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Original Article

Worm Infections (Soil-Transmitted Helminthiasis) in Elementary School Students

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ABSTRACT

Environmental sanitation factors and human behavior factors are factors that greatly influence the occurrence of worm disease. The high incidence of worms is caused by environmental factors or demographic conditions in an area and is also influenced by community behavior. This study aims to determine the factors associated with the incidence of worms in elementary school students in Manggala District, Makassar City. This type of research is observational analytic with a cross-sectional study design. The population in this study were elementary school children in grades IV, V, and VI who attended SD Komplek Inpres, SD Perumnas Antang II, Manggala District, Makassar City, with a total sample of 61 samples. Sampling used the Systematic Random Sampling technique. This research found that 29.5% of elementary school students were positively infected, where Ascaris lumbricoides and Tricuris trichiura were the main infections. The results of the analysis showed that hand washing behavior (p=0.003), nail cleanliness (p=0.031), and clean water facilities (p=0.001) were significantly related to the incidence of worm infections in elementary school students, and the variable clean water facilities were the variable that most dominant in the incidence of worms in elementary school students.

Keywords : *Worms, Behavior, Environment, Personal Hygiene*

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INTRODUCTION

Soil Transmitted Helminthiasis (STH) or worm infection is an infectious disease transmitted through the soil by intestinal nematode worms[1]. This infectious disease has increased and has quite a high prevalence worldwide[2]. Data from the World Health Organization (WHO) shows that more than 1.5 billion people, or around 24% of the world's population, were infected in 2016, 60% of whom were students, and around 870 million students are at high risk of being infected with this disease[3].

Soil Transmitted Helminthiasis (STH) is spread in almost all regions of the world, especially in areas with tropical and sub-tropical climates[4]. The air humidity is quite high in Indonesia, a country with a tropical climate, causing Soil-Transmitted Helminthiasis (STH) to develop well[5]. This is influenced by warm and wet soil so that eggs and larvae can develop more quickly. The prevalence rate proves this in several regions in Indonesia, which has reached more than 20%, reaching 76.6%. Based on the survey results, the prevalence figures obtained in Sulawesi, West Nusa Tenggara, West Java, Papua and Sumatra were 88%, 92%, 90%, 50% and 80%, respectively[6].

South Sulawesi has quite high rainfall, which causes Soil-Transmitted Helminthiasis (STH) to develop well and has the potential to increase the prevalence of worm infections. The number of worm sufferers in South Sulawesi from 2011 to 2014 was quite high, namely 11,884 cases, 9,476 cases, 12,949 cases, and 13,375 cases[7].

As the capital of South Sulawesi Province, Makassar City has the highest number of worm sufferers. Most worm

infection sufferers are students aged between < 1 year to 14 years[8].

With the high number of worm cases in Makassar City, this research aims to identify the status of worms in elementary school students and to analyze factors related to the incidence of worms in elementary school students in Makassar City, which include personal hygiene factors and environmental sanitation factors.

METHOD

This research uses quantitative research with observational analytical methods and a Cross-Sectional Study design. The research population was all students in grades IV, V, and VI of SD Inpres Perumnas Antang II, Manggala District, Makassar City. Meanwhile, the number of samples in this study was 61 students, calculated using the Lemeshow (1991) sample formula for observational research with a limited population and sampling using Systematic Random Sampling with an interval value of 3.

Data collection regarding students' worm status was obtained by examining worm eggs or larvae of the Soil-Transmitted Helminthiasis group through fecal examination. Data collection began with the signing an informed consent sheet by the student's parents. Students who have received approval are interviewed with the assistance of their parents regarding personal hygiene (hand washing behavior, use of footwear, habits of cutting and cleaning nails) using a questionnaire as well as an assessment of environmental sanitation conditions (clean water facilities, wastewater disposal facilities, and latrine sanitation) using an observation sheet. Meanwhile, for data on worm status, ± 100 mg of feces (the size of a marble or thumb) was taken and put into a feces pot, which had been coded according to the code written in the questionnaire. Feces are examined in the laboratory using the Kato-Katz method. The data obtained was then processed and analyzed univariately, bivariate, and multivariately. Bivariate analysis was carried out using the Chi-Square test with an alpha value of 0.05. Meanwhile, multivariate analysis was carried out using the Logistic Regression test.

RESULTS

The research results on age, gender, class level, education, and income are presented in Table 1. In the age characteristics of the 61 students, the most dominant was ten years old, 19 students, namely 31.1%, and 13 years old, the least was 31.1%. 2 respondents, namely 3.3%. Regarding gender characteristics, there were 20, or 32.8%, male students and 41, or 67.2%, female students. Regarding class level characteristics, the largest number of students was at the class IV level, with 26 students or 42.6%, and the lowest was at the class V level, with as many as 15 students or 24.8%. Regarding income characteristics, the most dominant parents had an income of <2.5 million, as many as 34 respondents or 55.7%, and those with an income of at least >5 million were five respondents or 8.2%.

Table 1. Characteristics of Respondents

Characteristics		**n**	**%**
Age (years)	9	5	8,2
	10	19	31,1
	11	18	29,5
	12	17	27,9
	13	2	3,3
Gender	Man	20	32,8
	Woman	41	67,2
Class	IV	26	42,6
	V	15	24,6
	VI	20	32,8
Parental income	< 2.5 Million	34	55,7
	2,5–5 Million	22	36,1
	> 5 Million	5	8,2
Jumlah		61	100,0

Regarding income characteristics, the most dominant parents had an income of <2.5 million, as many as 34 respondents or 55.7%, and those with an income of at least >5 million were five respondents or 8.2%. In the distribution regarding the worm status of elementary school students, as many as 43 students, or 70.5%, were negative, and as many as 18 students, or 29.5%, were positive for worms.

Table 2. Bivariate Analysis

Variable			Worm Infections		Total	p-Value
			positive	Negative		
Hand Washing Behavior	Not Good	n	14	14	28	0,003
		%	50,0	50,0	100,0	
	Good	n	4	29	33	
		%	12,1	87,9	100,0	
Use of Footwear	Not Good	n	1	3	4	1,000
		%	25,0	75,0	100,0	
	Good	n	17	40	57	
		%	29,8	70,2	100,0	
Nail Hygiene	Not Good	n	11	12	23	0,031
		%	47,8	52,2	100,0	
	Good	n	7	31	38	
		%	18,4	81,6	100,0	
Clean Water Facilities	Not eligible	n	9	4	13	0,001
		%	69,2	30,8	100,0	
	Eligible	n	9	39	48	
		%	18,8	81,3	100,0	
Fecal Disposal Facilities	Not eligible	n	2	1	3	0,205
		%	66,7	33,3	100,0	
	Eligible	n	16	42	58	
		%	27,6	72,4	100,0	
Waste Water Sewerage	Not eligible	n	1	2	3	1,000
		%	33,3	66,7	100,0	
	Eligible	n	17	41	58	
		%	29,3	70,7	100,0	
Total		n	18	43	61	
		%	29,5	70,5	100,0	

Based on the results of statistical tests, the analysis of hand-washing behavior shows that 12.1% of elementary school students who have good hand-washing behavior are positive for having worms, and 87.9% are negative or do not experience worms and have good hand-washing. The results of the bivariate test obtained a p-value = 0.003 < 0.05. These results indicate a relationship between hand-washing behavior and the incidence of worms in elementary school students.

Analysis of footwear usage behavior shows that 29.8% of elementary school students with good footwear habits tested positive for worms. Meanwhile, 70.2% were negative or did not experience worms. Based on the results of the bivariate test, the p-value = 1.000 > 0.05. This shows no relationship between footwear usage behavior and the incidence of worms in elementary school students.

18.4% of elementary school students with good nail hygiene were positive for having worms, while 81.6% were negative or did not experience worms because they had good nail hygiene. The bivariate test results found a p-value = 0.031 <0.05. Thus, it can be concluded that there is a relationship between nail hygiene behavior and the incidence of worms in elementary school students.

In clean water facilities, 18.8% of elementary school students who had clean water recommendations met the requirements experienced worm infections. Meanwhile, 81.3% did not experience worm infections. The bivariate test found a p-value = 0.001 < 0.05. so that clean water facilities are significantly related to the incidence of worms in elementary school students.

Based on fecal disposal facilities, as many as 27.6% of elementary school students with fecal disposal facilities met the requirements and were positive for having worms. In comparison, 72.4% were negative or did not experience worms. The bivariate test found a p-value = 0.205 > 0.05. Thus, the means of feces disposal is not significantly related to the incidence of worms in elementary school students.

Analysis of wastewater disposal facilities shows that 29.3% of elementary school students who have wastewater disposal facilities that meet the requirements are positive

for having worms. In comparison, 70.1% are negative or do not have worms. The results of the bivariate test found a value of p = 1,000 > 0.05. This means that there is no relationship between wastewater disposal facilities and the incidence of worms in elementary school students.

Table 3. Logistic Regression Test Analysis

Variable	p-Value	OR	95% C.I for OR	
			Lower	Upper
Hand Washing Behavior	0,006	10,599	1,969	57,067
Nail Hygiene	0,051	4,312	0,993	18,727
Clean Water Facilities	0,002	17,900	2,760	116,075

Multivariate analysis with logistic regression tests shows that the most dominant variable among all variables related to the incidence of worm infections is clean water facilities, which influence B = 17,900.

DISCUSSION

WHO explains that worms are closely related to poverty, where the family income level is relatively low. Parents with good education, work, and income can bring their families to a good and healthy environment[9].

The types of worm eggs that can infect elementary school students in Manggala District are Ascaris lumbricoides and mixed infections, namely Ascaris lumbricoides and Tricuris trichiura. This can be caused because the life cycle of these two types of worms is almost the same, which can enter the human body orally[10]. Ascaris lumbricoides worms can be found in all positive samples. This is because the worm can lay between 100,000 and 200,000 eggs daily. This type of worm is the most common type found [11].

Hand-washing behavior is a personal hygiene factor closely related to the incidence of worms[12]. From the research results, 12.1% of elementary school students with good hand-washing habits were positive for having worms, and 87.9% were negative or did not have worms or had good hand-washing. From the results of observations that have been made, the majority of respondents wash their hands well using running water and soap. On the other hand, some respondents who tested positive for worms, even though they had washed their hands well, did not wash their hands with running water. In line with this, research by Limbong O.S. (2020) found that washing hands before eating, after defecating, and after playing was significantly related to the incidence of worms[13].

According to the Republic of Indonesia Minister of Health Regulation no. 15 of 2017, the habit of washing hands to prevent transmission of worm eggs should be done before and after eating, every time your hands are dirty, and after defecating. Washing your hands using running water and soap can more effectively remove dirt and dust mechanically from the skin's surface[14]. It can significantly reduce the number of disease-causing microorganisms. The eggs of the worm species Ascaris lumbricoides are sticky easily, so soap and running water are necessary to remove the eggs from the hands when washing hands [15].

The influence of nail hygiene behavior on the incidence of worms. From the research results, 18.4% of elementary school students with good nail hygiene were positive for having worms, while 81.6% were negative or did not experience worms because they had good nail hygiene. Based on the results of the logistic regression test, the value of p=0.051<0.05 was obtained, so it can be concluded that there is an influence between nail hygiene behavior and the incidence of worms in elementary school students in Manggala District. The habit of students to bite their nails, which can influence the incidence of worms[16]. If nails that are long and dirty are bitten, it can cause worm eggs that might be stuck in the nails to be swallowed [17]. Worm infections can be transmitted in various ways. One is that long, dirty nails may contain worm eggs and can later be swallowed when eating or sucking fingers[18]. Well-groomed and clean nails also reflect a person's personality[19]. Long and unkempt nails will become a place for various types of dirt containing various substances and microorganisms, including bacteria and worm eggs, which are often trapped in dirty nails[20]. This condition often occurs in students who often play on the field. Long and dirty nails and cutting nails at least once every two weeks cause worms [21].

The influence of clean water facilities on the incidence of worms. That 18.8% of elementary school students with clean water supplies that meet the requirements are positive for having worms. In comparison, 81.3% are negative or do not experience worms because they have clean water facilities that meet the requirements. Based on the results of the multivariate test, a value of p = 0.002 > 0.05 was obtained, so it can be concluded that clean water facilities influence the incidence of worms in elementary school students in Manggala District. Most respondents access clean water from PDAM, while the rest use drilled and dug wells. Several respondents' locations were found to be close to landfill areas (final waste disposal sites), where some of these respondents used drilled wells or dug wells, which could be contaminated with bacteria that cause worms[22]. Clean water facilities are related to the incidence of worms. Water facilities that are near pollutants can cause worm eggs to contaminate the water[23]. Groundwater, such as dug and drilled wells with a depth of <10 meters, is more easily contaminated by disease germs[24]. If contaminated water is used daily, such as drinking, bathing, and washing, it can cause worm eggs/larvae to enter the human body. Therefore, clean water facilities must consider the source and distance from pollutants. Clean water sources such as tap water/PDAM are good to use because they have gone through physical, chemical, and biological processing processes so that they are more protected from contamination by disease germs[25].

CONCLUSION

This study concluded that hand-washing behavior, nail hygiene, and clean water recommendations were significantly related to the incidence of worm infections, where clean water facilities are the most dominant factor in the incidence of worm infections.

It is recommended that schools collaborate with the nearest health service facilities in a worm prevention program through routine administration of worm medicine. Carrying out periodic nail checks and teaching school students how to wash their hands properly will help them get used to clean and healthy behavior to avoid worm infections. For the community to always maintain sanitation and the environment inside and outside the home. Teach and supervise students to behave in a clean and healthy lifestyle.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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