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Analysis on Incidents of Helminthiasis Based on Home Sanitation of Elementary-School Children in Seluma Regency

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Abstract - Intestinal helminthiasis is a worm infection transmitted from soil contaminated by helminths (soil-transmitted helminths). The incident of helminthiasis is commonly found in school-age children. Frequent outdoor activities, contact with soil, and poor environmental sanitation increase the incident of helminthiasis in school-age children. This study was to analyze the incident of helminthiasis based on environmental sanitation in school-age children in Seluma Regency. This was a quantitative study applying cross-sectional and observational approaches. The research subject was ninety elementary-school children from five subdistricts in Seluma Regency collected by using a random sampling technique. Stool samples of all research subjects were collected and examined for the presence of helminthiasis. The data in terms of environmental sanitation were collected using questionnaires. Then all the data were analyzed in three steps of analysis: the univariate, the bivariate, and the multivariate analysis. From the stool examination, it was found 34.4% of the children were infected with helminthiasis. The data analysis on home sanitation showed a significant relationship between feces disposal facilities, sewerage systems, trash can, type of house floor, and helminthiasis with p-value < 0.25. On the home sanitation analysis, there was a relationship between clean water supply and the incident of helminthiasis with p-value < 0.25. From the multivariate analysis using logistic regression, the most dominant variable influencing the incident of helminthiasis in elementary-school students was the sewerage system with Exp B 3.032 (p-value 0.352, 95 % CI 0.293-31.402). Sewerage system was a dominant factor that influenced the incident of helminthiasis in elementary-school children in Seluma Regency.

Keywords: helminthiasis, environmental sanitation, elementary-school children

I. INTRODUCTION

Intestinal parasitic helminthiasis is the most common infection of humans in developing countries transmitted through soil (soil-transmitted helminths) and commonly found in school-age children. This disease is widely spread both in rural and urban areas. The infection rate is high, but the intensity of the infection (the number of worms in the stomach) is different. More than two billion people are infected with soil-transmitted helminths (STH) throughout the world, and 300 million of them suffer severe infections with 150 thousand deaths each year [1].

Intestinal helminths as parasitic animals do not only take nutrients in the intestines but also damage the intestinal wall so that the absorption of these nutrients is inhibited. Children infected with intestinal worms usually experience lethargy, pale or anemia, weight loss, weaknesses, lack of concentration, and sometimes they have a cough [2].

The prevalence of helminthiasis in Indonesia is still relatively high. In 2006, the prevalence was at 32.6% and reached 65% in 2007 especially in lower socioeconomic groups [3]. The lower socioeconomic groups are at high risk of helminthiasis because they live in the environment with higher exposure to poor personal and sanitary hygiene [4]. The high prevalence of helminthiasis infection is caused by the tropical climate and high air humidity, which is a good environment for worm development, as well as poor hygiene and sanitation [5].

The transmission of helminthiasis can be caused by poor personal hygiene and environmental sanitation. The increased prevalence of helminthiasis in school-age children is mainly affected by their poor personal hygiene, habits of playing more outdoor activities, and frequent contact with soils contaminated with soil-transmitted helminths. Helminthiasis can cause anemia [6]. This study was to analyze the incident of helminthiasis based on the environmental sanitation conditions among school-age children in Seluma Regency.

II. METHODS

This research was a quantitative study with a cross-sectional and observational design. The study was conducted at Seluma Regency in March - April 2019. The total sample of 90 elementary school students was taken randomly from five subdistricts namely Lubuk Sandi, West Seluma, East Seluma, North Seluma, and Talo Subdistricts.

Stool samples of research subjects were collected and then examined for the detection of helminthiasis in school-age children. The primary data on environmental sanitation including access to clean water supply, lavatory facilities, sewerage system, garbage bins, and floor types were obtained through questionnaires. Meanwhile, the data collected for research secondary data were demographic data and helminthiasis data obtained from local Puskesmas. Other related data supporting this study were also collected. All the data were statistically analyzed using a computer program called the Statistical Package for Social Sciences (SPSS). The risk factors for helminthiasis in elementary-school children in Seluma

Regency were analyzed using the Chi-square test and binary logistic regression.

Ethical clearance

This research had been approved by the Research Ethics Committee of the Faculty of Public Health, Sriwijaya University No.83/UN9.1.10/KKE/2019.

III. RESULTS

The results of the univariate analysis on frequency distribution of helminthiasis and home sanitation showed that the proportion of students with helminthiasis was 34.4%, 19 (21.1%) of the respondents did not have clean water supply, 35 (38.9%) had clean water supply but it did not meet requirements, 52 (57.8%) had feces disposal facilities in a category of < 10 meters, 22 (24.4%) did not have sewerage system causing wastewater flooded on the home yard, 50 (55.6%) did not have trash can, and 39 (43.3%) lived in houses with soil as house floor.

Table 1. Frequency Distribution of Helminthiasis and Home Sanitation

No	Variable	Category	Total Sample	
			n	%
1	Helminthiasis in elementary-school children	Helminthiasis	31	34.4
		Not Helminthiasis	59	65.6
2	Clean water supply	None	19	21.1
		Available, not personal property, did not meet minimum requirements	19	21.1
		Available, personal property, did not meet minimum requirements	35	38.9
		Available, not personal property, met minimum requirements	4	4.4
		Available, personal property, met minimum requirements	13	14.4
3	Feces disposal facility	< 10 meters	52	57.8
		≥ 10 meters	38	42.2
4	Sewerage system	None, flooded the yard	22	24.4
		Available, absorbed into the soil and contaminated the source of water (< 10 m)	21	23.3
		Available, drained into open syringe	5	5.6
		Available, absorbed into the soil and contaminated the source of water (>10 m)	27	30.0
		Available, drained into closed syringes (box drainage) to be processed	15	16.7

5	Trash can	None	50	55.6
		Available, not water-proof, no cap	14	15.6
		Available, water-proof, no cap	22	24.4
		Available, water-proof, with cap	4	4.4
6	Type of house floor	Soil	39	43.3
		Wood/bamboo, close to soil/cement	27	30.0
		Cement/tile/ceramic/wood/house on stilts	24	26.7

The results of the bivariate analysis on the relationship between the condition of clean water supply and the incident of helminthiasis obtained *p*-value = 0.442 (p > 0.25). It meant that there was no relationship between the condition of clean water supply and the incident of helminthiasis in elementary-school children. The statistical analysis between the condition of feces disposal facilities and the incident of helminthiasis obtained *p*-value = 0.245 (p < 0.25). These results showed that there was a relationship between the condition of feces disposal facilities and the incident of helminthiasis in elementary-school children. The analysis of the relationship between house sewerage system and the occurrence of helminthiasis showed a significant relationship between house sewerage system and helminthiasis in elementary-school children (p = 0.000 < 0.25). Besides, it was found a significant relationship between the condition of the trash bin with the incident of helminthiasis (p = 0.227 < 0.25), and there was a relationship between the type of house floor and the status of helminthiasis in elementary-school children (p = 0.000 < 0.25).

Table 2. The Bivariate Analysis on Home Sanitation

Variable	**Helminthiasis (%)**				**∑ N**	***P***
	Helminthiasis		**Not Helminthiasis**			
Clean Water Supply	N	%	N	%		
Did not meet minimum requirements	27	37.0	46	47.9	73	0.442
Met minimum requirements	4	23.5	13	76.5	17	
Feces Dispossal Facility	N	%	N	%	**N**	
< 10 m	21	40.4	31	59.6	52	0.245
≥ 10 m	10	26.3	28	73.7	38	
House Sewerage System	N	%	N	%	N	0.000
Did not meet minimum requirements	27	56.3	21	43.8	48	

Met minimum requirements	4	9.5	38	90.5	42	
Trash Can	N	%	N	%	N	0.227
Did not meet minimum requirements	28	32.6	58	67.4	86	
Met minimum requirements	3	75.0	1	25.0	4	
Type of House Floor	N	%	N	%	N	0.000
Soil	24	61.5	15	38.5	39	
Wood/bamboo. close to soil/cement	6	22.2	21	77.8	27	
Cement/tile/ceramic/wood/ house on stilts	1	4.2	23	95.8	24	

From the results of the multivariate analysis using logistic regression, it was found one variable (home sewerage system) that could influence the incident of helminthiasis in elementary-school students. The risk factor of helminthiasis in elementary-school students in Seluma Regency was the sewerage system with Exp B 3.032 (p value = 0.352, 95% CI 0.293-31.402). Students who have a sewerage system had a higher risk of developing helminthiasis.

Table 3. Final Model of Logistic Regression

Variable	B	Sig.	Exp (B)	95%CI for Exp (B)
Condition of feces disposal facility	-3.85	.421	.680	.266-1.738
Sewerage systems	1.109	.352	3.032	.293-31.402
Type of house floor	-.134	.617	.875	.518-1.478
Constant	.318	.826	1.374	

IV. DISCUSSION

From the results of the bivariate analysis, it was found that there was no relationship between the condition of clean water supply and the incident of helminthiasis in elementary-school children. The condition of clean water supply that did not meet the health requirements of students with helminthiasis was 37.0%, and the proportion of students with helminthiasis in the provision of clean water that met the requirements was 23.5%. The proportion of clean water supply that did not meet the requirements of students with negative helminthiasis was 47.9%, while the proportion of students in the condition of providing clean water that met the requirements for non-helminthiasis students was 76.5%. Based on statistical tests

obtained *p*-value = 0.442 > 0.25. These results showed that there was no relationship between the conditions of water supply and the incident of helminthiasis in elementary-school children. Helminthiasis is usually found in slum areas, both in urban or suburbs [7]. According to Phiri, the prevalence of *Ascaris lumbricoides* is commonly found in urban areas[8]. One of the factors that could facilitate the transmission of helminthiasis is environmental sanitation such as the provision of clean water. The water used as daily water needs must meet water quality requirements. The water must be clean, clear, odorless, tasteless, and colorless. The minimum distance between the source of water and the source of contamination is approximately 11 m [8].

The results of the multivariate analysis using logistic binary regression in the final modeling of this study indicated that the variables of clean water supply with helminthiasis showed *p*-value = 0.710 (p > 0.05). It meant that this variable did not have a risk for helminthiasis. The water that did not meet the quality and quantity requirements will create a greater possibility for the outbreak of a disease, both infectious and non-infectious diseases.

Based on the bivariate analysis on the feces disposal facilities and incident of helminthiasis in elementary-school students at Seluma Regency, it showed that there was a relationship between the feces disposal facilities and the incident of helminthiasis (*p*-value = 0.245; p < 0.25). It is known that the condition of feces disposal facilities in the category of <10 m with helminthiasis was 40.4%, and the one in the category of ≥ 10 m with helminthiasis was 26.3%. Meanwhile, the condition of feces disposal facilities in the category of < 10 m with no helminthiasis was 59.6%, and the ones in the category of ≥10 m with no helminthiasis were 73.7%. Every member of the house must use a toilet for defecation and urination to keep the environment clean and healthy. By following this procedure, flies or other insects that potentially transmit diseases such as diarrhea, cholera, dysentery, typhus, helminthiasis, gastrointestinal disorder, skin problems, and poisoning will disappear. In general, the mode of transmission of various diseases is through the disposal of feces (latrines) contaminating water, hands, food, drinks, and soil [9].

The results of the multivariate analysis on variables of feces disposal facilities and helminthiasis using binary-logistic regression in the final modeling of this study indicated that the *p*-value = 0.421 > 0.05. These variables were not the risk factors for helminthiasis in elementary-school children since the distance of latrines from the source of drinking water is 10 meters. A latrine (toilet or water closet) is a small room used for privately accessing the sanitation fixture for urination and defecation. The function is for the sanitary collection and disposal of human waste products such as urine and feces. It consists of a squat or seat with or without a swan's neck which is equipped with a sewage and water collection unit to flush the waste out. Human feces or stool is a human waste product and must be removed from the body. The other substances that must be removed from the body are urine and carbon dioxide as a result of the respiratory process [10].

The results of the bivariate analysis on sewerage system and helminthiasis in

elementary school- students at Seluma Regency showed that there was a relationship between sewerage system and helminthiasis with the obtained *p*-value was 0.001 (< 0.25). It was known that the home sewerage system that did not meet health requirements with helminthiasis was 56.3%, while the one that met the qualifications with helminthiasis was 9.5%. The sewerage lines that did not meet the requirements with no helminthiasis was 43.8%, and the sewerage water that did not meet the requirements with no helminthiasis was 90.5%. The results of the multivariate analysis using binary logistic regression in the final modeling of this study indicated that the variable of sewerage water and helminthiasis showed *p*-value = 0.352 (p > 0.05). This variable was not a risk factor for helminthiasis in elementary-school children. However, the sewerage system showed Exp B 3.032 (*p*-value 0.352, 95% CI 0.293-31.402). The students having waste-water drains had a higher risk of developing helminthiasis. As conclusion, the greater the value of Exp B, the higher the risk of developing helminthiasis.

V. CONCLUSION

The sewerage system is a dominant factor that affects the incident of helminthiasis in elementary-school children in Seluma Regency.

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