

# Environmental Factors and Helminth Infections Among Elementary Students

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**Abstract--**Childhood is an important stage, a golden age in preparing individuals and developing their potential to compete in the future. Helminthiasis is included in the top 10 infectious diseases suffered by children. Helminthiasis is an environment-based disease thus it is crucial to improve the awareness of environmental sanitation. Slum or environment with poor sanitation influence the spreading helminthiasis. Moyudan Health Center (Puskesmas) is one of the health centers in Sleman Regency with the highest cases of helminthiasis. This study aimed to determine the relationship of environmental factors and helminthiasis infection. The research design used was Cross Sectional. The subjects of this study were 311 elementary school students in the work area of Puskesmas Moyudan. Data retrieval technique was conducted using multistage random sampling. Fecal examination was done using direct method while measurement of independent variables was conducted using observational method. Statistical analysis was performed using Chi Square test. The result showed that from 311 samples of elementary school students, 37.5% were infected with *Enterobius vermicularis*. Environmental factors showed no association with helminthiasis infection: fly density (sig=0.348), toilet availability (sig = 0.307), landfill (sig = 0.207), floor type (sig = 0.330). There was no relationship between environmental factors and helminthiasis.

**Educating community especially parents about maintaining hygiene at home and local environment has a positive impact on the prevention of helminthiasis infection.**

**Keywords:** *helminthiasis, fly density availability of latrines, landfills, types of floors*

## I. INTRODUCTION

Childhood is a significant stage that often referred to as the golden period. It is a stage where children's distinctive potential is developed in order to prepare them to face the future. In this stage, children's health greatly influences their physical and cognitive development. Thus, it is

important to prevent and protect children from common childhood diseases that can impair their development. There are 10 most common diseases that can attack children including Acute Respiratory Tract Infections (ARI), Helminthis, Nutrition Anemia, Malaria, Asthma, Chronic Obstructive Pulmonary Disease (COPD), Diarrhea, Pneumonia, Hepatitis and Pulmonary Tuberculosis [1]. Helminthiasis is one the most common infection that infect children worldwide. In Indonesia, this disease has not been extensively controlled or eliminated because it is included in the neglected diseases. The existence of neglected infectious diseases (PMN) is an indicator of poverty. Of the 13 PMNs that have become a world health problem, especially in Indonesia, one of them is caused by worms [2].

Data show that more than 1.5 billion people or 24% of the world's population are infected by helminthiasis that are transmitted through soil [3]. Meanwhile, more than 270 million pre-school children and more than 600 million school-age children suffer from STH infections and require intensive treatment. The result of a stool examination survey in elementary school children in 10 regencies/cities in Indonesia, in 2011 revealed that from 3,666 students in 64 elementary schools, around 829 children had helminthiasis, and the prevalence was around 22.6 percent [4].

Helminthiasis is included in 11 of the 20 types of Neglected Tropical Disease (NTD)/neglected tropical diseases found in Indonesia. The prevalence of helminthiasis in Indonesia based on data from the Ministry of Health in 2017 is generally still very high, especially in the disadvantaged community with poor sanitation which varies between 2.5%-62%. The prevalence of helminthiasis in children in Indonesia is 43% - 45% [5]. The survey results on 40 elementary schools in 10 provinces showed that the prevalence of helminthiasis ranged from 2.2% -96.3% [6]. The

prevalence of helminthiasis in Sleman Regency in 2016 showed that there were 558 cases of helminthiasis in 25 Puskesmas [7]. Puskesmas Moyudan is one of the health centers in Sleman Regency which has the highest case of helminthiasis among all Puskesmas. There were 162 cases of helminthiasis in Puskesmas Moyudan in which one of the cases involved elementary school children [8].

Helminthiasis is an environment-based disease. Thus it is important to pay attention to environmental sanitation. Environmental health is an important factor in social life. It is one of the determinants of community welfare. A healthy environment is not only necessary to improve public health, but also for the convenience of life and improve efficiency of work and learning. Helminthiasis is related to lifestyle, poverty, and environmental sanitation. Indicators of environmental sanitation include housing, Waste Water Sewerage (SPAL), sewage disposal, clean water supply, waste management, urban drainage, and waste treatment [9].

II. METHOD

The design of this study is observational analytic using Cross Sectional as the research design. The subjects were elementary school students in the work area of Moyudan Health Center. The sample of this study was 311 respondents. The sampling technique used was multistage random sampling. Fecal examination was done using direct method while measurement of independent variables was done by observational method. The analysis was done using Chi Square test.

III. RESULTS

A. Univariate Analysis

Univariate analysis was conducted to determine the frequency distribution of each variable in the study. The results can be seen in Table I.

Table 1. Frequency Distribution based on helminthiasis infection, fly density, availability of latrines, landfills, and types of floors in the houses of subjects, Sleman Regency in 2018.

TABLE I. UNIVARIATE ANALYSIS RESULTS

Variable	Frequency (person)	Percentage(%)
<b>Helminthiasis</b>		
Positive	8	2,6
Negative	303	97,4
<b>The density of flies</b>		
Dense	16	5,1
Not dense	295	94,9
<b>Availability of latrines</b>		
Not eligible	137	44,05
Eligible	174	55,95
<b>Garbage dump</b>		
Not eligible	269	86,5
Eligible	42	13,5
<b>Type of floor</b>		
Not eligible	17	5,47
Eligible	297	94,53
Total	311	100

Source: Primary Data, 2018

The data in Table I shows that from 311 samples of elementary school students in the Puskesmas Moyudan

work area, the majority (97.4%) were declared negative for helminthiasis. terms of fly density, it was found out that there were less than 3 flies in 295 respondents' houses (94.9%) thus belonged to non-dense category. Regarding latrines availability, 55.95% fulfilled the necessary condition. Next, 85.50% garbage disposal were not qualified. Finally, there were 294 (94.53%) whose floors of the houses fulfilled the necessary condition.

The distribution of helminthiasis based on the type of worms 311 samples of elementary school students in the Puskesmas Moyudan work area were as follows. 2 students and 1 female student (37.5%) were infected with pinworms (*Enterobius vermicularis*). 2 students (25.0%) were infected with hookworm (*Ancylostoma duodenale*). 1 female student (12.5%) was infected with roundworms (*Ascaris lumbricoides*). 1 student (12.5%) was infected with worms whip (*Trichuris trichiura*), and 1 student (12.5%) was infected with hookworm (*Necator americanus*). The results can be seen in Table II

TABLE II. DISTRINATION OF FREQUENCY OF HELMINTHIASIS BASED ON WORM TYPES IN STUDENT IN THE PUSKESMAS MOYUDAN WORKING AREA OF SLEMAN REGENCY IN 2018

Type of worm	Respondent		Total	%
	Male	Female		
<i>Ascaris lumbricoides</i>	0	1	1	12,5
<i>Trichuris trichiura</i>	1	0	1	12,5
<i>Ancylostoma duodenale</i>	2	0	2	25,0
<i>Necator americanus</i>	1	0	1	12,5
<i>Enterobius vermicularis</i>	2	1	3	37,5
<b>Total</b>	<b>6</b>	<b>2</b>	<b>8</b>	<b>100</b>

B. Bivariate Analysis

Bivariate analysis was carried out with the aim to determine the relationship between independent variables (fly density, availability of latrines, landfills and types of floors) with the dependent variable (helminthiasis infection). The test analysis was carried out using a chi square test. The results of the analysis can be seen in Table III.

TABLE III. THE RELATIONSHIP BETWEEN FLY DENSITY, AVAILABILITY OF LATRINES, LANDFILLS, TYPES OF FLOORS WITH HELMINTHIASIS IN ELEMENTARY SCHOOL STUDENT IN

Variable	Helminthiasis				Total	P value	RP (CI 95%)
	Positive		Negative				
	n	%	N	%			
<b>Density of Flies</b>							
Dense	1	6,3	15	93,8	16	0,348	2,634 (0,345-20,135)
Not dense	7	2,4	288	97,4	295		
<b>Availability of latrines</b>							
Not eligible	5	3,6	132	96,4	137	0,307	2,117 (0,515-8,703)
Eligible	3	1,7	171	98,3	174		
<b>Laystall</b>							
Not eligible	3	1,6	183	98,4	186	0,275	0,403 (0,098-1,657)
Eligible	5	4,0	120	96,0	125		
<b>Type of floor</b>							
Not eligible	1	6,7	14	93,3	15	0,330	2,819 (0,307-21,466)
Eligible	7	2,4	289	97,4	296		

PUSKESMAS MOYUDAN WORKING AREA IN 2018

Source: Primary Data, 2018

In terms of fly density, respondents in the dense category were less (6.3%) than those who were in the category of

non-dense and negative helminthiasis (93.8%). Then, respondents whose latrines did not meet the necessary conditions were less (3.6%) compared to respondents with proper latrines and were negative from worm infections (96.4%). Landfills that did not meet the necessary condition was smaller in percentage (1.6%) compared to respondents whose landfills did not meet the requirements and were negative from worm infections (98.4%). Respondents whose type of floor did not fulfill the requirements and were positive from worm infections was lower in percentage (6.7%) compared to respondents whose floor met the necessary condition and were negative from worm infections (93.3%). There is no correlation between fly density, availability of latrines, landfills, type of floor with helminthiasis in elementary school students in *Puskemas Moyudan*.

#### IV. DISCUSSION

The transmission of worm eggs in human can occur in several ways, namely by inserting contaminated hands or items/toys into the mouth, walking barefoot on contaminated soil, and consuming food and beverages contaminated with worm eggs [3]. The habit of not using footwear when doing outdoor activities can cause worm infections. The results of a study stated that children who do not wear footwear are 23.2 times more likely to develop worms than children who wear footwear [10].

The results showed that 94.9% respondents' houses belonged to the non-dense category in terms of fly density. The measurements was done at food storage table. Based on observation, almost all of the respondents' food storage tables were far from trash can because some people there still disposed garbage in the yard or unused land which were quite far from the measurement location. This indicated that there was a relationship between the distance of landfills and the density of flies [11]. Another thing that can affect the density of flies is the flow of waste water disposal (SPAL), floors, latrine conditions, clean water conditions and seasons. This measurement was carried out from May to the beginning of June. Based on the Meteorology, Climatology and Geophysics Agency (BMKG) in the beginning of the dry season in 2018 in 342 Seasonal Zones (ZOM), it was estimated that there were 121 ZOM (35.4%) and 99 ZOM (28.9%) in June 2018 [12]. This affected the density of flies because in the dry season, the humidity level is low.

The results of this study statistically showed that there is no relationship between fly flies, the availability of latrines, landfills and types of flies with worms. Although it did not statistically indicate a link between environmental sanitation and helminthiasis, it did not mean that environmental sanitation has no effect on worm infections. The results of other studies stated that helminthiasis infection is related to the type of floor, availability of clean water, availability of garbage bins and waste water disposal facilities, but there is no relationship between the availability of latrines and the case of helminthiasis in elementary school children [13]. Other research also stated that there is no relationship between availability of family toilet, availability of clean water sources, availability of waste disposal facilities, and type of floor with helminthiasis [14] [15] [16]. On the

other hand, different researches stated that there is a direct relationship between environmental sanitation and the case of helminthiasis in children [17].

The risk factors for helminthiasis include defecation in the toilet, washing hand with antiseptic soap before and after meals and after defecation, using footwear around the house, adequate clean water, wearing gloves, and cutting nails [18]. Helminthiasis is related with open defecation habits, hand washing with soap with running water and poor waste processing (19). The habit of not washing hands properly is 26 times more at risk to worm infections compared to those who have good hand washing habits [20]. Another study stated that there is a relationship between type of floor with helminthiasis in which children who have houses with dirt floors are more than 3 times more at risk than children whose house are non-ground floor [21].

Helminthiasis can be caused by poor environmental sanitation conditions, especially through poor disposal facilities. A study showed that there is a relationship between toilet condition and worm infections in children aged 6-12 year where children who use latrines with poor conditions are 10.818 times at risk having worm infections compared to children that use proper latrines [22]. Proper disposal of feces that meet the requirements and sanitary ware can reduce the risk of helminthiasis. Poor disposal of human waste often pollutes clean water thus causes disease or contaminate soil and food.

Helminthiasis is also closely related to personal hygiene. Children who have poor personal hygiene is 21 times more likely to experience intestinal worms than children who have good personal hygiene [10]. Studies also showed that people who do not have habit of cleaning nails are 23 times more at risk to suffer from helminthiasis compared to people who have good and sufficient nail hygiene [20]. Good sanitation hygiene can prevent helminthiasis in both children and adults [23]. Mothers play an important role in providing examples of good hygiene habit to children such as using footwear, cutting nails, and washing hand before and after meals and after defecation [24][25]. Children who do not have a habit of washing hands after defecation are 4,821 times more at risk for getting helminthiasis infection compared to those who do [26].

Out of 311 respondents in this study, only 8 people were positively infected with helminth worms. This is due to the government program providing worm medicine to children in elementary schools. Taking regular helminthiasis medicine lower the chance of children getting infected with helminthiasis. A study showed that there is a relationship between regularly taking worm medicine with helminthiasis. Children who do not take worm medicine in the span of 6 months have 11 times higher risk than children who routinely take helminthiasis medicine within a span of 6 months [27]. One of the focus of helminthiasis prevention in high-risk residents is children. Infected children experience nutritional and physical disorders. The control involves regular medication, health education to prevent re-infection, and sanitation improvement to reduce soil contamination [3]. Hygiene education is essential especially to mothers as it

has a positive impact on the prevention of helminthiasis in children [28].

## V. CONCLUSION

There was no relationship between fly densities, availability of latrines, landfills, types of floors with helminthiasis infection in elementary school students in the *Puskesmas* Moyudan Working Area, Sleman Regency. Nevertheless, the community still needs to maintain and improve the condition of house sanitation to suppress pollutant that can invite flies as an effort to control the density of flies at home. In addition, it is necessary to improve the coordination between policy makers and the community, for example, village workers as community empowerment in improving micro-businesses, namely by recycling waste into something useful and can be resold.

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