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Association Between Personal Hygiene and Nutritional Status in School-Age Children

Andromeda[1,*], Muhammad Luthfi Rafshanzany[2], Joseph Dharmadi Buntoro[3]
[1]Departement of Parasitology, Faculty of Medicine, Pasundan University, West Java, Indonesia
[2]Faculty of Medicine, Pasundan University, West Java, Indonesia
[3]Departement of Public Health, Faculty of Medicine, Pasundan University, West Java, Indonesia

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***CORRESPONDENCE:**
andromeda@unpas.ac.id

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Abstract: Malnutrition is a global health problem often found in children and adolescents. This condition can inhibit growth and development in children. Soil transmission helminth (STH) infection absorbs nutrients in the host's digestive system, affecting the host's nutritional status. One of the risk factors for STH infection is poor personal hygiene. This study aims to analyze the association of STH infections and personal hygiene with the nutritional status of elementary school children. This research is a cross-sectional study with primary data conducted in August – September 2022 on 92 children aged 6 – 12 years at Neglasari Elementary School, Cilame Village, District Bandung. Nutritional status was assessed by measuring height and weight to calculate body mass index and then putting it into the WHO 2007 Z-Score plotting curve. STH infections were determined by microscopic examination of helminth eggs from feces using the Kato-Katz method. Personal hygiene was assessed through direct interview methods. The results showed that there was no STH infection in all research respondents. The distribution of nutritional status was dominated by normal nutrition, with 66 (71.7%) respondents and the majority had implemented good personal hygiene behavior habits (78 (84.8%) respondents). It can be concluded that there was a significant relationship between personal hygiene and nutritional status in students (p= 0.000). The average score of children who had implemented good personal hygiene was in normal nutritional status.

Keywords: children; nutritional status; personal hygiene

INTRODUCTION

Malnutrition is a global health issue that affects children and adolescents in practically every country, including Indonesia.[1] According to the World Health Organization (WHO), 45 million children are predicted to be underdeveloped in 2020, with 149 million children under the age of five having stunting.[1,2] The prevalence of stunting in Indonesia was relatively high in 2018, at 27.67%, indicating that the country has yet to meet the WHO objective of less than 20%.[3] In children, malnutrition can impede physical growth, cognitive ability, motor function, physiological function, and immune response.[4]

Worm infections, particularly soil-transmitted helminth (STH) infections, are a major cause of impaired nutritional absorption in children.[5] According to a study conducted in Ethiopia by Gosa et al., 2022, only 54 of 273 children infected with STH had normal nutritional status, with the remaining 219 people classified as malnutrition.[6] Another study in Nigeria by Cletus et al., 2020 revealed that 42.8% of the 504 fecal samples investigated were proven positive for helminth infections accompanied by nutritional status concerns, with 24.4% experiencing malnutrition, 36% being short, and 20.8% being thin.[7] According to these studies, children's nutrition and STH infection have a close and significant relationship.

Soil-transmitted helminth infection is a neglected tropical disease caused by intestinal nematodes such as *Ascaris lumbricoides, Trichuris trichiura,* and *Hookworm* (*Necator americanus* and *Ancylostoma duodenale*).[8] STH infection is ubiquitous worldwide, particularly in tropical and subtropical parts of Sub-Saharan Africa, America, and Asia, where warm and humid conditions encourage helminth egg and larvae survival.[9] STH

infects over 270 million preschool children and 550 million school-age children worldwide.[10] According to the Indonesia Ministry of Health, the highest prevalence of STH infection in 2006 was caused by *T.trichiura* species (24.2%), followed by *A. lumbricoides* (17.6%) and hookworms (1%).[11] Worms absorb nutrients from the host to survive, leading to disruptions in nutrition usage in the body through various processes.[12] Chronic *A. lumbricoides* infection results in anorexia, nutritional malabsorption, and jejunal mucosal abnormalities. Endogenous mucosal damage caused by *T. trichiura* burrowing the intestinal epithelium causes inefficient iron supplementation, loss of appetite, and anemia. Hookworm infection consumes erythrocytes through a proteolytic mechanism that breaks down hemoglobin, resulting in nutritional inadequacies due to increased blood loss and diminished iron reserves in the body.[13,14] Chronic STH infection causes a decreased growth rate, physical health disorders, decreased activity, weakened cognitive function, and Protein Energy Malnutrition (PEM) in children.[15,16]

Socio-economic, dietary status, personal hygiene, and education intensify a person's susceptibility to STH infection. Personal hygiene includes washing hands before and after eating, keeping nails clean, and defecating in the toilet or bathroom. The deterioration of personal hygiene is a significant contributor to the occurrence of helminthiasis.[17] School children aged 5 to 15 years in developing countries are at a higher risk of developing STH due to their playing habits and direct contact with soil, a breeding ground for worm eggs.[12,18]

In Indonesia, the problem of nutritional status and helminthiasis remains severe and has not been addressed by the government.[19,20] Based on the data acquired from a school health screening by the health center in Cilame village in 2050, children (25.3%) apparently suffered from undernutrition and malnutrition. Geographically, Cilame village is located in a tropical climatic area surrounded by plantation lands, forestry, and vacant terrain often used as playgrounds for local children. This condition increases the risk of STH infection. According to socioeconomic factors, the majority of the population has a poor level of education and income, which can influence a person's lack of health concerns. Therefore, researchers are interested in analyzing the incidence of soil-transmitted helminth infections, personal hygiene, and nutritional status of children in elementary schools of Cilame Village, Bandung.

MATERIAL AND METHOD

This research was an analytic observational study with a cross-sectional approach. The sample was measured descriptively to identify the characteristics of the subjects. The independent variables were soil-transmitted helminth infection and personal hygiene. The dependent variable was nutritional status. This study used consecutive sampling with total respondents of 92 children from Neglasari Elementary School, Cilame Village, Bandung. The inclusion criteria were being registered as a student of Neglasari Elementary School and being willing to participate in the examination process. Samples were taken using simple random sampling.

The study was conducted in August – September 2022 by measuring height and weight to calculate body mass index and then entering it into the WHO 2007 Z-Score plotting curve to classify nutritional status. To examine soil-transmitted helminth infections, the stool samples were collected using a stool tube and sent to a certified regional health laboratory in Bandung (Labkesda Kota Bandung) for microscopic examination of worm eggs using the Kato-Katz method. The personal hygiene assessment of the respondents was carried out by giving questionnaires through the direct method. The validity of the questionnaire was tested using total correlation items with results > 0.3 and reliability test > 0.7.

The research ethics committee of Padjadjaran University, Bandung, granted permission for this study under the following number: 715/UN6.KEP/EC/2022. The analysis tool used SPSS 27. The Spearman test was utilized to analyze the correlation between personal hygiene and nutritional status, with a value of $p<0.05$.

RESULT

The data obtained from respondents were analyzed descriptively using SPSS to identify the frequencies and percentages, as shown in Table 1.

Table 1. Distribution of respondents based on gender and class level

		Total (n)	Percentage (%)
Gender	Male	39	42.4%
	Female	53	57.6%
Grade	Grade I	27	29.3%
	Grade II	12	13%
	Grade III	16	17.4%
	Grade IV	8	8.7%
	Grade V	4	4.3%
	Grade VI	25	27.2%

According to the Table 1, which was conducted on 92 children of Neglasari Elementary School, Cilame Village, District Bandung, the majority of the research respondents were female, with 53 respondents (57.6%). The majority of the class level was grade I, with a total of 27 children (29.3%). The least number of respondents was grade V, with a total of 4 children (4.3%).

Table 1. The proportion of STH infections in study respondents

	Total (n)	Percentage (%)
Positive	0	0%
Negative	92	100%

Table 2 summarizes the microscopic examination of worm eggs using the kato-katz methods obtained from the parasitology laboratory. The findings revealed that no children were positive for STH infection in any samples based on the distribution of respondents' characteristics depending on STH infection status.

Table 3. The proportion of nutritional status in research respondents

	Total (n)	Percentage (%)
Severely Thin	5	5.4%
Thin	15	16.3%
Normal	66	71.7%
Overweight	3	3.3%
Obesity	3	3.3%

Based on Table 3, measuring the body mass index (BMI) and plotting it into the Z-Score curve showed that the respondents' nutritional conditions were classified into five categories: severe thin, thin, normal, overweight, and obesity. The highest prevalence is children in normal nutritional conditions, with a total of 66 participants (71.7%).

Table 4. Results of personal hygiene questionnaire responses

Personal hygiene	Total (n)	Percentage (%)
Playing and contacting with the ground directly		
Yes	24	26.1%
Seldom	29	31.5%
No	39	42.4%
Washing hands after playing		
Yes	73	79.3%
Seldom	15	16.3%
No	4	4.3%
Washing hands before eating		
Yes	76	82.6%
Seldom	14	15.2%
No	2	2.2%
Washing hands after defecation		
Yes	90	97.8%
Seldom	2	2.2%
No	0	0%
Washing hands with running water		
Yes	70	76.1%
Seldom	15	16.3%
No	7	7.6%
Washing hands with soap		
Yes	69	75%
Seldom	17	18.5%
No	6	6.5%
Keeping nails clean		
Yes	68	73.9%
Seldom	21	22.8%
No	3	3.3%
Cutting nails every 1 week		
Yes	54	58.7%
Seldom	35	38%
No	3	3.3%
Wearing footwear when playing on the ground		
Yes	81	89%
Seldom	9	9.9%
No	1	1%
Defecating in toilet		
Yes	92	100%
Seldom	0	0%
No	0	0%

Table 5. Participant distribution based on personal hygiene behavior

		Total (n)	Percentage (%)
Personal Hygiene	Good	78	84.8%
	Poor	12	13%
	Bad	2	2.2%

Table 4 demonstrates the result of a personal hygiene assessment using a questionnaire asked directly to the respondents. The average number of children had implemented good personal hygiene as evidenced by frequent washing of hands before eating and after defecating. Besides that, all children have defecated in the toilet. Furthermore, based on Table 5, it can be concluded that most 78 children (84.8%) had good personal hygiene behavior.

The Correlation between personal hygienes and nutritional status

Table 6. Distribution of nutritional status with personal hygiene

Nutritional Status	Personal Hygiene						Total	
	Good		Poor		Bad			
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Severely Thin	2	40	1	20	2	40	5	5.43
Thin	10	66.66	5	33.33	0	0	15	16.3
Normal	60	90.90	6	9.09	0	0	66	71.74
Overweight	3	100	0	0	0	0	3	3.26
Obesity	3	100	0	0	0	0	3	3.26
Total	**78**	**84.78**	**12**	**13.04**	**2**	**2.17**	**92**	**100**

Table 6 describes the distribution of children regarding nutritional status with personal hygiene. 66 children were in the category of normal nutritional status, where 90.90% had implemented good personal hygiene behavior. Otherwise, severely thin children had poor and bad personal hygiene, with a total of 3 children (60%).

Table 7. Correlation between nutritional status and personal hygiene

Correlation				
			Personal Hygiene	Nutritional Status
Spearman's rho	Personal Hygiene	Correlation Coefficient	1.000	0.379
		Sig. (2-tailed)	.	0.000
		N	92	92
	Nutritional Status	Correlation Coefficient	0.379	1.000
		Sig. (2-tailed)	0.000	.
		N	92	92

Table 7 shows the statistical results using the Spearman-rank test to determine the correlation between personal hygiene and nutritional status. According to the results, personal hygiene significantly correlated with nutritional status (p= 0.000). These findings indicated a correlation between personal hygiene and nutritional status among Neglasari elementary school students in Cilame Village, District Bandung.

DISCUSSION

Personal hygiene with STH infection

STH infection was not discovered in all of the study participants. In Neglasari Cilame village, 78 (84.8%) children in elementary school practiced good personal hygiene. Good personal hygiene in children reduced the spread of infections caused by STH, resulting in no children being infected with STH. This study was in line with the previous study conducted by Syairul et al., 2021, which revealed no STH infections in all research participants since Sibela Timur Elementary School youngsters practiced good personal hygiene.[21] According to Zulaikha et al., 2020, good personal hygiene practices such as hand washing and keeping nails clean can prevent the entry of worm egg pollutants from entering the digestive system through the mouth.[22] This study was conducted during the Covid-19 pandemic. Therefore, clean and healthy behavior (PHBS) in children and school sanitary conditions were deemed adequate. According to Rizqa et al., 2022, environmental sanitation in schools has improved during the pandemic.[23] These behaviors and conditions aim to break the Covid-19 infection chain while reducing STH infection. Furthermore, the Indonesian government operated a health program that administered Mass Deworming Drugs (POMP) to elementary school-age children.[24] POMP provision allowed children to take anti-worm medications easily. It could impact the findings as no STH infection was discovered in study participants.

STH infection with nutritional status

There were 5 people (5.43%) experiencing severe thin conditions and 15 experienced (16.3%) having thin conditions. This finding suggested that STH infection was not the cause of the poor and deficient nutritional status of children in Neglasari elementary school. According to Liena et al., malnutrition in children can be caused by various factors, including worm infections. Furthermore, the pathway from STH infection to producing a decline in nutritional status takes a long time and depends on the severity of the illness.[25] According to Annida et al., the causative factors of malnutrition are infectious disorders and pattern factors of eating disorders, bad parenting, a lack of proper food intake, and lack of health care.[26]

Research conducted by Emmanuel et al. revealed that parasitic infections play an important role in increasing the incidence of malnutrition by disrupting the immune system and changing the balance of macro and micronutrients in the body. STH infection has been demonstrated to modify the nutritional pool by influencing food intake, metabolism, and micronutrient absorption in the intestine. Micronutrient deficiencies result from poor nutrient absorption, which is part of malnutrition caused by a lack of essential vitamins and minerals in the body.[15] According to the research by Mary et al., STH infection was also associated with low food intake, impaired absorption mechanisms, and metabolic alterations that result in poor growth and nutrient loss.[27]

According to Zelleke et al., there was a strong correlation between *T.trichiura* infection and stunting, as the parasite produced a persistent inflammatory process that resulted in enteropathy, which triggered nutrient absorption problems and intestinal leaks.[28] Additionally, moderate and severe *T. trichiura* infections were related to malnutrition, according to Solomon et al. Mature parasite worms are known to contribute to gastrointestinal blood loss and immunological problems.[29]

According to a study by Abraham et al., intestinal worm infection might directly or indirectly contribute to malnutrition. It occurred due to intestinal worms that induced the pathophysiology of the gastrointestinal tract by secreting substances that inhibit pancreatic enzymes and prevent nutrients from being absorbed in the small intestine. Worms also trigger persistent blood loss and intestinal inflammation, which results in malnutrition.[30] To more precisely assess this correlation, research participants' feces must be examined in regions where high STH infections are endemic.

Personal hygiene with nutritional status

Personal hygiene variables and nutritional status was correlated (p = 0.000). Children with severely thin nutritional levels had poor and bad personal hygiene habits. This result was consistent with recent research by Pagdya et al. in 2022, which found a substantial association between personal hygiene and the stunting rate. People with poor personal hygiene were more susceptible to infection, reducing nutritional status.[31] The habit of not washing hands before eating makes it easier for worm eggs to enter the digestive system orally. According to Johana et al., 2020, Ascaris and trichuris eggs enter the digestive system orally through contaminated food.[32] Hookworms enter the body through the skin when someone plays on the ground without wearing shoes.[33] Furthermore, Febriana et al., 2020 determined that adequate personal cleanliness keeps microbial diseases out of the digestive system. However, this study contradicts the findings of Lida et al. 2018, revealing no correlation between personal hygiene and nutritional status.[34]

CONCLUSION

Most children in Neglasari Elementary School had good personal hygiene, and none had STH infections; thus, their nutritional status was generally good. It can be concluded that the correlation between nutritional status and personal hygiene was significantly correlated.

CONFLICT OF INTEREST

No conflict of interest.

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