

# 24. behavior factors and helminthiasis

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# Behavior Factors and Cases of Helminthiasis in Elementary School Students

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**Abstract**—Helminthiasis infection is the most common infection worldwide. More than 1.5 billion people or 24% of the world's population are infected with helminthiasis where pre-school age and school-age children are vulnerable to infection of helminthiasis. Intestinal worms are the main species that most infect humans. The prevalence in Sleman DIY is 21.78%. This study is a descriptive analytic with a cross-sectional design. The samples were elementary school students in grades 1-6 in the working area of Moyudan Public Health Center amounting to 311 students. The sampling technique used was multiple random sampling. The measurement of risk factors was done using a questionnaire and an interview. The data were analyzed using Fisher's test and to see the magnitude of risk by looking at the prevalence ratio (RP). It was found that 8 students were positively exposed to helminthiasis. Fisher's Exact Test analysis showed that the p-value for the relationship of handwashing variables before meals (0.484), hand washing after defecation (0.224), bowel habits (0.232), nail cutting habits (0.145), fingernail biting habits hands (1.000), use of footwear (0.273), and use of clean water (0.099). The value of  $p > 0.05$  indicates that there was no significant relationship between the variables studied and the incidence of helminthiasis in elementary school students in the work area of Moyudan Health Center. There is no relationship between handwashing before eating, hand washing after defecation, bowel habits, nail cutting habits, fingernail biting habits, footwear use, and clean water use with helminthiasis in elementary school students in the work area of Moyudan Health Center.

**Keywords**—risk factors, behavior, helminthiasis, elementary school students

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Helminthiasis disease is still a health problem in Indonesia and is one of the neglected diseases. It is one of the most common infections worldwide and affects the low economic community. More than 1.5 billion people or 24% of the world's population are infected with this disease. The main species that infect people are roundworms (*Ascaris lumbricoides*), whipworm (*Tricuris Trichiura*), and hookworms (*Necator americanus* and *Ancylostoma duodenale*). The most vulnerable group is pre-school age children and school-age children. More than 267 million pre-school-aged children and more than 568 million school-age

children infected with worm parasites live in areas where these parasites are intensively transmitted [1]. In the study conducted said that apart from the Soil Transmitted Helminths (STH) worms, it is also found worms from non-STH groups namely pinworms (*Enterobius vermicularis*) which in certain regions, the prevalence of pinworms is still relatively high [2].

The prevalence of helminthiasis in children that occurs in Indonesia shows a figure of 43-45% [3]. Sleman Regency of Yogyakarta shows a prevalence of 21.78% [4]. Helminthiasis rarely causes death, but can increase the morbidity rate due to its impact. The incidence of helminthiasis can disrupt the nutritional status of an infected person, increase nutrient malabsorption, and cause loss of appetite [1]. Helminthiasis is closely related to behavioral habits, careless defecation, not washing hands before eating, behavior of children playing on barefoot land, and habit of eating land [5]. Based on preliminary studies conducted at the Sleman District Health Office, it shows that in Sleman Regency, there were 559 cases in 2016. The cases were obtained from the results of examination of patient visits to the public health service. Sleman Regency has 25 health centers, of which the highest prevalence of helminthiasis occurs in Moyudan Health Center with 182 cases. The results of observations that have been made in the Moyudan region show that there are still children who have a risky behavior for being exposed to helminthiasis, such as playing without using footwear and playing in the river, and playing with soil. The purpose of this study is to find out the influential risk factors against helminthiasis in elementary school students in the work area of Moyudan Health Center Sleman Regency.

## II. METHOD

This study was an observational analytic with cross-sectional approach conducted in the working area of Moyudan Public Health Center Sleman in May-June 2018. The study population was all elementary school students from grades 1-6 in the work area of Moyudan Public Health Center totaling 1796 students. The sampling used was a multiple random sampling method. The sample size in this study was 311 students. Variables in this study include: independent variables: handwashing behavior before eating, hand washing

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after bowel movements, habit of defecation / defecation, nail cutting behavior, habit of biting fingernails, use of footwear, and use of clean water. The dependent variable is helminthiasis. The instruments used in this study were laboratory tests and questionnaires.

The tools used in this study were stationery and tools and materials for direct examination methods using a microscope for examination of worm eggs. The data analysis used univariate (descriptive) analysis and bivariate analysis (Fisher's Exact Test) with significance level  $p < 0.05$  and Confidence Interval (CI) 95%.

### III. RESULT

#### A. The Characteristics of Research Subjects

The characteristics of research subjects based on age and gender. The results can be seen in table 1.

TABLE I. THE CHARACTERISTICS OF RESPONDENTS IN ELEMENTARY SCHOOL STUDENTS

Variable	Helminthiasis				Total	
	Positive	%	Negative	%	(n)	%
Age:						
5	0	0	1	0.3	1	0.3
6	0	0	8	2.6	8	2.6
7	1	12.5	49	16.2	50	16.1
8	4	50	60	19.8	64	20.6
9	1	12.5	63	20.8	64	20.6
10	0	0	53	17.5	53	17.0
11	2	25	53	17.5	55	17.7
12	0	0	15	5.0	15	4.8
13	0	0	1	0.3	1	0.3
Gender:						
Male	6	75	144	47.5	150	48.2
Female	2	25	159	52.5	161	51.8
Total	8	100	303	100.0	311	100

Source: Primary Data, 2018

The data in Table 1 shows that female students (51.8%) were more than the male ones (48.2%). Students who are infected with helminthiasis amounted to six male students (75%) who were positively infected. While 2 other students (25%) who were infected were female students.

Results can be seen in table 2

TABLE II. FREQUENCY BASED ON THE TYPE OF WORM THAT INFECTS

Type of Worm	Frequency (n=8)	Percentage (%)
Ascaris lumbricoides	1	12.5
Trichuris trichiura	1	12.5
Hookworm	3	37.5
Enterobius vermicularis	3	37.5
Total	8	100

Source: Primary Data, 2018

Based on the table 2, it can be seen that hookworm and Enterobius vermicularis were the most infecting elementary school students in the working area of Moyudan Sleman Public Health Center with the number of each was 3 students (37.5%) infected

#### B. Bivariate Analysis

Bivariate analysis was carried out with the aim to determine the relationship between independent variables with the dependent variable. The results of the analysis can be seen in Table 3.

TABLE III. RELATIONSHIP BETWEEN INDEPENDENT VARIABLES AND HELMINTHIASIS

Variable	Helminthiasis				Total	P Value	RP (CI 95%)
	Positive	%	Negative	%			
Washing hands before eating						0.484	1.636 (0.417-6.416)
No	4	3.4	11	96.6	118		
Yes	4	2.1	18	97.9	193		
Washing hands after going to the toilet					0.224	0.224	2.629 (0.552-12.524)
No	2	5.7	33	94.3	35		
Yes	6	2.2	27	97.8	276		
Defecation / bowel habits					0.232	0.232	4.3 (0.583-31.72)
Poor	1	10	9	90	10		
Good	7	2.3	29	97.7	301		
Cutting nails					0.145	0.145	3.761 (0.771-18.343)
No	6	4.3	13	95.7	138		
Yes	2	1.2	17	98.8	173		
Biting finger nails					1.000	1.000	0.746 (0.094-5.929)
Yes	1	2	49	98	50		
No	7	2.7	25	97.3	261		
The use of footwear					0.273	0.273	2.513 (0.612-10.328)
No	5	4	11	96	124		
Yes	3	1.6	18	98.4	187		
The use of clean water					0.099	0.099	10.964 (1.726-69.634)
No	1	25	3	75	4		
Yes	7	2.3	30	97.7	307		

Source: Primary Data, 2018

Based on the table 3, it was obtained statistically  $p > 0.05$ , which means that there was no significant relationship between the variables studied and the incidence of helminthiasis in elementary school students in the working area of Moyudan Health Center.

#### IV. DISCUSSION

Cases of helminthiasis were only found in 2.6% of the total sample. There are more male patients (75%) compared to the female ones (25%). This can be caused by the presence of worm drug administration activities carried out by Moyudan Community Health Center in elementary school children held in November 2017, which allows at least children infected with helminthiasis. Helminthiasis in elementary school students can be influenced by the consumption of worm medicine in which students who do not take worm medicine within a span of 6 months can risk 11 times greater than students who take worm medicine within a span of 6 months [6].

Higher incidence rates in male students relate to their activities which are generally more outside the home. Based on observations made, boys have more direct contact with the ground, such as playing football without using footwear, playing the ground, and playing on the river. These results are consistent with the research conducted in elementary school children that men are more easily infected with helminthiasis compared to women, this is related to the activity of boys who play more often on the ground without using footwear [7]. The study shows that the use of footwear affects helminthiasis in children [8]. However, different from research previously, the percentage of ascariasis cases found in female students was greater than male students [9].

In this study, when viewed based on grade level and age, the most infected were at the age of 8 years and were students who were in Grade 2 elementary school. Helminthiasis was associated with high and low age in which infections occur more in grade 1, 2 and 3. This can be because students who have lower levels of education (grades 1-3) have not realized the importance of maintaining personal hygiene that can have an impact on their health. Likewise with the age of students, the more mature the fewer students experience infection [10].

##### A. The Relationship between Handwashing Behavior before Eating and Helminthiasis

In this study, the results of statistical bivariate analysis showed that there was no significant relationship between handwashing before meals with helminthiasis in elementary school students in the working area of Moyudan Sleman Public Health Center. This can be because children are accustomed to the habit of washing their hands before eating using soap and running water with the support of facilities and infrastructure such as hand washing and soap in the school environment. The availability of facilities had a significant relationship with hand washing behavior in school-age children. That with adequate facilities and infrastructure for hand washing in schools, it can improve students' habits in carrying out handwashing behaviour [11]. However, there are still students who experience helminthiasis. This can be influenced by other personal hygiene factors. Helminthiasis can also be transmitted through contamination of the hands by worm eggs [7] or also be through inhalation (*Enterobius vermicularis*) or through penetration of the skin (hookworm).

This study is in line with previous research, that there is no significant relationship between hand washing habits and the incidence of helminthiasis (p value = 0.235) [12]. The study conducted in West Sulawesi, said statistically the incidence of helminthiasis was not related to hand washing habits in elementary school students [13]. In contrast to previous

studies, that hand washing habits before eating had a significant relationship to the incidence of ascariasis in elementary school students in Keerom Papua Regency [9].

Other studies also showed that there was a significant relationship between hand washing and helminthiasis [14]. Children who did not have hand washing behavior were at a risk of 3.49 times more likely to be affected by helminthiasis [15]. The results showed that from 118 respondents (54.8%) respondents did not wash their hands before eating, there is a relationship between hand washing habits before eating with helminthiasis in children [8].

Research reveals that not washing hands with soap is significantly associated with the prevalence and intensity of roundworm infections, hookworms and roundworms [16]. Dirty hands, dirty nails that allow worm eggs to slip, so they can be allowed with food which can be aggravated by the habit of not washing hands before eating using soap and running water. The behavior of hand washing using soap and running water has an important role in preventing the occurrence of helminthiasis, because hand washing using soap and running water can remove impurities including worm eggs that attach to the skin and nails, so as to reduce helminth infections [17].

##### B. The Relationship between Handwashing Behavior after Bowel Movements and Helminthiasis

In this study the results of bivariate analysis showed that there was no significant relationship between the habit of washing hands after bowel movements and the incidence of helminthiasis in elementary school students in the working area of Moyudan Sleman Health Center. Based on the results of interviews with students, it was found that 88.7% of students already had the habit of washing their hands after defecation using running water and soap. This can be caused by the availability of soap around the toilet area used by students, so they tend to wash their hands using running water and soap after defecation. This research conducted in Central Jakarta, resulting in a p value of 0.704 ( $p > 0.05$ ) which means that there is no significant relationship between the habit of washing hands after defecation with helminthiasis in elementary school students [10]. The habit of washing hands after has no connection with worm infections in elementary school students [18].

The difference with previous research which stated that the risk factors that influence the incidence of ascariasis is the habit of washing hands after bowel movements ( $p = 0.021$ ) [19]. Hand washing habits after bowel movements have a significant relationship with helminthiasis, where children who do not have a habit of washing hands after a risky 5.91 times more likely to be affected by helminthiasis, hand washing after defecation using running water and soap is very important, because feces have a very important role as the main pathway for transmitting the spread of diseases both non-communicable diseases and infectious diseases such as helminthiasis [17]. The results revealed that the majority of children (95%) defecate carelessly and wash their hands with soil without using soap to wash their hands [19]. During activities such as playing and defecating, the child can touch his fist or the ground containing worm eggs if not washed before eating, it can be swallowed through the hand [6].



### C. The Relationship between Defecation / BAB Behavior and Helminthiasis

In this study, the results of bivariate analysis showed that there was no significant relationship between habitual defecation and helminthiasis in elementary school students in the working area of Moyudan Sleman Public Health Center. This can be caused by the students' awareness about the use of latrines when defecation/defecation is high enough. This condition can cause students not to be too in contact with the soil contaminated by worm eggs, thereby reducing the risk of being infected with worms. However, there are still students who are infected with helminthiasis, this can be caused by children being infected because of other behavioral factors. Even though children have defecation/defecation habits in latrines, but children do not have the habit of washing their hands after defecation using running water and soap, it can increase the risk of being infected with worms, because the worms or eggs are still attached to the hands [20].

This study shows that defecation/bowel habits do not have a significant relationship with helminthiasis in elementary school students in the Tangerang area [21]. Other studies suggest that there is no relationship between toilet use and the incidence of helminthiasis [13], [15]. Defecation/bowel habits have a relationship which is significant with helminthiasis, where children who are defecate/defecate carelessly have a 6.3 times greater risk of developing helminthiasis [20]. In line with previous studies, it is shown that defecation/bowel habits have a significant relationship with helminthiasis in elementary school children [18]. Dissemination of wrong diseases, the other through dirt or feces that are disposed of carelessly. Human feces or manure contain millions of bacteria which can be one of the spreads of disease. One of the diseases that arise is helminthiasis. The habit of defecation / defecation causes the soil to be contaminated with worm eggs. In general, worm eggs survive on moist soil and then develop into infective eggs [13], [22].

### D. The Relationship between Nail Cut Behavior and Helminthiasis

The results of this study indicate that there was no significant relationship between the habit of cutting nails with helminthiasis in elementary school students in the work area of Moyudan Sleman Public Health Center. This can be caused because students have habitually cut their nails regularly which is done once a week. However, there is still a presence of helminthiasis in children who diligently cut their nails. This can be caused because students only do the nail cutting periodically but do not clean it, because based on observations there are still short but dirty finger nails because they often play sand and soil. Nails are part of the hand where pathogenic germs can hide and the part is often difficult to clean, this condition allows the existence of helminthiasis infection in students [23].

This study is in line with previous studies that the habit of cutting nails did not have a significant relationship with helminthiasis [10]. Thus another study stated that the habit of cutting nails did not have a significant relationship with helminthiasis [12], [18]. However, it was different from other studies conducted on students elementary school in Bandar Lampung City, where children who do not have the habit of cutting nails risk 2.3 times more likely to be affected by

helminthiasis compared to children who have a habit of cutting nails [23]. It was also found that there was a significant relationship between the habit of cutting nails with helminthiasis [24].

Children who are accustomed to playing the soil cause a higher risk of worm egg contamination. Where long and unkempt nails become a place where various impurities contain various microorganisms including bacteria and egg worms. Children should keep their nails clean not only by cutting the nails but also cleaning the nails when the nails are dirty. If no nail cleaning is done, soiled nails can support the occurrence of helminthiasis [24], [25]. Untreated nails can be seen when the nails are black and long. Long nails, of course, because they are not cut for a long time. So that long nails and those that don't get used to cutting fingernails can cause worms. Many helminthiasis infections are transmitted through unclean hands, because the fingernails of dirty and long fingers are often stored by worm eggs. If it is not washed clean, the worm eggs stored in the finger nail can be swallowed during meals [26]. One prevention that can be done to avoid helminthiasis is by making a habit of keeping nails clean and washing hands using soap and running water [27].

### E. The Relationship between Finger Nail Biting Behavior and Helminthiasis

In this study it was found that there was no significant relationship between the habit of biting nails with helminthiasis in elementary school students in the work area of Moyudan Sleman Public Health Center. This was because most respondents (83.9%) were children who did not have the habit of biting their fingernails. Previous research stated the same thing, namely finger nail biting habits did not have a significant relationship with helminthiasis [10], [15], [28]. The absence of a relationship can also be caused by having good hand washing habits so as to reduce contamination of worm eggs on clean children's nails and short [12]. However, a previous study in Kulonprogo found that biting on the fingernails showed a significant association with helminthiasis in elementary school students [17].

The unclean and infected fingernails of the soil contaminated by infective worm eggs were a medium in the transmission of helminthiasis. Therefore, children who had a habit of biting finger nails can increase the risk of getting a helminth infection. Nail hygiene was one effort to achieve personal hygiene. The habit of biting your nails and putting your fingers in your mouth in children can allow the transmission of worms from nails to the mouth [6]. In children, helminthiasis infections often occurred directly through hands contaminated with soil containing infective eggs. Children were most often worms because they usually put their fingers in their mouth or eat without washing their hands first. Nail biting behavior was bad behavior and has a significant relationship with helminthiasis infection [17].

### F. The Relationship between the Use of Footwear and Helminthiasis

The results of statistical tests showed that there was no significant relationship between the habit of using footwear and helminthiasis in elementary school students in the working area of Moyudan Sleman Public Health Center. The use of footwear is a habit of students wearing footwear when outside the home, especially when in contact with the ground. Most students already have the habit of wearing footwear such

as shoes or sandals when outside the home, whether it's when playing, during breaks at school, or during sports lessons. This can cause no significant relationship between the use of footwear and helminthiasis. This research is supported by previous research that there is no relationship between the habit of using footwear with helminthiasis in elementary school students [13].

The relationship between the habit of using footwear and helminthiasis, where children who do not wear footwear when outside the home are 1.7 times more at risk of being exposed to helminthiasis [15]. The research found that the habit of wearing footwear was related to helminthiasis [29]. Not wearing sandals or shoes is significantly associated with the prevalence and intensity of roundworm infections and hookworms, but not with the intensity of hookworm infection [16]. The use of footwear is very important to prevent the entry of worm larvae from the pores of the skin because if you often do not wear footwear it is at risk of infection with worms, if the infective form of larvae or worm eggs penetrates the outer skin through hair follicles, pores damaged skin and skin. Generally, the area of infection is between the toes. If the soil is contaminated with worm eggs, the infective form can infect when not using footwear. This is because children very often do not use footwear when playing on the ground. Infection can be prevented if children have a habit of wearing footwear when doing activities outside the home [12]. Hookworm eggs hatch into rhabditiform larvae within 24-36 hours and then on day 5-8 become infective filariform forms. Larva filariform hookworms can last 7-8 weeks on the ground and must enter through human skin (especially *Necator americanus*) to continue the life cycle [30].

#### G. The Relationship between the Use of Clean Water and the Incidence of Helminthiasis

The results of the bivariate analysis showed that p value was 0.099, which means that there was no statistically relationship between the use of clean water and the incidence of helminthiasis in elementary school students in the work area of Moyudan Sleman Health Center. In this study, 98.7% of students have had the habit of using clean water for daily needs such as bathing, cooking, and drinking. Most of the water sources used by students come from wells and PAM. In line with previous studies that the use of clean water has no relationship with helminthiasis in elementary school students in Band Lampung City [23]. Previous studies in Bima District showed that there was no significant relationship between clean water use and helminthiasis [23]. However, it was different from research the other is that there is a relationship between the use of clean water and the incidence of helminthiasis in elementary school students in Boyolali [30]. The availability of clean water has a significant relationship with the incidence of helminthiasis [6].

Not all available sources of water are of a quality that is suitable for consumption. As ground water on earth is never found in a pure, clean state, it often also contains bacteria or other microorganisms. This does not mean that all water on the earth is polluted, especially for groundwater depending on the geological, hydrological, and also human behavior that exists in the area and around the water source. The presence of compounds or other elements and bacteria or microorganisms in water sources will potentially cause undesirable effects on humans, especially for human health [31]. River water is still used in some areas as a very risky

source of water. Research on river water in North Jakarta found more than 50% of river water containing *Ascaris lumbricoides* eggs. This unclean source of water becomes a place for developing worm eggs to become a risk factor for worms [4].

#### V. CONCLUSION

There was no relationship between Washing hands before eating, washing hands after going to the toilet, defecation / bowel habits, cutting nails, biting finger nails, the use of footwear, the use of clean water with helminthiasis.

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