Percentage (%)
Positive	10	20
Negative	40	80
Total	50	100

From table 4 shows that *Ascaris lumbricoides* got the first ranks first in contaminating the soil of the house yard in Gampong Jawa, Kuta Raja District, Banda Aceh City, with soil contamination by *Ascaris lumbricoides* as much as 84.6% and soil contamination by *Trichuris trichiura* as much as 15.4%. Finally, Hookworm, with a prevalence of 0%.

Worm Type Distribution

Table 5. Frequency Distribution of Soil Pollution by STH Worm Species

Soil Pollution	Number (N)	Percentage (%)
<i>Ascaris lumbricoides</i>	11	84,6
<i>Trichuris trichiura</i>	2	15,4
<i>Hookworm</i>	0	0
Total	13	100

Table 5 shows that *Ascaris lumbricoides* ranks first in contaminating the soil of the house yard in Gampong Jawa, Kuta Raja District, Banda Aceh City with soil contamination by *Ascaris lumbricoides* as much as 84.6%, then soil contamination by *Trichuris trichiura* as much as 15.4%. Finally *Hookworm* with a prevalence of 0%.

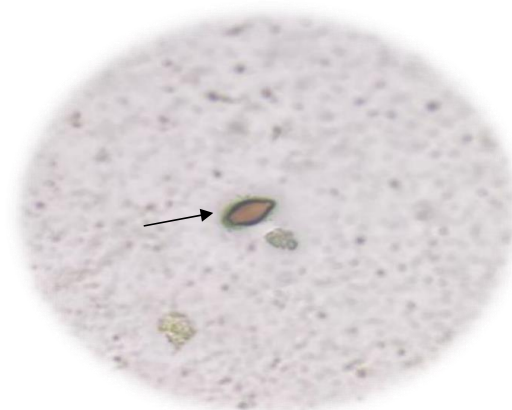


Fig.1 Microscopic Examination Results of *Trichuris trichiura* Eggs

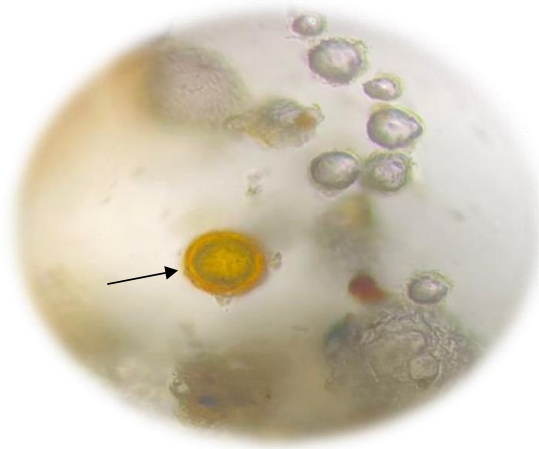


Fig.2 Microscopic Examination Results of *Ascaris lumbricoides* Eggs

Chi Square Analysis

Table 6. Results of the Analysis of the Relationship between Soil Pollution by STH in the Yard and *Helminthiasis* Infection in Elementary School-Age Children.

	Value	Df	Asymp. Sig.(2-sided)	Exact Sig.(2-sided)	Exact Sig.(1-sided)
Pearson Chi-Square	12,578b	1	,000		
Continuity Correction	9,882	1	,002		
Likelihood Ratio	11,272	1	,001		
Fisher's Exact Test				,001	,001
Linear-by-Linear Association	12,326	1	,000		
N of Valid Cases	50				

Note: a. Computed only for a 2x2 table

b. 1 cell (25.0%) has expected count less than 5. The minimum expected count is 2.60

From table 6 shows that the p value of the chi square test obtained a value of 0.002 which is smaller than 0.05, so it can be concluded that there is a significant relationship between soil pollution of the yard by STH and *Helminthiasis* infection in elementary school children.

This study was conducted on 50 children in Gampong Jawa, Kuta Raja Sub-district, Banda Aceh, from June 2023 to July 2023. The number of respondents was 21 male children and 29 female children. Based on age, in this study, the age of children aged 6-8 years totaled 33 people, aged 9-10 years totaled 15 people, and aged 11-12 years totaled 2 people. Based on the results of the soil examination in this study, it shows that the soil in the yards of children's homes polluted by STH eggs is 26% and the soil that is not polluted by STH eggs is 74%. These results are in accordance with the research of Sevfianti et al. (2018), which reported that the soil polluted by STH eggs (37.3%) was less than the soil that was not polluted by STH eggs (62.7%). [14]. The contamination of yard soil by STH eggs can be caused by feces from people with helminthiasis, which is an important source of soil contamination. Soil contamination can occur if an infected person defecates outside the home, such as in bushes, yards, or fields, or if the feces of an infected person are used as fertilizer, eggs will be deposited in the soil. [3].

The results of the examination of soil samples at the Microbiology Laboratory of the Medical Laboratory Technology Department, Poltekkes Kemenkes Aceh, showed that, after being identified, the highest STH worm eggs contaminating the soil of the house yard were *Ascaris lumbricoides* eggs, with a total of 84.6%. This is in accordance with research (Ghiffary, 2017), which states that the highest STH worm eggs contaminating the soil of the house yard are *Ascaris lumbricoides* eggs by 43.5%. [15]. Freeman, et al. (2015) said that children who suffer from STH infections but live in an unpolluted environment may get infections from playgrounds whose environment is polluted by feces containing worm eggs. [16]. Fertilized *Ascaris lumbricoides* eggs can grow at an optimum temperature of 25-30 °C. These worm eggs will not hatch in the soil and can survive for several years. In a suitable environment, fertilized eggs will develop into infective forms in approximately 3 weeks. The infective form, when ingested by humans, will hatch in the intestine. [17].

The results of fecal examinations in children in Gampong Jawa showed that 10 people (20%) were infected with STH and 40 people (80%) were not infected with STH. This is in accordance with Pabalan, et al. (2018), that state that STH infections often occur in schoolchildren. School-aged children between 5 and 15 years old in most developing countries are at the highest risk of *helminthiasis* infection. [5]. The results of the observations that have been made by respondents can be explained by the fact that the transmission of STH infections in primary school children in Gampong Jawa can occur due to poor personal hygiene. Not paying attention to the cleanliness of food or drinks; having the habit of not wearing footwear when wandering in the yard makes it easier for children to be infected by STH worms; not washing hands before eating; not washing hands with soap and running water after defecation; and There are still respondents who defecate in any place, which can also be another factor that supports the occurrence of *Helminthiasis* infection. STH live in the intestines, and their eggs are found in the feces of infected people. *Ascaris* and

Hookworm eggs become infective when they mature in the soil. People become infected with *Ascaris lumbricoides* and *Trichuris trichiura* when their eggs are swallowed. Hookworm eggs are not infective; Hookworm eggs hatch in the soil and mature larvae can penetrate human skin. [3]. STH infections have detrimental effects on children, which can be worrisome for their survival as well as their mental and physical development. [6]. These infections also negatively affect nutritional status in ways such as anemia, vitamin deficiencies, stunted growth and development, and intestinal obstruction. [7]. [7][18]. For example, *Ascaris lumbricoides*, every 20 adult worms per day, will rob 2.8 grams of carbohydrates and 0.7 grams of protein, so that, especially in children, it often causes a distended stomach, pale, lethargic, rarely red hair, and a thin body, especially if the child has previously suffered from under nutrition. [19].

Based on statistical tests, a p-value of 0.002 was obtained, indicating that there is a significant relationship between soil pollution in the yard by STH and helminthiasis infection in children. This can be caused by the

behavior of the community, including children who still defecate in any place, such as the yard or the field around the house. This is because respondents still have latrines that are not in accordance with health standards, and there are even respondents who do not have family latrines. According to Rahmayanti, et al.

(2017), states that a person's behavior can be influenced by knowledge gained from experience, so this can lead to attitudes and actions towards good values, and one of them is the value of health. Children's lack of knowledge about worm infections is a basic factor in a child's behavior. [20].

CONCLUSION

Based on the research that has been conducted, it can be concluded that the relationship between Soil-Transmitted Helminths (STH) egg contamination in home yard soil and Helminthiasis infection in elementary school-age children in Gampong Jawa, Kuta Raja Sub-district, Banda Aceh City is as follows:

1. The prevalence of *Helminthiasis* among primary school-aged children in Gampong Jawa, Kuta Raja Sub-district, Banda Aceh City is 20%.
2. The prevalence of children's yard soil contamination by STH eggs was 26%.
3. The results of the identification of STH worm eggs that most highly

- contaminate the soil of the house yard are *Ascaris lumbricoides* eggs.
4. There is an association between Soil-Transmitted Helminths (STH) egg contamination in yard soil and *Helminthiasis* infection among primary school-aged children in Gampong Jawa, Kuta Raja Sub-district, Banda Aceh City.

ADVICE

1. For respondents, especially elementary school-age children in Gampong Jawa, Kuta Raja Sub-District, Banda Aceh City, to further improve personal hygiene by implementing PHBS (Clean and Healthy Living Behavior) and conducting routine *Helminthiasis*

- screening every 6 months in order to avoid *Helminthiasis* infection.
2. Routine deworming and socialization of the importance of taking deworming drugs are expected to prevent *Helminthiasis* infection.
 3. Provide education on STH egg contamination in soil to avoid the dangers of worms to parents and children.

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Relationship Between Soil-Transmitted...

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