

The Relationship Between Personal Hygiene and Soil Transmitted Helminths in Students of State Elementary School Inpres 1 Apo, Jayapura City

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ABSTRACT

Soil Transmitted Helminths (STH) remains a health problem found in tropical countries, especially Indonesia, where humidity supports the development of worm parasites. This study aimed to determine the relationship between personal hygiene and worm infections among students of SD Negeri Inpres 1 Apo, Jayapura City. This analytical observational study used a cross-sectional design with a population of 167 and a sample of 97 respondents selected through proportionate stratified random sampling. Inclusion criteria were fifth and sixth grade students willing to participate and submit faecal samples; absent or sick students were excluded. Data were collected using questionnaires and faecal examinations through the direct method at the Jayapura Health Polytechnic Laboratory. Data were analysed using univariate and bivariate analysis with the chi-square test ($\alpha < 0.05$). Results showed that most respondents were 11 years old (45.4%), female (55.7%), class VI B students (24%), and 47.4% tested positive helminth infection. Bivariate analysis found no significant relationship between knowledge, handwashing, footwear use, nail hygiene, snack hygiene, or defecation habits and helminth infection ($p > 0.05$). Although no significant association was found, good personal hygiene remains essential to prevent STH. Education from schools and parents is crucial to improve children's hygiene practices.

Keywords: Elementary School; Personal Hygiene; Soil Transmitted Helminthes; Students

INTRODUCTION

Soil transmitted helminths (STH) is a health problem that continues to be encountered, especially in tropical countries like Indonesia. Indonesia, with its tropical climate and humidity, supports the growth and survival of parasitic worms (Sari et al., 2019). The cause of STH generally comes from nematode worms which require soil for the development of their infective form roundworms (*Ascaris lumbricoides*), hookworms (*Ancylostoma duodenale* and *Necator americanus*), threadworms (*Strongyloides stercoralis*), and whipworms (*Trichuris trichiura*) are the nematode species responsible for helminthiasis. Another common nematode is the pinworm (*Oxyuris vermicularis*) (Prabandari et al., 2020).

World Health Organization (WHO 2023) states that more than 1.5 billion people, or 24% of the world's population, are infected with STH worldwide. Infections are widespread in tropical and subtropical regions, with the highest prevalence occurring in sub-Saharan Africa, the Americas, China, East Asia, and Southeast Asia, including Indonesia. More than 270 million preschool-age children and over 700 million school-age children live in areas where these parasites are highly transmitted and require treatment and preventive interventions.

According to data from the Ministry of Health, the prevalence of STH in children aged 1-6 years or 7-12 years shows a fairly high figure, namely 30%-90%, and as many as 195 million Indonesians live in STH endemic areas. Approximately 13 million preschool children and 37

million elementary school children are infected with worms. Eighty percent of STH are found in areas with poor sanitation and hygiene, contaminated water, densely populated areas, and hot and humid weather. Data shows that >58,000,000 children are targeted for taking deworming medication in Indonesia. A worm prevalence survey was conducted in 124 districts/cities, resulting in 27 districts/cities with a worm prevalence of >10%, 17 districts/cities with a worm prevalence of 5-10%, and 80 districts/cities with a worm prevalence of <5% (Ministry of Health of the Republic of Indonesia, 2023).

STH infection rates in Indonesia vary widely, with several studies showing that in 2012, several districts reported worm infections at Sumatra Province 78%, Kalimantan 79%, Sulawesi 88%, West Nusa Tenggara 92% and West Java Province 90%. The prevalence is increasingly widespread among underprivileged populations and those with poor sanitation. This high prevalence is due to numerous factors influencing the worm's life cycle, including inadequate environmental sanitation, poor individual hygiene practices, and the socio-economic demographic conditions of the surrounding area (Hartati et al., 2021).

The effects of STH are not immediately apparent, as they are often considered trivial by the public. They can generally cause anemia, weakness, drowsiness, a lack of learning ability, decreased IQ, and decreased performance and productivity (Sunarti et al, 2022). STH is particularly likely to occur in elementary school-aged children (6-12 years old) because they engage in numerous activities that often involve direct contact with dirty environments, making them susceptible to diseases (Triasmari and Kusuma, 2019).

Personal hygiene in elementary school children, such behavior includes eating vegetables, regularly cutting or cleaning nails, not wearing shoes, open defecation, not washing hands with soap before and after eating, washing hands after defecating and after defecating, not consuming safe drinking water, and buying snacks in random places. Factors that influence poor personal hygiene are knowledge, attitudes, and the role of parents, which are important factors in children's behavior. Without sufficient knowledge, parents cannot carry out their role in maintaining children's healthy behavior optimally (Rohmah et al., 2022)(Pabalan et al. 2018)(Garrison et al. 2021).

Efforts to prevent worms can be done by wearing footwear when playing or walking, washing hands before eating and after defecating with running water and soap, using the toilet for defecation or urinating, keeping nails short and clean, and keeping food and drinks clean and free from flies (Triasmari and Kusuma, 2019). Based on research by Fattah et al., (2020) in Makassar, show a relationship between handwashing habits, nail hygiene, snacking habits, and defecation habits where 30% of children had poor handwashing habits, 36.4% poor nail hygiene, 18.2% unclean snacking habits, and 27.3% poor defecation habits. The research results of another study found that 50% of children were infected with worms at Abe Pantai Elementary School in Jayapura City, with the most infections caused by *Ascaris lumbricoides* (48.5%) and *Trichuris trichiura* (28.6%). Most respondents were female (80%) and aged 9-11 years (60%). There is no relationship between knowledge and the incidence of STH ($p=0.408$), and there is a relationship between behavior and the incidence of STH ($p=0.030$) (Nurmia, 2019).

In 2011, data from the Papua Provincial Health Office recorded 528.8 cases of STH per 1,000 residents, and 2.48 cases per 1,000 residents were reported in Jayapura City (Hartati et al., 2021) Data on STH at the North Jayapura Community Health Center from 2018-2021 showed that 105 children aged 5-14 years experienced infestation (North Jayapura Community Health Center, 2022). SD Negeri Inpres 1 APO is an elementary school located in

Bhayangkara Village and is included in the working area of the North Jayapura Health Center. The results of observations and initial interviews conducted by researchers on July 20, 2023 at SD Negeri Inpres 1 APO, Jayapura City, found that the school environment is in the middle of a densely populated residential area, school sanitation is still lacking because the school bathroom floor is still flooded, during the rainy season gutter is often flooded and causes an unpleasant odor, and the trash can is full and uncovered so that the presence of fly vectors is visible. Then, there are still students who play in dirty places without wearing footwear, the behavior of students who buy snacks outside the school (random places) and snacks in an open state, and the results of interviews there are still those who do not wash their hands before eating.

This study is novel in examining the link between personal hygiene and STH infection among elementary school students in Jayapura, Papua a region with high humidity yet limited local evidence on hygiene related parasitic infection risks. Based on the description above, the researcher is interested in conducting research with the title "The Relationship between Personal Hygiene and Soil Transmitted Helminthes in Students of State Elementary School Inpres 1 Apo, Jayapura City".

METHOD

Research Design and Population

This type of research uses analytical observational with a cross-sectional approach. The population in this study were 167 fifth and sixth grade students of SD Negeri Inpres 1 Apo, Jayapura City, with a sample size of 97 respondents taken using the slovin formula. Inclusion criteria were fifth and sixth grade students, willing to participate and submit fecal samples; absent or sick students were excluded.

Sampling Technique

The sampling technique is carried out in a proportionate stratified random sampling. The sample was calculated based on the proportion of each grade, where fifth and sixth grade students each had three classes with different numbers of students. The dependent variable in this study was worm infestation, while the independent variables were knowledge, handwashing habits, footwear habits, nail hygiene, snack hygiene, and bowel habits. Data were obtained through a questionnaire and fecal examination using the direct method at the Jayapura Health Polytechnic Laboratory.

Data Analysis

Data were analyzed univariately and bivariately using the chi-square test ($\alpha < 0.05$). Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Public Health, Cenderawasih University No.081/KEPK-FKM UC/2023.

RESULTS AND DISCUSSION

This study found diverse sample characteristics at SD Negeri 1 Apo. The analysis first outlines the students' ages, genders, and class levels, then examines the prevalence of helminth infection and personal hygiene factors, including knowledge, handwashing practices, footwear use, nail care, snack hygiene, and bathroom habits. A chi-square test was employed to assess associations between these factors and STH infection. The results elucidate the influence of personal hygiene on helminth transmission and identify discrepancies between students' knowledge and practices that may contribute to infection rates narratives to aid interpretation.

Table 1. Frequency Distribution of Research Respondent Characteristics

Variables	Frequency	Persentation (%)
Age		
9 years	1	1.0
10 years	19	19.6
11 years old	44	45.4
12 years old	29	29.9
13 years old	4	4.1
Gender		
Woman	54	55.7
Man	43	44.3
Class		
VA	13	13.4
VB	12	12.4
VC	16	16.5
VI A	18	18.6
VI B	24	24.7
VI C	14	14.4

Based on table 1 it shows that of the 97 respondents in the research sample, the highest age percentage was in the 11 year age category, with 44 respondents (45.4%), female gender with 54 respondents (55.7%), and based on class, namely class VI B with 24 respondents (24.7%).

Table 2. Frequency Distribution of Respondents Based on Research Variables

Variables	Frequency	Persentation (%)
Helminth infection		
Positive	46	47.4
Negative	51	52.6
Knowledge		
Low	11	11.3
High	86	88.7
Handwashing practices		
Bad	35	36.1
Good	62	63.9
The habit of wearing footwear		
Bad	40	41.2
Good	57	63.9
Nail hygiene		
Bad	76	78.4
Good	21	21.6
Snacks hygiene		
Bad	81	83.5
Good	16	16.5
Defecation habits		
Bad	6	6.2
Good	91	93.8

Table 2 shows that of the 97 respondents in the research sample, 46 respondents (47.4%) were positive for STH, which means that many elementary school children still suffer

from STH. Although many of the respondents suffered from STH, the results also show that 86 respondents (88.7%) have high knowledge, 62 respondents (63.9%) have good hand washing habits, 57 respondents (58.8%) have good footwear habits, and 91 respondents (93.8%) have good hygiene. The high number of infected respondents could also be caused by poor nail habits in 76 respondents (78.4%) and poor snacking habits in 81 respondents (83.5%).

Table 3. Chi-Square Test Results between Research Variables and Soil Transmitted Helminthes in Students State Elementary School Inpres 1 Apo, Jayapura City

Variables	Category	Helminth Infection				Total	%	p-value
		Positive	%	Negative	%			
Knowledge	Low	7	63.6	4	36.4	11	100	0.410
	High	39	45.3	47	54.7	86	100	
Handwashing Practices	Bad	17	48.6	18	51.4	35	100	1,000
	Good	29	46.8	33	53.2	62	100	
The Habit of Wearing Footwear	Bad	18	45	22	55	40	100	0.846
	Good	28	49.1	29	50.9	40	100	
Nail Hygiene	Bad	37	48.7	39	51.3	76	100	0.821
	Good	9	42.9	12	47.1	21	100	
Snacks Hygiene	Bad	37	45.7	44	54.3	81	100	0.617
	Good	9	56.3	7	43.8	16	100	
Defecation Habits	Bad	4	66.7	2	33.3	6	100	0.418

Table 3 presents the distribution of helminth infection among elementary school students based on six behavioral and hygiene related variables. Of the 97 respondents, 39 respondents (45.3%) with a high level of knowledge tested positive for helminth infection, while 47 respondents (57.7%) tested negative. For the variable of handwashing practices categorized as good, 29 respondents (46.8%) were positive and 33 (53.2%) were negative. Regarding footwear habits, students with good practices showed 28 respondents (49.1%) positive and 29 (50.9%) tested negative. For nail hygiene in the poor category, 37 respondents (48.7%) were positive and 39 (51.3%) were negative. For snacks hygiene in the poor category, 37 respondents (45.7%) were positive and 44 respondents (54.3%) were negative. In terms of defecation habits categorized as good, 42 respondents (46.2%) were for helminth infection and 49 respondents (53.8%) were negative. The results of the chi-square statistical test showed that none of the six variables had a significant relationship with helminth infection

A person's knowledge influences their worm status and plays a crucial role in STH prevention (Pujiana et al., 2022). The results of this study indicate that although most students have good level of knowledge regarding STH infections (definition, types, causes, prevention, and effects) the prevalence of infection in this group remains high. Knowledge alone is not sufficient to avoid STH infections, there is gap between knowledge and practices/environments that allow transmission to continue. The results also found that poor nail hygiene and inadequate food hygiene, conditions that the literature indicates are direct factors in the transmission of STH eggs through the oral route or nail-mouth contact. This study is in line with research (Afandi et al., 2025) findings indicate that transmission occurred primarily via the fecal-oral route. These results highlight that improving handwashing and nail hygiene behaviors can substantially reduce infection risk. Other studies also show the odds of infection with any STH increased as the frequency of trimming decreased. The odds of nail

contamination with any STH and *A. lumbricoides* were higher for younger children (Tadege et al., 2022). Increased knowledge is not always followed by a reduction in infections, it must be accompanied by improvements in hygienic practices (nails, footwear, cleanliness of food stalls) and also environmental conditions (WASH facilities, school cleanliness).

Handwashing is the act of cleaning your hands and fingers using running water and soap. Not washing your hands before preparing food, before and after eating, after defecating and urinating, after playing, or after handling garbage can increase the risk of STH through worm eggs that can stick to your hands and the food you consume (Nugraha, Semiarty, and Irawati 2019). Based on field observations, it was shown that the majority of students at SD Negeri Inpres 1 Apo who had STH had good handwashing habits. Good handwashing habits are essential for preventing and breaking the chain of transmission of infectious diseases such as worms. STH can be influenced by various factors, one of which is handwashing habits. This study found no significant relationship between hand washing and STH, which is consistent with the results of previous studies Mukti, Sari, and Susiawan (2022) which obtained a p-value of 1,000, meaning that there was no relationship between hand washing and the incidence of STH and it was found that from 32 samples examined, only 1 respondent was positive for STH.

This is not in accordance with the explanation of L. Green's theory which states that factors related to handwashing behavior include predisposing factors such as knowledge, attitudes, values, beliefs, perceptions, age, gender and economic status that can trigger individuals to carry out an action, enabling factors such as the availability of information, the availability of facilities, and abilities, and reinforcing factors in the form of the function of parents, health workers, teachers, friends, and handwashing programs with soap. Human behavior is based on three aspects, namely cognitive, affective, and psychomotor activities that are interconnected (Sintyadewi, Rismawan, and Wulansari 2023). Differences in research results can occur due to various factors, mainly due to diverse sample characteristics.

Footwear or shoes are tools used to protect the feet, especially the soles of the feet. Footwear protects the feet from injury from environmental conditions such as rocky ground, water, hot or cold air. Using footwear is an effort to maintain personal hygiene. When children do not have the habit of using footwear when on the ground, both when playing and resting in the school yard or in the yard of a house that is contaminated with worm eggs or larvae, the worm eggs or larvae will penetrate the skin (Suraini et al., 2018). Field observations show that most students at SD Negeri Inpres 1 Apo who have STH have good footwear habits. Wearing good footwear while still being infected with worms can be influenced by other factors, such as consuming unclean and unhealthy food, improper handwashing, and a weakened immune system. These findings align with previous research Farida et al., (2019) which got the same results, where there was no significant relationship between the habit of wearing footwear and the incidence of STH, with a p-value of 0.433 and obtained from 30 samples that were positive for STH were 5 respondents, where respondents with the habit of not wearing footwear who were positive for STH were 1 person and respondents with the habit of wearing footwear who were positive for STH were 4 people.

This is in accordance with research Pradinata, Sudarmaja, and Ariwati (2019) This explains that the skin is a portal of entry for disease-causing germs into the body. If someone walks barefoot and neglects foot hygiene, they become a portal for disease-causing germs, including worm larvae and eggs, to enter the body. Loose soil is ideal for the growth of worm larvae, particularly *Ascaris lumbricoides* and *Trichuris trichiura*. Nails are membranes or hard parts that grow on the tips of human fingers. One common way to maintain nail hygiene is by

trimming them. Nails should be trimmed short at least once a week to prevent the transmission of worms from the nails to the mouth. Nail biting and putting fingers in the mouth should be avoided as they facilitate the spread STH (Suraini et al. 2018). Field observations show that students with poor nail hygiene are more likely to have STH than those with good nail hygiene. This can occur because students do not maintain nail hygiene, such as the habit of having long, dirty nails, biting nails without paying attention to hand hygiene, and rarely trimming nails once a week. Maintaining good nail hygiene is very important for children to maintain personal hygiene, because various germs can enter the body through nails.

This research is in line with Putri (2020) The p-value of 0.469 indicates no significant relationship between nail hygiene and STH. Of the 30 students, 6 (20%) were infected with STH. Maintaining nail hygiene is an important aspect of maintaining self-care because germs can enter the body through nails. Nail trimming can be done once a week or when they look long. Long nails have the potential to cause a number of health problems because they are the perfect place for germs and dirt to live. One risk of not maintaining nail health is STH. Long and dirty nails will become a place for dirt and worm larvae eggs to settle, so when eating, eggs or larvae will be swallowed with food (Maulina et al., 2023).

School children's low awareness of snack choices negatively impacts their health. Unhygienic snacks can lead to contamination by microorganisms, including worm eggs. Worm eggs in soil or dust can reach food when carried by the wind. Furthermore, worm eggs can be transmitted through flies that have landed on soil or feces, carrying the eggs on their legs and contaminating uncovered food (Maulina et al. 2023). Based on the observation results, students of SD Negeri Inpres 1 Apo prefer to consume snacks purchased from outside and also within the school environment rather than bringing provisions. The behavior of students who buy snacks in random places is less concerned about the cleanliness, safety and nutritional content of the snacks purchased, where the snacks are sold in open conditions (without covers), so that in this study students with poor snack hygiene are more positive for worms than students with good snack hygiene. Consumption of unhealthy snack foods can result in decreased nutritional status and increased morbidity in school children.

This research is in line with Wulandari, Saleh, and Silviana (2015) obtained a p-value of 0.068 which means there is no significant relationship between snacking habits and the incidence of worms where 54.5% of respondents were positive for STH, the need for parental attention to not let children buy snacks in random places, this needs to be avoided because it is feared that the food and drinks consumed by children are not clean and the equipment used is also not sterile. According to Sari & Hayati, (2020) Indiscriminate snacking can increase the risk of various health problems, especially if there is no supervision from parents or teachers. Uncovered and dirty snacks can contain worm eggs, which can be a source of STH in children. Unhealthy snacking significantly contributes to STH in children, with 40-60% of cases occurring.

Poor defecation habits and indiscriminate defecation can be risk factors for STH. Theoretically, worm eggs require soil for development. The presence of worm eggs in the stool of people who defecate in the open increases the risk of worm larvae being transmitted to the surrounding community (Lidia, Ridha, and Trisnawati 2014). The results of field observations show that students' habits of defecating in toilets have been carried out well at school and at home, this indicates a high awareness of students to defecate in toilets at school and at home. In this study, although all respondents have defecated in toilets, students' behavior does not maintain good personal hygiene such as not washing their hands with water and soap properly

after defecating and only washing their hands with water only. Education needs to be provided to respondents periodically to improve health behaviors regarding worm diseases.

A parallel study was conducted by Welan (2019) a p-value of 1,000 was obtained, and from the examination of 64 samples infected with STH of the *Ascaris lumbricoides* type, as many as 1 respondent (2%), it can be concluded that there is no significant relationship between defecation habits and STH. The role of feces in the spread of disease is very large. Feces can directly contaminate food, drinks, vegetables, water, soil, insects, and body parts so that they can be contaminated by feces. Diseases spread by human feces include typhus, dysentery, cholera, various types of worms (roundworms, pinworms, hookworms), schistosomiasis, and so on. Defecation and urination should always be done in a toilet, not in rivers or random places because it can cause various diseases (Dyinnia & Rangkuti, 2022)

CONCLUSION

Although the variables in this study are not related, it is hoped that students can maintain personal hygiene by diligently washing their hands properly before and after activities, wearing footwear during activities, diligently cutting their nails once a week, consuming clean and healthy food or snacks, and taking deworming medication once every six months. Schools are expected to provide hygiene facilities such as trash bins available in every corner of the school, clean and suitable toilets for use, and special sinks or water taps for washing hands and enough soap so that students can wash their hands before and after carrying out activities.

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