

The Relationship of Personal Hygiene to the Number of Eggs Soil Transmitted Helminths on Hand Nail Dirt

¹Nurmaliza Hasan*, ²Yulnefia, ³Eva Oktariani, ⁴Retha Arvina Permata

¹Department of Parasitology, Faculty of Medicine, Universitas Abdurrah, Indonesia*;
email: nurmaliza.hasan@univrab.ac.id

²Public Health Sciences, Faculty of Medicine, Universitas Abdurrah, Indonesia

³Department of Physiology, Faculty of Medicine, Universitas Abdurrah, Indonesia

⁴Department of Medicine, Faculty of Medicine, Universitas Abdurrah, Indonesia

*Correspondence

Article Information

Submitted: 12 July 2026

Accepted: 18 July 2026

Publish: 23 July 2026

Keyword: Nail Dirt Check;
Personal Hygiene; Soil
Transmitted Helminths;

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Hasan, Yulnefia, Eva Oktariani,
Retha Arvina Permata

Year: 2026

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Abstract

Introduction: Soil Transmitted Helminths are worms whose life cycle takes place partly in the soil and are the tenth most common infection worldwide. STH infections are transmitted through poor personal hygiene and often occur in children aged 3–8 years. **Objective:** This study aims to determine the relationship between personal hygiene and the number of STH eggs in the fingernail dirt of students at Elementary School 40 Pekanbaru. **Method:** Observational analytic with a cross-sectional approach to samples that meet the inclusion criteria. **Result and Discussion:** The results of 116 samples obtained as many as 97 samples with good personal hygiene were found to have STH eggs of around 35.1%; as many as 17 samples with sufficient personal hygiene were found to have STH eggs of around 100%; as many as 2 samples with poor personal hygiene were found to have STH eggs of around 100%. **Conclusion:** Based on the Spearman correlation test with $P=0.000$, p value <0.05 was obtained which indicated a significant relationship between personal hygiene and the number of STH eggs in fingernail dirt. The number of Soil Transmitted Helminths eggs was found to be lower in someone with a high level of personal hygiene.

Introduction

Worm disease is a tropical disease that is neglected in the health world because of its effects that are only seen in the long term. One of the neglected worm infections, namely Soil Transmitted Helminths infections (Tersandy et al., 2024; Manyullei et al., 2023; Damayanti et al., 2024; Saskyarasmi et al., 2021; Sudarti et al., 2024). *Soil Transmitted Helminths* (STH) are intestinal nematodes whose life cycle and transmission take place in the soil. Some of the worms that belong to STH consist of *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis*, *Necator americanus*, and *Anchylostoma duodenale* (Putri et al., 2022; Oktavia et al., 2025; Idayani et al., 2021; Saskyarasmi et al., 2021; Rahmawati et al., 2024; Sudarti et al., 2024). The transmission mechanism of each species of STH differs significantly and needs to be understood to determine the relevance of nail examination as a detection medium. *Ascaris lumbricoides* and *Trichuris trichiura* are transmitted mainly through the ingestion of infective eggs that contaminate hands, food, or drinks, so the long, ungroomed fingernails act as a medium for attaching eggs that can enter the digestive tract.

In contrast, hookworms such as *Necator americanus* and *Anchylostoma duodenale* primarily infect through the penetration of larvae on the skin, specifically the soles of the feet, so nail contamination is not the main route of transmission. *Strongyloides stercoralis* can infect both through skin penetration and through auto-ingestion pathways. This difference in transmission mechanism is important to consider in interpreting the findings of worm eggs on nails, as the relevance of nails as a transmission medium is stronger for species transmitted through the fecal-oral route than for species that infect through skin penetration. STH infection is transmitted through eggs and larvae that contaminate the soil of environmental areas that have poor sanitation. (Idayani et al., 2021)

The World Health Organization (WHO) recorded that more than 1.5 billion people or 24% of the world's population are infected with STH. In Indonesia, the prevalence of STH infection in children is still high around 2.7-60.7% of cases. In Pekanbaru, the prevalence of worm infections in children is 12.7%. The age group that is most infected is 6-12 years old or school children. Children of school age are susceptible to worm infection because their activities are often related to soil. The habit of playing on the ground or touching objects contaminated with worm eggs results in worm eggs being tucked in long, unmaintained nails. In this context, eggs found in nail dirt can be in the form of eggs that are still viable and infective, eggs that have undergone degeneration, or environmental materials that contain parasitic remains. (Anisa et al., 2022; Damayanti et al., 2024)

Differences in egg viability status have different clinical implications; infective eggs have the potential to cause active transmission if they enter the gastrointestinal tract, while non-viable eggs reflect environmental exposure without the risk of direct transmission. Therefore, nail examination in the context of this study is intended to detect the presence of STH eggs as an indicator of environmental exposure and individual hygiene, not as confirmation of active infection. Therefore, the detection of the presence of worm eggs can be done through nail examination because the nails can be a medium for attaching various dirt containing microorganisms, including worm eggs. Based on the above background, the researcher wants to find out the relationship between STH eggs and (Indraswari et al., 2025) personal hygiene through the examination of hand nail dirt on students of SDN 40 Pekanbaru so that the researcher can apply the prevention of STH infection in school-age children.

Method

This study uses an observational analytical method with a cross sectional approach. The data obtained was analyzed using the Spearman correlation test. The samples used in this study totaled 116 samples. Samples were obtained by the Total Sampling method. The following are the tools and materials used in this study can be seen in table 1 below.

Table 1
Research tools and materials

No.	Tools and Materials	No.	Tools and Materials
1.	Stationery	9.	Dropper pipette
2.	Label	10.	Stirring stalk
3.	White paper	11.	Test tubes
4.	Questionnaire paper	12.	Glass objects
5.	Plastic pots	13.	Object glass cover
6.	Nail Clippers	14.	Centrifugator
7.	Gloves	15.	Microscope
8.	Cotton alcohol	16.	KOH Solution 10%

The flow of this research begins with a survey of locations and places. The researcher gathered the students according to the time that had been discussed together with the school. The researcher explained the purpose of the research to students and the school. Then the research team accompanied by the school distributed questionnaires. After the questionnaire was analyzed, the research team took samples of the fingernail dirt of students who had met the inclusion criteria and put them in plastic pots that had been marked with labels. The plastic pots containing the samples were taken to the parasitology laboratory to be added to 30 ml of 10% KOH solution and then left for 24 hours. After 24 hours, the sample is transferred into a pre-labeled test tube. The tube is centrifuged at 2500 rpm for 5 minutes. Then the supernatant liquid is discarded and the sediment is taken using a dropper pipette. Place 1-2 drops of each sample on top of the glass object and then cover with a glass cover. Observe the sample under a microscope with a magnification of 10x or 40x, then identify the type of egg and calculate the total STH eggs found.

Result and Discussion

This study was conducted to determine the relationship between personal hygiene and Total Soil Transmitted Helminths eggs in the fingernail dirt of students in grades I, II, and III of SD Negeri 40 Pekanbaru which was in accordance with the inclusion criteria so that a research sample of 116 samples was obtained. The location of SD Negeri 40 Pekanbaru is located in the Meranti Pandak area, Rumbai Pesisir District, Pekanbaru City. Based on the results of observations, the elementary school has risk factors that support the occurrence of STH infection, namely the location on the edge of the Siak River, high population density, poor environmental sanitation, and the habits of children who like to play on the ground. The following is a table showing the distribution of personal hygiene to the total number of STH eggs in the fingernail droppings of SD Negeri 40 Pekanbaru students.

Nail Cutting Habits

Table 2
Distribution of respondents based on nail cutting habits

Nail cutting habits	Frequency	(%)
Good	89	76.7
Poor	27	23.3
Total	116	100

Table 2 shows that out of 116 respondents, 89 (76.7%) respondents have the habit of cutting their fingernails once a week and 27 (23.3%) of the respondents do not have the habit of cutting their fingernails once a week.

Contamination of Worm Eggs in Nail Dirt

1. Contamination of *A. lumbricoides* Eggs in Nail Dirt

Table 3
Distribution of respondents contaminated with *A. lumbricoides* eggs in feces
Hand nails

Total eggs of <i>A. lumbricoides</i>	Frequency	(%)
6	2	1.7
4	7	6.0
3	6	5.2
2	5	4.3
1	23	19.8
0	73	62.9
Total	116	100

Table 3 shows the results of the examination of hand nail dirt from 116 respondents in the laboratory, it was found that as many as 2 (1.7%) respondents had 6 eggs, as many as 7 (6.0%) respondents had 4 eggs, as many as 6 (5.2) percent of respondents got 3 eggs, as many as 5 (4.3%) respondents had 2 eggs, as many as 23 (19.8%) respondents had 1 egg, and as many as 73 (62.9%) respondents did not find *A. lumbricoides* eggs in their fingernail dirt.

2. Contamination of *T. trichiura* Eggs in Nail Dirt

Table 4
Distribution of respondents contaminated with *T. trichiura* eggs in feces Hand
nails

Total eggs <i>T. trichiura</i>	Frequency	(%)
2	2	1.7
1	8	6.9
0	106	91.4
Total	116	100

Table 4 below shows that it was found that as many as 2 (1.7%) respondents had 2 eggs, as many as 8 (6.9%) respondents had 1 egg, and as many as 106 (91.4%) respondents did not find *T. trichiura* eggs in their fingernail dirt.

3. Contamination of Hookworm Eggs in Nail Dirt

Table 5

Distribution of respondents contaminated with hookworm eggs in feces Hand nails

Total eggs Hookworms	Frequency	(%)
0	116	100
Total	116	100

Table 5 shows that as many as 116 (100%) of the respondents did not have hookworm eggs (*A.duodenalis* and *N.americanus*) in the examination of hand nail dirt in the laboratory.

Comparison of Total Eggs of Soil Transmitted Helminths (STH) in Nail Dirt to Personal Hygiene

Table 6

Total Distribution of STH Eggs on Hand Nail Dirt

Personal hygiene	Soil Transmitted Helminths Eggs												Total	
	0		1		2		3		4		6			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Good	63	100	27	87.1	3	42.9	3	50	1	14.3	0	0	97	83.6
Moderate	0	0	4	12.9	4	57.1	3	50	6	85.7	0	0	17	14.7
Poor	0	0	0	0	0	0	0	0	0	0	2	100	2	1.7
Total	63	100	31	100	7	100	6	100	7	100	2	100	116	100

Based on table 6, it shows that with good personal hygiene, 27 (87.1%) respondents found 1 egg, as many as 3 (42.9%) respondents found 2 eggs, as many as 3 (50%) respondents found 3 eggs, and as many as 1 (14.3%) respondents found 4 STH eggs on hand nail dirt. Personal hygiene was sufficient showing that 4 (12.9%) respondents found 1 egg, 4 (57.1%) respondents found 2 eggs, 3 (50%) respondents found 3 eggs, 6 (85.7%) respondents found 4 STH eggs on hand nail stains. Personal hygiene that lacked as many as 2 (100%) of the respondents found 6 STH eggs on the dirt of their fingernails.

The findings of this study show a strong relationship between personal hygiene and total STH eggs in students' fingernail dirt ($r = -0.623$), although personal hygiene only explains 39% of the variation. This indicates that personal hygiene is an important factor but not the only determinant of worm egg contamination on nails. Environmental factors, including high soil exposure around the school located on the banks of the Siak River with poor sanitation, may have contributed independently to the contamination of students' nails.

The predominance of *Ascaris lumbricoides* eggs (37.1% of respondents) compared to *Trichuris trichiura* (8.6%) and the absence of hookworm eggs were consistent with the transmission mechanism of each species. *Ascaris lumbricoides* and *Trichuris trichiura* are transmitted through the ingestion of infective eggs, so dirty fingernails are relevant transmission pathways for both species. The absence of hookworm eggs in nail feces is in line with its transmission mechanism which is mainly through the penetration of larvae on the skin, not through the fecal-oral route, so the nails are not the main transmission medium for this species. These findings reinforce the relevance of specific nail examinations for detecting exposure to species transmitted through the fecal-oral route.

Although most of the respondents (76.7%) had good nail cutting habits, STH eggs were still found in all students in the good personal hygiene group. This shows that the habit of cutting nails alone is not enough to prevent contamination if it is not accompanied by effective handwashing practices. Improper hand washing, such as without soap, for an inadequate duration, or not covering between the nails, may be a factor explaining why contamination is still found in groups with good nail hygiene. This condition is supported by high exposure to the environment around the school, where repeated contact with contaminated soil can result in nail reinfection even after regular cutting. This is in accordance with the research of Damayanti et al. (2024) which found a meaningful relationship between the frequency of nail clippings and STH egg positivity, as well as the research of Sari et al. (2020) which reported that respondents who did not maintain nail hygiene were 20.5 times more likely to be infected with worms.

It is also necessary to consider that the personal hygiene category in this study is broad and includes various behavioral indicators. When categorized in aggregate, differences between individuals in certain aspects such as the habit of washing hands after playing dirt or before eating may not be captured specifically. This may explain why some respondents with good personal hygiene overall still show worm egg contamination on their nails.

As an important methodological limitation to acknowledge, this study cannot completely rule out the possibility of cross-contamination during the process of collecting or examining samples in the laboratory. Nail polish collection from elementary school-age students in field conditions is susceptible to contamination from the surrounding environment as well as from the equipment used. In addition, eggs found on nails cannot be ascertained whether they are viable and infective, or whether they are environmental materials that are no longer able to infect. This limitation needs to be considered in interpreting the total eggs found, because the presence of eggs on the nails in this study is more accurately interpreted as an indicator of environmental exposure and individual hygiene, rather than as direct evidence of active infection. This fact suggests that the often overlooked nail can be an important indicator in the surveillance of parasitic transmission of worm infections. (Oktavia et al., 2025)

Conclusion

Based on the results of this study, the total number of students of SD Negeri 40 Pekanbaru who have the habit of cutting their fingernails once a week is more than the total number of students who have the habit of cutting their fingernails once in two weeks. The species of STH that infects students with dirty, untreated long nails is the worm egg *Ascaris lumbricoides* (roundworm). Based on the results of *Spearman's correlation*, there was a significant relationship between *personal hygiene* and Total STH eggs in hand nail dirt. The better a person's *level of personal hygiene*, the fewer total STH eggs will be found.

THANKS

Thank you to the research team to the Principal of SD Negeri 40 Meranti Pandak, Rumbai Pesisir District, Pekanbaru City for all the assistance.

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