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THE RELATIONSHIP BETWEEN HAND WASHING HABITS AND SOIL-TRANSMITTED HELMINTH INFECTIONS IN STUDENTS AT PUBLIC ELEMENTARY SCHOOL 106856 TANJUNG BERINGIN

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ABSTRAK

Kecacingan merupakan penyakit infeksi yang disebabkan parasite berupa cacing yang pada manusia disebabkan oleh *Soil Transmitted Helminth (STH).* Rendahnya Tingkat higienis pribadi dan sanitasi dapat menjadi faktor utama penyebab kecacingan. Mencuci tangan dengan sabun dengan Teknik yang benar merupakan Upaya terbaik untuk mencegah kecacingan. Penelitian dilakukan untuk mengetahui hubungan kebiasaan cuci tangan dengan penularan STH pada siswa. Jenis penelitian ini adalah observasional analitik dengan desain cross sectional. Pemeriksaan telur STH akan dilakukan di laboratorium Parasitologi FK UMSU dengan cara pemeriksaan Kato-Katz. Subjek penelitian adalah semua siswa kelas I-VI SDN 106856 Tanjung Beringin Serdang Bedagai Sumatera Utara. Analisis data menggunakan uji chi square. Angka kejadian infeksi STH pada siswa SD Negeri 106856 sebesar 29,4%. Hasil uji chi-square antara kebiasaan cuci tangan dengan infeksi STH diperoleh p-Value <0,05 (0,000<0,05), sehingga disimpulkan terdapat hubungan kebiasaan cuci tangan dengan penularan STH pada siswa kelas I-VI SDN 106856 Tanjung Beringin Serdang Bedagai Sumatera Utara tahun 2022.

ABSTRACT

The Relationship between Hand Washing Habits and Soil-Transmitted Helminth Infections in Students at Public Elementary School 106856 Tanjung Beringin. *Helminthiasis*, an infectious disease caused by soil-transmitted helminths, can be attributed to poor hygiene and sanitation. Effective prevention entails handwashing with soap and proper technique. A study was conducted to investigate the handwashing behaviors of students and their susceptibility to soil-transmitted helminth (STH) transmission. Utilizing a cross-sectional approach, researchers employed analysis and observation methods. STH egg examination was performed using the Kato-Katz technique at the FK UMSU Parasitology lab. The study population comprised pupils from class I-VI at SDN 106856 Tanjung Beringin Serdang Bedagai, North Sumatra. Data analysis was conducted using the chi-square test, revealing a 29.4% STH infection rate among the sampled students. The chi-square test for handwashing behaviors and STH infection yielded a statistically significant p-value (<0.05; p=0.000), indicating a significant relationship between handwashing practices and STH transmission among class I-VI students at SDN 106856 Tanjung Beringin Serdang Bedagai, North Sumatra.

INTRODUCTION

One of the infectious diseases caused by parasitic worms is worm disease. *Soil Transmitted Helminth* (STH) infection is the cause of worm disease in humans. The STH group of worm species commonly found can cause human infections, namely hookworms (*Necator americanus* and *Ancylostoma duodenal*), whipworms (*Trichuris trichiura*), and roundworms (*Ascaris lumbricoides*).[1]

Tropical and subtropical areas are regions with a very high prevalence of soil-transmitted helminths (STH), where hygiene and sanitation practices are still poor. The World Health Organization (WHO) has stated that more than 1.5 billion people worldwide are infected with STH. Most STH infections are reported in East Asia, China, and sub-Saharan Africa. As many as 568 million school-age children and more than 267 million preschool-age children in areas at risk of contracting STH infections require treatment and prevention.[2]

A study indicates that the highest number of STH infections occurs in Asia, particularly in Southeast Asia, which has the highest prevalence of STH infections. The tropical and humid climate prevalent in most Southeast Asian countries provides an ideal environment for the survival of STH eggs or larvae.[3] One of the health problems in Indonesian society is worm infections caused by STH. In Indonesia, the prevalence of worm infections is based on data from the Republic of Indonesia Minister of Health No. 15 of 2017, ranging from 2.5% to 62%, especially in the underprivileged population category where sanitation is poor.[4]

The Geographical Information System (GIS) states that the spread of STH infections in Indonesia occurs in all regions, with the highest incidence rates in Papua and North Sumatra, where the prevalence ranges from 50% to 80%.[5] However, several other survey results regarding the prevalence of STH infections in Indonesia show that the incidence of A. lumbricoides is higher than 70%, particularly in West Nusa Tenggara (92%), Kalimantan (79%), and Sumatra (78%). The prevalence of T. trichiura is also high in the areas of West Nusa Tenggara, Kalimantan, and Sumatra, at 83%.[3] The results of a survey of elementary school children in several North Sumatra districts in 2005 showed that STH infections were highest in Central Tapanuli (66.7%), Nias (52.17%), Deli Serdang (39.56%), and Padang Sidempuan (34.23%). In 2014, the North Sumatra Health Office stated that the prevalence of worms in North Sumatra districts reached 29%. In 2016, based on a survey conducted by the North Sumatra Health Office among early childhood in 10 North Sumatra regencies/cities, the prevalence of worms decreased to 22.5%.[6]

Reports from the North Sumatra Level 1 Health Service Data in 2009 show that the results of a survey on worms in elementary school children in 14 districts/cities of Serdang Bedagai reached 50%.[7] Worm infections are a type of infection that receives little attention and rarely cause clear clinical symptoms. The effects of this disease are usually only visible in the long term, such as cognitive impairment in children, malnutrition, and growth disorders. Many factors can cause worm disease, such as individual behavior, education, sanitation, hygiene, environmental health management, nutritional status, and socio-economic factors.[8]

The sanitation factor that plays a major role in worm infections is the low level of personal sanitation, such as clean nails and the habit of washing hands after defecating or before eating.[8] UNICEF data from 2014 reported that 75.5% of Indonesian people do not practice the habit of washing their hands because they believe their hands are clean. Meanwhile, WHO stated that hands are the main way for germs to enter the body. The habit of washing hands with soap can minimize and prevent diseases. Diseases that can be prevented through the habit of washing hands include worm infections, ARI, and diarrhea.[9]

Washing hands is a sanitary action that involves cleaning hands and fingers using water and soap to make them clean and kill germs. This is done because hands are often a breeding ground for germs that can be transferred to other people.[24] According to Perry & Potter, washing hands is the best and most basic way to control and prevent infection. Meanwhile, Tietjen states that washing hands is a process of removing dust and dirt from the skin of both hands. In society, hand washing activities generally focus more on daily activities such as touching rubbish, handling money, touching animals, caring for wounds, caring for sick people, cleaning or coughing, changing diapers, using the toilet, and before eating, holding a baby, or preparing food.[25] Washing your hands with the correct technique is the best step to prevent worm diseases. According to Iramawati (2014) in a journal entitled "The Relationship between Personal Hygiene (Washing Hands Using Soap) and the Incidence of Worm Disease in Class I-VI Children at MI Nahdlatul Wathan Bimbi, Rensing Raya Village, West Sakra District," washing hands with soap is an important step in disease prevention. This is because clean hands can minimize bacteria or worm parasites on the hands.[10]

In Putra's analysis at Pesisir Elementary School in Tadui Village, Mamuju District with a sample of 33 children, it was found from the results of his research that there was a relationship between handwashing habits and worm infections in children. The result is that there is a relationship between handwashing habits and worm infections in children. In line with Kartini's (2016) analysis at Rumbai Pesisir Pekanbaru District Elementary School with a sample of 240 students. This analysis aims to understand the proportions and factors related to the incidence of STH. The results of the research show that there is a relationship between handwashing habits and the incidence of worm infections.[11] In the initial survey conducted by researchers at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai Regency, North Sumatra, it was found that the students' habits were no different from those of other elementary schools. They liked to play in the dirt, did not use footwear when playing, and also consumed food without washing their hands first. These habits can cause worm eggs to enter the nails and be swallowed while eating, leading to worm infections. The condition of the school environment, densely populated residential areas close to the coast, as well as inadequate deworming programs, are also factors that can contribute to the high prevalence of worm infections in the area.

Referring to the description above, this research aims to determine whether there is a relationship between handwashing habits and STH infections in students at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai, North Sumatra in 2022.

METHOD

This type of research is analytical and observational. The research design used was a cross-sectional study. A cross-sectional design is a research design in which measurements and observations are carried out simultaneously at one time. The research will be conducted at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai Regency, North Sumatra. Examination of STH eggs will be carried out in the Parasitology Laboratory, Faculty of Medicine, Muhammadiyah University, North Sumatra.

The population in this study consisted of students at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai Regency, North Sumatra, from grades I-VI, totaling 227 students. Based on the formula for samp;ing, the minimum sample size required for this study is 43 students. Sampling utilized the total sampling method, where the sample included all students in grades I-VI who met the inclusion criteria, with no exclusion criteria identified.

Inclusion criteria comprised students who had parental permission and whose parents were willing to complete an informed consent form, as well as students who provided fecal samples and were willing to complete a questionnaire. Exclusion criteria encompassed students who had taken deworming medication within the past month.

Based on this formula, the minimum sample size required for this study is 43 students. Sampling utilized the total sampling method, where the sample included all students in grades I-VI who met the inclusion criteria, and no exclusion criteria were identified. Inclusion criteria consisted of students who had parental permission and whose parents were willing to complete an informed consent form, as well as students who provided a stool sample and were willing to complete a questionnaire. The exclusion criteria included students who had taken deworming medication within the past month.

How to Store and Preserve Feces

A 10% formalin solution is made by mixing 27 ml of 37% formaldehyde mixed with 73 ml of distilled water. The feces are put in plastic pots and enough of the solution is added until it is submerged and then closed tightly.[21]

Kato-Katz technique

How to make Kato solution [21]: Weigh 3 grams of malachite green, put it in a beaker glass, and add 100 cc of distilled water little by little then stir until homogeneous, then you get a 3% malachite green solution. Put 100 cc of distilled water into a plastic container, then add 100 cc of glycerin little by little and add 1 cc of 3% malachite green solution, then stir until homogeneous. Then you will get Kato Solution 201 cc. Qualitative Examination Method (modification of the Kato-Katz technique):[22] Take 50 mg of feces to be examined with a stick and place it on the surface of a glass object. Close it using cellophane tape. Press the cellophane tape with another glass object or rubber bottle cap so that the stool becomes flat and spreads under the cellophane tape. Place the preparation upside down on filter paper, dry the excess solution using filter paper, and leave the preparation for approximately 20-30 minutes. Examine the preparation under a microscope with 10x10 magnification.

The data that has been collected will be processed using a computer program, namely Statistics Product and Service Solution (SPSS). The data was analyzed descriptively, and then the results were presented in the form of a frequency distribution table.

To determine the relationship between handwashing habits and STH infection, use the chi-square test. The result of this chi-square test is to determine the significance level value (p-value), which provides the results if the p-value <0.05 means there is a relationship between hand washing habits and STH infection at State Elementary School 106856 Tanjung Beringin. This research was conducted after obtaining approval from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Muhammadiyah University of North Sumatra with the number 930/KEPK/FKUMSU/2022.

RESULT

The research was carried out in December 2022 on 126 students at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai, North Sumatra. The distribution of respondents can be seen in Table 1.

Table 1. Distribution of Respondents Based on Age, Gender, Class, Infection Status, Type of Infection, and Hand Washing Habits

Variables	Quantity	Percentage
Age		
6 – 10 years	99	78.6
>10 years	27	21.4
Sex		
Female	66	52.4
Male	60	47.6
Class		
I - III	53	42.1
IV - VI	73	57.9
Infection Status		
Positive	37	29.4
Negative	89	70.6
Type of Infection		
Ascaris lumbricoides	8	21.6
Trichuris trichiura	16	43.2
Hookworm	0	0
Ascaris lumbricoides + Trichuris trichiura	11	29.8
Ascaris lumbricoides + Hookworm	2	5.4
Hand Washing Habit		
Bad	53	42.1
Good	73	57.9

The majority of respondents in this study were aged 6-10 years, with 99 people (78.6%), and the least aged over 10 years, with 27 people (21.4%). Female respondents in this study were 66 people (52.4%), while there were 60 male respondents (47.6%). The number of respondents in classes I-III was 53 people (42.1%), and in classes IV-VI was 73 people (57.9%).

From the results of laboratory examinations regarding STH infections in students at State Elementary School 106856 Tanjung Beringin, it was found that 37 people (29.4%) were positively infected with STH. The type of worm that most frequently infects the students at State Elementary School 106856 Tanjung Beringin is T. trichiura, with 16 people (43.2%) infected. Meanwhile, A. lumbricoides infected 8 people (21.6%). From the results of the examination, it was also known that several students were infected with more than one type of STH, such as 11 people infected with A. lumbricoides and T. trichiura (29.8%), and 2 people infected with A. lumbricoides and hookworm (5.4%).

From the research results, it is also known that more students at State Elementary School 106856 Tanjung Beringin have good handwashing habits, namely 73 people (57.9%), while 53 people (42.1%) have bad handwashing habits.

The research results show that the number of respondents who tested positive for STH infection was higher among students aged 6-10 years, with 30 people (81.1%), and a p-value > 0.05 (0.000 < 0.838). In terms of gender, more women were infected with STH, with 21 people (56.8%) compared to men, with 16 people (43.2%), and a p-value > 0.05 (0.000 < 0.661). The number of infected students in classes I-III was 19 people (51.4%), while in classes IV-VI it was 18 people (48.6%), with a p-value > 0.05 (0.000 < 0.245). Therefore, it can be concluded that although there are differences in age, gender, and class with infection status, statistically, the differences are not significant (Table 2).

Table 2. Distribution of Infection Status Based on Age, Gender, and Class

Variables	Infection Status				P value
	Positive		Negative		
	n	%	n	%	
Age					
6 – 10 years	30	81.1	69	77.5	0.838
>10 years	7	18.9	20	22.5	
Sex					
Female	21	56.8	45	50.6	0.661
Male	16	43.2	44	49.4	
Class					
I – III	19	51.4	34	38.2	0.245
IV – VI	18	48.6	55	61.8	

The research results show that students aged 6-10 years exhibit poorer hand-washing habits compared to students aged >10 years (20.8%) with a p-value > 0.05 (0.000 < 1.000). In terms of gender, there are more male students with poor hand washing habits, totaling 30 individuals (56.6%), compared to 23 female students (43.4%) with poor hand washing habits, also with a p-value > 0.05 (0.000 < 0.124). The research findings indicate that students in grades IV-VI have poorer hand-washing habits than students in grades I-III. Therefore, it can be concluded that despite differences in age, gender, and grade levels, the statistical significance of these differences in hand-washing habits is not significant (Table 3).

Table 3. Distribution of Hand Washing Habits Based on Age, Gender, and Class

Table 3. Distribution of Hand Washing Habits Based on Age, Gender, and ClassVariables	Hand Washing Habit				P value
	Bad		Good		
	n	%	n	%	
Age					
6 – 10 years	42	79.2	57	78.1	1.000
>10 years	11	20.8	16	21.9	
Sex					
Female	23	43.4	43	58.9	0.124
Male	30	56.6	30	41.1	
Class					
I – III	23	43.4	30	41.1	0.940
IV – VI	30	56.6	43	58.9	

STH infections can occur as a result of poor handwashing habits with a percentage of 60.4%, while those who are not infected with STH from bad handwashing habits are 39.6% (Table 4). Then, STH infections can occur with good handwashing habits at 6.8%, while those not infected with STH with good handwashing habits have a percentage of 93.2%. From this table, it is also known that the results of the chi-square test for cross-sectional observational studies show that there is a relationship between handwashing habits and STH infection, as seen from the P-value < 0.05 (0.000 < 0.05). The results of the prevalence ratio (PR) calculation, show that the proportion of STH incidents is 8.815 times greater in children with poor handwashing habits compared to those with good handwashing habits (95% CI 3.680-21.117).

Table 4. Relationship between hand washing habits and STH infection

Hand Washing Habit	Infection Status				Total		PR 95% CI	P Value
	Positive		Negative					
	n	%	n	%	n	%		
Bad	32	60,4	21	39,6	53	100	**8,815 (3,680-21,117)**	**0,000**
Good	5	6,8	68	93,2	73	100		

DISCUSSION

This research aligns with the findings of a study by Indri et al. (2021) on students at State Elementary School 129 Pulokerto Palembang, which reported a prevalence rate of 29.2%.[12] In Harnan et al.'s (2020) research, elementary and Madrasah Ibtidaiah students from five sub-districts in Gandus Palembang District obtained a score of 23.56%.[13]

The high incidence of worm infections in children is closely related to environmental factors, personal hygiene habits, and children's playing habits. The more often children play and interact directly with the ground without wearing footwear, and do not wash their hands thoroughly with soap after playing and before eating, the greater the chance that parasites will easily enter the body.[12]

The types of worms that infected the most were *T. trichiura*, with as many as 16 people (43.2%), A. lumbricoides with as many as 8 people (21.6%), A. lumbricoides and *T. trichiura* with as many as 11 people (29.8%), and infected with A. lumbricoides and hookworm as many as 2 people (5.4%). This finding is in line with research that *T. trichiura* infects most people (65.4%), followed by A. lumbricoides worm infections (23.1%).[3] In research conducted by Dewi et al. (2017), most infections were also caused by *T. trichiura* (55.6%), hookworm (22.2%), and *A. lumbricoides* (11.1%).[8]

The results of this study indicate that *T. trichiura* worm infections are more common than A. lumbricoides and hookworms. Several factors that influence this incidence are that Indonesia's tropical climate greatly influences the development of *A. lumbricoides* and T. *trichiura* worm eggs to become infective stages. If the humidity level is low, the eggs will not develop properly, and the larvae will die more quickly. Another factor that is thought to influence is that the breeding ground for *A. lumbricoides* and *T. trichiura* worms requires warm, wet, and shady soil. Meanwhile, hookworms require sandy, loose soil, mixed with

humus or mud, covered with leaves, and protected from excessively dry or wet conditions. Apart from that, the development of hookworm eggs to hatch into rhabditiform larvae is quite fast within 24 to 48 hours, whereas infective eggs of *A. lumbricoides* and *T. trichiura* can survive for several years.[14]

Based on the research results in Table 2, it can be seen that more students infected with STH are aged 6-10 years. This finding is in line with research that conducted more children aged 6-10 years were infected with STH than children aged over 10 years. This is because children aged 6-10 years like to play in the yard, both in the school environment and in the neighborhood where they live. Thus, this shows that infections will decrease as the student gets older, because as the child's age increases, the child will change their playing patterns, and activity patterns, and have a higher level of cleanliness or body immunity.[3]

Based on the research results, it can be seen that more female children are infected with STH than male children. This finding is in line with research conducted by Tapiheru which found that women (31.8%) were more likely to be infected with STH than men (27.9%). However, this is not in line with the results of research conducted on elementary school students in North Bolaang Mongondow Regency, which showed more infections in males (72.75%) than females (27.25%).[3]

The chance of worm infection is more common in boys because they play more outside the home. However, boys and girls have similar playing habits, although with different types of games. Boys usually play ball, and marbles, and make toys from the ground, while girls typically play jump rope and make toy cakes from the ground. This indicates that there is no dominant gender that is easily infected with STH because each gender has factors that influence it.[3]

Based on the research results in Table 3, more students have good handwashing habits, namely 73 people (57.9%), while 53 people (42.1%) have bad handwashing habits. This is consistent with the research conducted by Dewi which found that more children have good handwashing habits (76.2%) than children who have bad handwashing habits (23.8%).[8] However, it is not in line with research conducted by Triwahyuni et al. (2020), which showed that in their study, more students had poor handwashing habits (58.7%) than students who had good handwashing habits (41.3%).[15]

Based on the research results, boys have worse handwashing habits than girls. This finding is in line with research conducted by Al-Khatib (2015), which reported that as many as 89.6% of girls have the habit of washing their hands before eating, while only 80.4% of boys have the habit of washing their hands before eating.[16]

Poor hand-washing habits can occur due to a lack of information about the importance of washing hands before eating, after playing, and after defecating. The habit of washing hands, which is rarely carried out by students is one of the factors causing the occurrence of worms. Therefore, it is necessary to provide continuous education to school-age children so that they get used to washing their hands to prevent disease transmission. Additionally, facilities need to be provided for students to wash their hands.[15]

Based on the research results in Table 4, it is evident that the chi-square test for cross-sectional observational studies indicates a relationship between handwashing habits and STH infection, as evidenced by the p-value <0.05 (0.000 < 0.05). STH infections were more prevalent in students with poor handwashing habits (60.4%) compared to those with good handwashing habits (6.8%). This finding is consistent with the study conducted by Dewi et al. (2017), which reported a higher incidence of worm infections in children with poor handwashing practices (28%) compared to those with good handwashing practices (1.25%).[8]

The results of research conducted by Tifannov also stated that there was a significant relationship between the habit of washing hands and worm infections, with a p-value of 0.018. According to the study, infections occur more often in students with poor hand-washing habits (5.4%) than in students with good hand-washing habits (2.1%).[17]

Transmission of worms in school-aged children often occurs orally, namely through worm eggs that enter and infective larvae that stick to the fingers and are then swallowed when the child sucks their fingers, especially if they have long and dirty nails where worm eggs are deposited. Children need to wash their hands with soap before eating.[18] Washing hands is often considered a trivial matter in society, even though handwashing can contribute to improving people's health status. Based on existing phenomena, it can be seen that school-age children have a habit of paying less attention to the need to wash their hands in daily life, especially when in the school environment. They usually immediately eat the food they buy around the school without washing their hands first, even though beforehand they were playing around. This behavior certainly has an influence and can contribute to the occurrence of intestinal infections. Washing hands is the most important basic technique in preventing and controlling the transmission of infections, and consistently washing hands can reduce intestinal infections.[19]

Prevention of the spread of *A. lumbricoides* and *T. trichiura* infections involves teaching children how to wash their hands properly with soap and warm water before eating and getting them into the habit of washing their hands after playing on the ground and after defecating. Prevention of hookworm infection can be achieved by ensuring that fecal dumps or latrines meet health criteria, and by using footwear to prevent larvae from entering through the skin.[14]

CONCLUSION

The incidence of STH infection among students in grades I-VI at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai, North Sumatra in 2022 is 29.4%. The types of STH infections among these students include T. trichiura (43.2%), A. lumbricoides (21.6%), *A. lumbricoides* and *T. trichiura* (29.8%), and A. lumbricoides and hookworm (5.4%). The handwashing habits of students at this school in 2022 are categorized as good at 57.9% and bad at 42.1%. There is a relationship between handwashing habits and STH infections among students in grades I-VI at State Elementary School 106856 Tanjung Beringin, Serdang Bedagai, North Sumatra in 2022.

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