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RESEARCH ARTICLES

The Relationship Between Nutritional Status and the Incidence of Soil-Transmitted Helminth Infections in Students of Muhammadiyah Elementary School 19 in Medan Denai District, Medan City

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Abstract: Worm infestation (STH) and nutritional status are ongoing health issues in Indonesia. Studies on their relationship are inconsistent, with some reporting a link and others finding none. This study aimed to determine the relationship between nutritional status and STH infection among 68 students at SD 19 Muhammadiyah in Medan City. This was an observational study using a cross-sectional design and total sampling. Nutritional status was determined using the CDC-NCHS 2000 growth curve, and STH infection was diagnosed using the Kato-Katz method. A total of 12 students (out of 68) were found to have an STH infection. Of the infected students, 47% suffered from moderate malnutrition, and 53% were well-nourished. The most prevalent STH species was *Ascaris lumbricoides*, followed by *Trichuris trichiura* and Hookworm. The statistical analysis using Fisher's Exact Test yielded a p-value of 0.203 ($p > 0.05$). The study concluded that there was no significant relationship between STH infection and the nutritional status of the students at 19 Muhammadiyah Elementary Schools.

Keywords: Infection, *soil-transmitted helminths*, nutritional status

INTRODUCTION

Nutrition is a fundamental determinant of human resource quality (HR), and nutritional disturbances early in life will affect the quality of life thereafter. Health and nutritional issues faced by school-aged children include stunting, underweight, anaemia, iodine deficiency, worm infestation (helminthiasis), malaria in endemic areas, diarrhoea, and respiratory tract infections. These health and nutritional problems commonly occur in developing countries.[1]

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In Indonesia, many diseases persist as health issues that affect nutritional status, one of which is intestinal worm infection or helminthiasis, transmitted through the soil. Helminthiasis can occur simultaneously with several types of worms and can lead to a decline in the health condition, nutritional status, intelligence, and productivity of the sufferers, thus causing significant economic losses by resulting in the loss of carbohydrates, protein, and blood.[1]

According to the latest data from the World Health Organisation (WHO), about 1.5 billion people, or approximately 24% of the world's total population, suffer from worm infections, generally affecting school-aged children. Sub-Saharan Africa, the Americas, China, and East Asia have the highest incidence rates. Meanwhile, in Indonesia, cases of worm infection are spread across all regions. Indonesia has a prevalence rate of helminthiasis ranging from 45% to 65%. Data from the North Sumatra Provincial Health Office indicate that about 32% of the population in North Sumatra suffers from helminthiasis, and out of this data, about 60–70% suffer from worm infestation.[2]

Nutritional status is an important indicator for school-aged children as a determining component of a child's condition related to their development and achievements in school and society. [3]

Various studies have proven that poor nutrition is related to worm infestation. The results of a study conducted at SDN Cambaya and SDN Mangkura in Makassar, South Sulawesi, showed that 44.5% of students with poor nutritional status were positive for worm infection, while 24.5% of students with good nutritional status were also positive for worm infection.[2] However, other studies state that there is no relationship between worm infection and nutritional status [4]

Given that helminthiasis remains a health problem that requires attention due to its varied incidence rates and its potential connection with nutritional status, the researcher is interested in conducting a study on the relationship between undernutrition and the incidence of worm infestation in students at Elementary School 19 Muhammadiyah in Medan Denai sub-district, Medan City.

METHOD

This was an observational-analytical study utilising a cross-sectional design. The research was conducted from January to February 2023. The study took place at SD Muhammadiyah 19 in Medan Denai Sub-district, Medan City, and the Parasitology Laboratory of the Faculty of Medicine at Universitas Muhammadiyah Sumatera Utara (UMSU).

The study population consisted of all students from grades 1 to 6 at SD Muhammadiyah 19, Medan Denai Sub-district, Medan City. The study sample included all students from grades 4 to 6 at SD Muhammadiyah 19, Medan Denai Sub-district, Medan City, using total sampling. The inclusion criteria were elementary

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school children in grades 1-6 who were cooperative with the research activities. The exclusion criteria were children who had consumed anthelmintic medication within the last 6 months, children who were currently experiencing diarrhoea (more than 3 bowel movements in the last 24 hours), and parents/guardians who did not provide consent.

Data collection techniques used primary data, which included collecting stool samples for examination at the UMSU Faculty of Medicine Parasitology Laboratory using the Kato-Katz examination method with Kato Solution, and primary data from anthropometric measurements such as age, weight, and height of the students at SD Muhammadiyah 19, Medan Denai Sub-district, Medan City.

RESULT

A study was conducted at SD 19 Muhammadiyah, Medan Denai Sub-district, Medan City, with ethical approval number: 980/LRPK/FKUMSU/2023. Demographic and anthropometric data (such as age, weight, and height) were collected, and stool samples were taken at Elementary School 19 Muhammadiyah, Medan Denai Sub-district, Medan City. This anthropometric data was required to determine the nutritional status of the research sample. The determination of Soil Transmitted Helminths (STH) infection status was carried out at the Parasitology Laboratory of the Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara.

The total number of students at Elementary School 19 Muhammadiyah, Medan Denai Sub-district, Medan City, is 115. The students who met the inclusion criteria for this study numbered 68 people (59%), while 47 people (41%) fell into the exclusion criteria. The frequency distribution by sex showed that there were 45 male students (66.1%) and 23 female students (33.9%).

Table 1. Distribution of gender and Age

Gender	Frequency	Percentage
Woman	23	33,9
Man	45	66,1
Total	**68**	**100%**

Age	Frequency	Percentage (%)
6	11	16,2
7	15	22,05
9	15	22,05
10	16	23,53
11	3	4,41
12	3	4,41
13	5	7,35
Total	**68**	**100**

Based on the table above, the results for the age distribution of Soil Transmitted Helminths infection incidence showed that 11 students (16.2%) were 6 years old, 15 students (22.05%) were 7 years old, 15 students (22.05%) were 9 years old, 16 students (23.53%) were 10 years old, 3 students (4.41%) were 11 years old, 3

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students (4.41%) were 12 years old, and 5 students (7.35%) were 13 years old.

Table 2. Distribution of Soil-Transmitted Helminth Infection Cases

Infection Status	Frequency	Percentage (%)
Negative	56	82
Positive	12	18
Total	68	100

Based on the research findings, the results showed that the number of students infected with Soil Transmitted Helminths (STH) was 18%, and the number of students not infected was 82%.

Table 3. Distribution of Samples Based on the Infecting Worm Species

Types of worms	Frequency	Percentage (%)
Ascaris lumbricoides	7	58%
Trichuris trichiura	4	33%
Hookworm	1	8%
Total	12	100

Based on the research results, it was found that STH infections were caused by Ascaris lumbricoides worms in 7 people (58%), followed by Trichuris trichiura worm infections in 4 people (33%), and Hookworm infections in 1 person (8%).

Table 4. Distribution of Samples Based on Nutritional Status

Nutritional status	Frequency	Percentage (%)
Malnutrition	32	47
Good nutrition	36	53
Total	**68**	**100**

Based on nutritional status measurements using the CDC-NCHS 2000 curve, the results from 68 samples examined showed that 47% of all samples were malnourished and 53% were well-nourished.

Table 4 above shows the age distribution of Soil-Transmitted Helminth infections: 5 students aged 6 years (41.5%), 2 students aged 7 years (16.5%), 2 students aged 9 years (16.5%), and 3 students aged 13 years (25.5%).

Table 5. Analysis of the Relationship between Soil-Transmitted Helminths Incidence and Nutritional Status

Variables	Worm infestation						*P value*
	Yes		No		Total		
Nutritional status	**N**	**%**	**N**	**%**	**n**	**%**	
Good	4	5.9	32	47.1	36	52.9	0.203
Not enough	8	11.8	24	35.3	32	47.1	
Total	**12**	**17.6**	**56**	**82.4**	**68**	**100**	

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Table 5 shows that the results of the analysis using Fisher's Exact Test found a p-value of 0.203 (p>0.05), which means there is no significant relationship between nutritional status and worm infestation in students of State Elementary School 19 Muhammadiyah, Medan Denai District, Medan City.

DISCUSSION

Based on Table 1, out of 68 samples examined, 12 samples (18%) were found to be positive and 56 samples (82%) were negative for Soil-Transmitted Helminths (STH) infection.

This is consistent with research conducted at SDN 8 Pusong Lama, Banda Sakti District, Lhokseumawe City, which reported an STH infection rate of 9.3%5. Similarly, research carried out at a Community Health Centre (Puskesmas) in Alor Regency, East Nusa Tenggara, found 18.38% of samples were positive for STH infection.

This is likely due to the implementation of education, the formation of 'Little Doctors' (Dokter Kecil), and the three core UKS (School Health Unit) activities at SD 19 Muhammadiyah, Medan Denai District, Medan City.[7]

Based on Table 2, it is known that *Ascaris lumbricoides* infection was the most common infection, accounting for 58%, followed by *Trichuris trichiura* infection at 33%, and then Hookworm infection at 8%.

This finding is consistent with research conducted at SDN Negeri Ngemplak 1 Kartasura, where the most common infection was also caused by *Ascaris lumbricoides* at 71.4%8. The high incidence of Soil-Transmitted Helminths (STH) infection is attributed to its prevalence in the location of the study, where the school grounds are still unpaved (earthen). This condition provides a suitable environment for the propagation of Soil-Transmitted Helminths[9].

Furthermore, a study on the relationship between STH infection and nutritional status in elementary school children conducted by Justina Meri Nauly (2021) found a significant relationship between STH infection and nutritional status, involving 62.1% (18 subjects). Of these, 8 individuals were infected with *Ascaris lumbricoides* and 23 individuals were infected with *Trichuris trichiura*[10].

Based on Table 3, the nutritional status data from 115 samples examined show that 47% of all samples had an underweight nutritional status, and 53% had a good nutritional status.

Several studies have shown that many factors influence children's nutritional status. These include eating habits, food availability, economic status, infection factors, poverty, poor environment, and lack of knowledge about nutrition[11].

Based on Table 4, the distribution of Soil-Transmitted Helminths (STH) infection by age group shows that students aged 6 years were positive for worm infection at 5 individuals (41.5%), aged 7 years at 2 individuals (16.5%), aged 9 years at 2

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individuals (16.5%), and aged 13 years at 3 individuals (25.5%). It is suggested that as children get older, they have changes in their play patterns, activities, and levels of cleanliness, as well as their immune resistance.[9]

Based on the results of the research conducted at SD 19 Muhammadiyah, Medan Denai District, Medan City, 53% of the total samples had a good nutritional status, and 47% had an underweight nutritional status. Based on this data, it can be concluded that the students of SD 19 Muhammadiyah, Medan Denai District, Medan City, receive good food intake and belong to a community group that is concerned about family health. [12]

Out of the 68 samples examined, 82% of the students at SD 19 Muhammadiyah, Medan Denai District, Medan City, showed negative results for STH infection. The remaining 18% were positive for STH infection, and the nutritional status of these 18% infected students was predominantly underweight and good. This study aligns with research conducted at an Elementary School in Bunaken Sub-district, Bunaken District, Manado City, which stated that there was no relationship because the number of children infected with STH was low, and 8.1% of the children had normal nutritional status[13]. This is possibly due to the low level of community concern and knowledge about health around the research location [14].

Soil-Transmitted Helminths (STH) infection is one of the infectious diseases that has a chronic impact on nutritional status. The impact on nutritional status caused by STH infection is related to the level of infestation. STH infestation is associated with age, where the higher the child's age, the lower the infestation will be[9].

In this study, the Chi-Square Test was used to determine the relationship between STH infection and nutritional status. The significance value showed a p-value of 0.2. Since $p>0.05$, the conclusion is that there is no relationship between STH infection and nutritional status in students of SD 19 Muhammadiyah, Medan Denai District, Medan City. This finding is also supported by a study conducted at an Elementary School in Manado, where a Chi-Square Test analysis yielded a p-value of 1.000, indicating no significant relationship between STH infection and nutritional status in that school[15].

STH infection can be prevented by breaking the chain of transmission. This can be done by maintaining personal hygiene, maintaining community hygiene, providing mass deworming medication to prevent worm infection in vulnerable groups (to stop the spread of worm eggs from infected individuals to the surrounding environment), improving sanitation and hygiene, and cultivating clean and healthy living behaviours through health promotion[16].

CONCLUSION

There is no significant relationship between Soil-Transmitted Helminths (STH) infection and nutritional status in students of

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SD 19 Muhammadiyah, Medan Denai District, Medan City.

The incidence of STH infection among students of SD 19 Muhammadiyah in Medan Denai District, Medan City, was 12 samples (18%). The nutritional status of the students suffering from STH infection at SD 19 Muhammadiyah, Medan Denai District, Medan City, was distributed as 47% with underweight status and 53% with good nutritional status.

ACKNOWLEDGMENTS

1. For future researchers, it is suggested to select research locations considering environmental conditions, season, soil type, and other factors that may have a significant influence on the research results.
2. Further research is needed regarding the relationship between STH infection and micronutrient deficiency.
3. For the administration of SD 19 Muhammadiyah in Medan Denai District, Medan City, it is recommended to provide knowledge about the prevention of STH infection and the importance of nutrition.
4. For the parents of students at SD 19 Muhammadiyah in Medan Denai District, Medan City, it is recommended to apply balanced nutrition behavior to their children, improve environmental sanitation to be better, teach children to get used to washing their hands with soap and clean water, wear footwear when outside the house, and follow the recommendation to take deworming medication every 6 months.

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