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Incidence rate of Soil Tranmitted Helminths Among Elementary School Students living in Coastal Areal of North Sulawesi

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The impact of helminthiasis if it occurs in children can result in a decrease in the health, nutrition, intelligence and productivity; It is also closely related to healthy living behavior or personal hygiene behaviours. This study aims to see the relationship between helminthiasis infection with nutritional status and personal hygiene behaviours in Tiwoho Elementary School students, Wori District, North Minahasa Regency. It was an observational study with cross-sectional design. This type of research is an observational study with a cross-sectional design. The total population is 69 students at SD Inpres Tiwoho. The sampling technique used was purposive sampling, where the stool samples were taken from students who had met the criteria, the samples used were 49 respondents. The results obtained from 49 students found that 6 students had worm infections with Ascaris lumbricoides species, 3 students Hookworm and 1 student Trichuris trichiura. There was no relationship between helminth infections and nutritional status and in personal hygiene behaviours there was a relationship between helminth infections with the habit of washing hands with soap before and after eating, cutting finger and toe nails and the habit of using footwear out of the house.

Kata kunci:

Siswa Sekolah Dasar
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Status Gizi
PHBS

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A B S T R A K

Dampak kecacingan jika terjadi pada anak-anak dapat mengakibatkan menurunnya kondisi kesehatan, gizi, kecerdasan dan produktifitas penderitanya; hal ini juga erat kaitannya dengan perilaku hidup sehat. Penelitian ini bertujuan untuk melihat adanya hubungan antara infeksi kecacingan dengan status gizi dan PHBS pada siswa SD Inpres Tiwoho Kecamatan Wori Kabupaten Minahasa Utara. Jenis Penelitian ini merupakan penelitian observasional dengan desain cross-sectional. Jumlah populasi sebanyak 69 siswa di SD Inpres Tiwoho. Teknik pengambilan sampel menggunakan Purposive Sampling, dimana sampel feses yang diambil yaitu pada siswa yang telah memenuhi kriteria inklusi, sampel yang digunakan sebanyak 49 responden. Hasil yang didapatkan dari 49 anak siswa ditemukan 6 orang siswa mengalami infeksi kecacingan dengan spesies Ascaris lumbricoides, Hookworm sebanyak 3 orang siswa dan Trichuris trichiura 1 orang siswa. Tidak didapatkan hubungan antara infeksi kecacingan dan status gizi dan pada PHBS didaptkan hubungan antara infeksi kecacingan dengan kebiasaan mencuci tangan dengan sabun sebelum dan sesudah makan, menggunting kuku jari tangan dan kaki dan kebiasaan menggunakan alas kaki keluar rumah.

INTRODUCTION

Helminthiasis generally occurs in humans is caused by a parasitic type of intestinal nematode worm that is transmitted through the soil, commonly called Soil Transmitted Helminths (STHs) (Suraini & Sophia, 2020). Intestinal nematodes that most often cause health problems in the world and Indonesia are roundworms (Ascaris lumbricoides) with a disease called ascariasis, whipworms (Trichuris trichiura) with a disease called trichuriasis, hookworms (Ancylostoma duodenale and Necator americanus) whose diseases are called ankylostomiasis and necatoriasis, respectively (Tapiheru & Nurfadly, 2020).

Children are the group of people who suffer the most from helminthiasis, especially elementary school age children because they often play or come into contact with the soil which is a place for the growth and development of these worms (Annisa et al., 2018). Deworming disease can cause malnutrition because some nutrients are absorbed by the worms will disrupt the mental and physical development of children, make children sick easily due to a decrease in their immune system, stunting or physical children become shorter and smaller than their peers, reduce children's intelligence at the same time; some cases can also cause death in children (Astuti et al., 2019).

Worms can also affect major organs such as the heart, liver and brain (Veesenmeyer, 2022). Andiarsa in Kalida (2020) states that the increase in immune cells including eosinophils, basophils and mast cells in helminth infections allows for faster hypersensitivity reactions (Khalida & Rusjdi, 2019). Chronic anemia due to trichuriasis can be experienced by malnourished patients (Nichols et al., 2021). Autoinfection of the gastrointestinal tract caused by ascariasis provides the possibility of a chronic inflammatory process in the lower genital tract (Sklyarova et al., 2021).

Factors that can cause the risk of worms in elementary school children include food contaminated with worm eggs, feet that are directly in contact with soil containing worm eggs or larvae, due to not wearing footwear, habit of defecating (BAB) in random places, habit of not washing hands, cleanliness of nails, ownership of latrines, house floor and availability of clean water (Suriani et al., 2019).

METHODS

The research was conducted from February to May 2022. Sampling was carried out at SD Inpres Tiwoho, Wori District, North Minahasa Regency and microscopic examination of specimens was carried out at the Parasitology Laboratory of Technology Medical Laboratory, Health Polytechnic, Manado Health Ministry. Respondents in this study were all students who were in SD Inpres Tiwoho, Wori District, North Minahasa Regency who meet inclusion criteria. The sample in this study were 49 people who met the inclusion criteria, namely those who returned the sample pot containing stool samples and did not take deworming medicine in the last 3 months. Primary data were obtained from direct survey results and through microscopic examination of faecal samples in the laboratory and secondary data obtained from data obtained from literature or journals related to this research. For data collection, first report to the principal, health center and request permission that research will be conducted at SD Inpres Tiwoho, Wori District, North Minahasa Regency, then the researcher visits prospective respondents by providing an explanation before further approval. A sign of approval to be signed and then given a questionnaire to the respondent then collect the stool specimen for examination in the laboratory.

Sampling in this study was carried out in the morning by collecting containers containing samples that had been distributed the previous day, then the samples were taken to the Parasitology Laboratory, Department of Technology, Medical Laboratory, Poltekkes, Ministry of Health, Manado for examination. The faecal sample examination methods used were Native , sedimentation, flotation, Koga agar palte and Baerman test. Native method of the sample is examined using a 2% eosin solution dripped on an object glass containing 2 drops of sample then covered with a deck glass and then examined under a microscope with a magnification of 10x and 40x. The sedimentation method of the sample is examined by taking 3 grams of stool sample mixed with 20 ml of aquadest, then the feces solution was filtered with layered gauze into a centrifuge tube, then the tube was centrifuged for 2 minutes at 1500 rpm, then the surface solution was discarded and replaced with water and stirred well, then rotated again for 2 minutes at 1500 rpm; this procedure is repeated until the surface solution becomes clear (repeat 2-3 times); the precipitate was examined under a microscope using 100x and 400x magnification. The flotation method in which the sample was examined by means of 5 g of faecal samples were put into a test tube and added with 100 ml of saturated NaCl, then stirred until dissolved then covered with coverglass and allowed to stand for 5 -10 minutes, take a cover glass and place it on a glass object and then examine it under a microscope using 100x and 400x magnification. The Koga agar method in which the sample is examined by preparing 1000 ml agar medium (15 g agar, 5 g meat extract, 10 g peptone, 5 g sodium chloride) dissolve in water to 1000 ml in the water bath, then transfer the freshly prepared agar medium to each petri dish; and allow to harden and cool at room temperature; the petri dish is labeled and then enter approximately 2 grams of fresh stool sample and place it in the middle of the agar on the petri dish, close the petri dish then incubate in an incubator at a temperature of 26-33oC for 48 hours, then check macroscopic/visual for larval characteristics, then place the agar under a light microscope and check for the presence of larvae without removing the cover with a magnification of 400x, pipette 15 ml of SAF into each plate to wash the agar, this solution is then collected with a pipette and transferred to a 15ml centrifuge tube and centrifuged at 2000 rpm for 5 minutes, pour the supernatant without disturbing the sediment, write the identity of the sample Then place 1 drop of Lugol's solution in the middle of the slide then pipette the sediment onto the slide (while homogenizing) then examine the slide under a microscope with a magnification of 100x and 400x. The Baerman test method is conducted by placing a funnel on top of the Baerman test equipment assembly filled with aquadest until it is accommodated at the clamping limit, then ± 5 grams of feces is placed on gauze over the funnel then the stool is left submerged in distilled water for two hours while the tube is which goes to the reservoir is irradiated with a lamp, then the water is collected in the tube and centrifuged at 2500 rpm for 5 minutes, after that the water in the tube is quickly removed and what remains in the tube is dropped on an object glass and examined under a microscope using a magnification of 100x and 400x. The results are then interpreted with the interpretation of Positive if eggs and larvae of intestinal nematodes are found and Negative if no eggs or larvae of intestinal nematodes are found and data is collected,

processed and analyzed descriptively and presented in tabular form, then narrated and conclusions drawn.

Data analysis using the chi-square test, if obtained p <0.05 then there is a significant relationship between the independent variable and the dependent variable. If p>0.05 is obtained, then there is no significant relationship between the independent variable and the dependent variable.

RESULTS AND DISCUSSIONS

This research was conducted at Tiwoho Elementary School, Wori District, North Minahasa Regency, starting with conducting a preliminary survey at Tiwoho Elementary School and Tiwoho Village to obtain data and information related to this research. The researcher recruited prospective respondents who were willing to be involved in this research and distributed sample containers, then the researcher explained how to collect the stool samples, the samples obtained were examinated at the Parasitology Laboratory, Department of Technology, Medical Laboratory, Poltekkes, Ministry of Health, Manado.

Table 1
Characteristics of subjects

	Total (N=49)	Percentage (%)
SEX		
Male	21	42,9
Female	28	57,1
AGE		
6 Years old	1	2
7 Years old	10	20,4
8 Years old	8	16,3
9 Years old	6	12,2
10 Years old	9	18,4
11 Years old	7	14,3
12 Years old	4	8,2
13 Years old	4	8,2
NUTRITIONAL STATUS		
Underweight	4	8,2
Normal	43	87,7
Overweight	2	4,1

Table 1 shows that the respondents based on gender were male (42.9%) and female (57.1%), most respondents were 7 years old (20.4%). there are 4 respondents (8.2%) are included in the underweight category then 43 respondents (87.7%) are included in the normal category and 2 respondents(4.1%) are included in the overweight category. Measurement of children's nutritional status is based on parameters of weight and length/height which consists of four indices including: weight for age (BB/U), Length or height for age (PB/U or TB/U), Weight for length/height (BB/PB or BB/TB) and Body Mass Index according to age (BMI/U) (Kemenkes, 2020).

The population of children aged in the province of North Sulawesi is included in the largest number in Indonesia, which is 31%. A total of 11.3% live below the poverty line. Data from the Province Brief Profile: North Sulawesi, SDGs for children in Indonesia shows that 11% of children in North Sulawesi Province still practice open defecation (None, 2015). The description of the nutritional status of elementary school children in North Minahasa Regency, North Sulawesi Province in 2018 shows 12.16% of very short nutritional status and 11.84% of short nutritional status (BALITBANGKES, 2019).

Table 2
Incidence rates of Soil-trasmitted helminths in school children in Tiwoho village

Variables	Number positive (N=49)	Incidence rate (%)
STHs species		
Ascaris lumbricoides	6	12,2
Hookworms	3	6,1
Trichuris trichiura	1	2.0
Methods		
Native	5	10,2
Sedimentation	3	6,1
Flotation	4	8,1
Koga agar plate	0	0,0
Bearmann test	0	0,0

Intestinal nematode species found from 49 samples were 6 respondents or 12.2% infected with *Ascaris lumbricoides* species, 3 respondents or 6.1% infected with hookworm and 1 or 2.0% infected with *Trichuris trichiura* species. The method of examining intestinal nematode worm eggs from 49 samples examined using native, sedimentation, and flotation methods obtained positive results on direct wet preparations as many as 5 respondents or 10.2%, positive sedimentation methods 3 respondents or 6.1%, and positive flotation methods as many as 4 respondents or 8.2%. No larvae were found in the Koga Agar plate and Baerman test methods.

Ascaris lumbricoides is the most worm species that infects school-age children because it is supported by hygiene factors. Research conducted by Sapada and Asmalinda (2020) showed that at two research sites, one of the locations showed the highest prevalence of helminth infections was *Ascaris lumbricoides* (Sapada & Asmalinda, 2020). However, another study conducted on children under five in Kokar, East Nusa Tenggara showed the highest prevalence was Hokworm infection (Onesiforus et al., 2020). Research conducted by Halleyantoro et al (2019) on elementary school students only found as many as 13.7% hookworm intestinal worm infections (Halleyantoro et al., 2019). Based on research conducted by Regina et al (2018) the most abundant species of Ascaris lumbricoides was found. In line with most studies on helminth infections in Indonesia, it shows that the prevalence of Ascaris lumbricoides infection is high (Regina et al., 2018). Meanwhile, a study conducted on 66 respondents of elementary school children in Muara Laung village, Central Kalimantan, showed no intestinal worm infections were found (Nurhalina & Desyana, 2018).

Worm infections can be caused by soil, climate, and temperature factors in Indonesia which greatly influence the prevalence of this species. The pH or acidity of the soil affects the development of worm eggs, especially worm eggs for the group of species included in soil-transmitted helminthes (Wardell et al., 2017). Environmental conditions suitable for the development of worms (Anhariyatni et al., 2017). In addition, the work activities of the respondents can also be a source of disease transmission; transmission carried out by Resnhaleksmana E (2014) showed the prevalence of helminth infections in farmers was 90% (Resnhaleksmana, 2014).

The examination of worm eggs using the native method, sedimentation method and flotation method to chek for the presence of worm eggs while Baerman test and Koga Agar Pate to examination the presence of larvae in the sampel.

Each method has different sensitivity and specificity. The sample used in the native method is less than the flotation and sedimentation methods but the results depend on the technical examination carried out. Research conducted by Lalangpuling (2020) where positive results were obtained as many as 5 respondents or (4%) using the native method (Lalangpuling, 2020). Research conducted by Nurhidayanti and Permana (2021) on the comparison of stool examination with the sedimentation method with the native method in the detection of Soil Transmitted Helminths showed that there was no significant difference between the two methods (Nurhidayanti & Permana, 2021).

Table 3
Relationship between nutritional status and STHs infection

Nutritional status	Underweight		Normal		Overweight		Total		Asymp.sig
	N	%	N	%	N	%	N	%	
Positive	1	2	4	8	0	0	5	10	
Negative	3	6	39	80	2	4	44	90	0,543
Total	4	8	43	88	2	4	49	100	

Table 3 shows that in underweight children, 1 child (2%) had intestinal worms and 3 children (6%) had negative worms. In children with normal nutritional status, 4 children (8%) had worm infections and 39 children (80%). Two children with obese nutritional status did not experience intestinal worm infection. According to research conducted by Annida et al (2018) that in general school children in Loksado District have good nutritional status, namely normal nutritional status 87.2%, 6.2% thin, 5% fat, and 1.7% obesity, even in most children who suffer from worms are in the category of normal nutritional status (Annida et al., 2018).

Based on statistical tests, there was no significant relationship between helminth infection and nutritional status (P>0.05). According to research conducted by Kamila et al (2018) regarding the Relationship of Worms with Nutritional Status and Learning Achievement in Grade IV and V Elementary School Children in Bandarharjo Village, Semarang, there is no significant effect between helminth infestation on nutritional status, because it is not only infection that can affect the nutritional status of humans, but also many other factors that influence nutritional status. In addition, the process from worm infestation to a decrease in nutritional status requires a certain period of time and with a certain level of infection severity. Many factors play a role in the incidence of nutritional status disorders, intestinal parasitic infection is only one of the factors that contribute to nutritional status disorders (Kamila et al., 2018). On the other hand, research conducted by Astuti et al (2019) concerning the Relationship between Deworming Disease and the Nutritional Status of Children in Elementary Schools in Pinrang Regency showed that there was a relationship between helminthiasis and nutritional status (Astuti et al., 2019). Another study conducted in the Eastern Philippines showed that stunting and anemia were associated with Soil Transmitted Helminth infections (Belizario et al., 2021).

Tabel 4
Relantionship between personal hygiene behaviours and STHs infection

Personal hygiene behaviours		Hasil pemeriksaan				total		Asump.sig
		positif		negatif				
		N	%	N	%	N	%	
Washing hands before and after eat	Yes	4	8,2	41	83,7	45	91,8	0,004*
	No	3	6,1	1	2	4	8,2	
	Total	7	14,3	49	85,7	49	100	
Washing hands after defecation	Yes	7	14,2	42	85,8	49	100	Constant
	No	0	0	0	0	0	0	
	Total	7	14,2	42	85,8	49	100	
Cutting nails	Yes	3	6,1	40	81,6	43	87,8	0,001*
	No	4	8,2	2	4,1	6	12,2	
	Total	7	14,3	42	85,7	49	100	
Finger sucking habit	Yes	3	6,1	8	16,3	11	22,4	0,364
	No	4	8,2	34	69,4	38	77,6	
	Total	7	14,3	42	85,7	49	100	
Pick up and eat food that falls on the ground	Yes	4	8,2	5	10,2	9	18,4	0,020
	No	3	6,1	37	75,5	40	81,6	
	Total	7	14,3	42	85,7	49	100	
Use of foot wear	Yes	3	6,1	38	77,6	41	83,7	0,009
	No	4	8,2	4	8,2	8	16,3	
	Total	7	14,3	42	85,7	49	100	
Available latrine	Yes	6	12,2	42	85,7	48	98	0,302
	No	1	2	0	0	1	2	
	Total	7	14,3	42	85,7	49	100	
Consuming healthy foods such as fruits and vegetables	Yes	7	14,3	40	81,6	47	95,9	1,000
	No	0	0	2	4,1	2	4,1	
	Total	7	14,3	42	85,7	49	100	
Consumsing clean drinking water	Yes	7	14,2	43	87,8	49	100	Constant
	No	0	0	0	0	0	0	
	Total	7	14,2	43	87,8	49	100	

The results of the analysis of the relationship between worm infection and clean and healthy living behavior showed that there was a significant relationship between the habit of washing hands with soap before and after eating (p = 0.004) where children who did not have the habit of washing their hands could be exposed to 5 times greater incidence than those who have the habit of washing their hands. Children who have the habit of washing their hands can reduce the occurrence of worm infections. There is a relationship between washing hands with soap before and after eating with worm infections. Therefore, washing hands before eating is a behavior that must be accustomed to be done, especially for children because generally children do not understand about cleanliness. Washing hands before and after eating can break the chain of transmission of intestinal worm infections because it can minimize the food or drink consumed to be contaminated with worm eggs that may stick to the hands (Lalangpuling, 2020).

According to Farida, et al (2019), which stated that handwashing habits had no significant relationship with STHs worm infection according to the results of data analysis where the asymp.sig (constanst) value was obtained, namely there was only one variable selected where no children had not washed hands after defecating. Nail hygiene is one of the efforts to achieve personal hygiene behaviours. Cleanliness of the nails should always be cut regularly, because worm eggs can be tucked in long nails. Clean and healthy nails in children need to be accustomed to cutting nails at least once a week in order to reduce exposure to the risk of worm eggs when playing in a dirty environment. The results of data analysis showed the asymp.sig value (0.001) where there was a significant relationship between the habit of cutting fingernails and toenails with worm infection. Unwashed hands after defecation or outdoor activities can be a source of transmission of worm infections to others and auto infection, the incidence of auto-infection is more likely if the child has a habit of finger sucking (Farida et al., 2019). There are 22,4% of respondents who have a finger sucking habit, but there is no relationship between worm infection and finger sucking habits because the results of data analysis obtained the value of asymp.sig (0.364). The habit of not using footwear is more susceptible to helminth infections than those who have the habit of using footwear because of the Hookworm worm species that infects through penetration through the soles of the feet. However, the chi square statistical test showed an asymp.sig value of 0.009 (p<0.005), thus there was no relationship between STH worm infection and the habit of using footwear. This is not in line with research conducted by Ayu (2020) which found a relationship between helminth infections and the habit of using footwear (Ayu, 2020).

Based on the results of data analysis, the asymp.sig value was 0.302 in the statistical test of the relationship between helminth infections and latrine ownership, it means that there was no significant relationship. A latrine is a place to dispose of feces, every house needs to have a latrine so as not to throw feces or defecate in any place. Stool containing worm eggs can be a source of transmission to other people if the infected person does not defecate in the latrine. Worm eggs can become infective in the soil so that it becomes a source of transmission for people who do not use footwear (Lalangpuling, 2020).

Efforts to control worms can be done through improving hygiene behavior, environmental sanitation and mass treatment. What is currently being done regularly for school children is mass treatment, but the threat of resistance is something to be worried about (Riswanda & Kurniawan, 2016). Knowledge about the importance of clean living behavior also affects the implementation of clean and healthy living. STH infection is still endemic in Central Java despite ongoing deworming program (Kurscheid et al., 2020). Research conducted by Maylasari et al (2014) showed that before and after treatment with Albendazole 400 mg, samples were still found that were positive for intestinal worm infection on molecular examination (Maylasari et al., 2014). Improved economic status can reduce the incidence of helminthiasis. Research conducted from 2000 to 2014 in China showed that the decline in Ascaris lumbricoides infection was inversely proportional to the increase in the economy in China (Dong et al., 2014).

CONCLUSION

Based on research conducted on 49 students of SD Inpres Tiwoho, it was found that 6 students (12.2%) had worm infections with Ascaris lumbricoides species, 3 students (6.1%) experienced worm infections with hookworm species and 1 student (2%) Trichuris trichiura worm infection. There is a relationship between helminth infections and personal hygiene behaviors, the habit of washing hands with soap before and after eating; and cutting finger and toe nails. There is no relationship between helminth infection and nutritional status.

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