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The Impact of Nutrition, Helminth Infection, and Lifestyle on Elementary School Student's Achievement

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ABSTRACT

There is a lot of helminth infections and malnutrition cases in Indonesia. Some of the effects of helminth infection are anemia, diarrhea, malnutrition, intestinal obstruction, growth and developmental disorder, and also cognitive impairment. This study aimed to explore the impact of nutrition, helminth infection, and lifestyle on elementary school students' achievement. An observational analytical study with the cross-sectional design was used. The study was participated by 65 elementary school students grade 3, 4, and 5. The study was conducted in Pasir Panjang Elementary School, Kupang, Nusa Tenggara Timur, Indonesia. The data was analyzed using chi-square. There were 7 students (10.77%) having helminth infections:4 students (57.1%) had *Ascarislumbricoides* infection, 2 students (28.6%) had *Enterobius vermicularis* infection, and 1 student (14.3%) had *Strongyloides stercoralis* infection. There were no differences found on students' achievement between students with normal and low nutritional state ($p = 0.917$; $p > 0.05$) and between different lifestyle habit ($p = 0.768$; $p > 0.05$). However, a significant difference in students' achievement was found between students with and without helminth infection ($p = 0.036$; $p < 0.05$). Helminth infection had a significant impact on elementary school students' achievement, but no significant impact found for differences in nutritional state and lifestyle habit.

Keywords: *Helminth infection, nutritional status, student's achievement*

INTRODUCTION

Children are the next generation who will determine the quality of a nation in the future. Indonesia is a big country with almost 250 million population with high prevalence of malnutrition cases in children. Besides, the prevalence of intestinal parasitic infection is also still high which is thought to have impact on children learning achievement [1, 2, 3].

Nutritional status of a child is influenced by multiple factors, some of them are the quality of intake and infection. The infection itself may cause undernutrition since infection can decrease the child intake and on the other hand increase the body nutritional demand. Intestinal parasitic infection can be caused by Soil-transmitted Helminths and intestinal protozoa, without symptoms and tend to be chronic.

Children are the most frequent target of intestinal parasitic infection, although intestinal parasites may infect any ages. The children will experience the biggest impact caused by the infection such as iron deficiency, anemia, diarrhea, malabsorption, malnutrition, intestinal obstruction, inhibition of cognitive development and immunologic response to bacterial, viral, and protozoal infection. The community which does not apply clean and healthy lifestyle may have an influence on the high prevalence of intestinal parasitic infection [1, 4, 5, 6, 7, 8]. This study aimed to explore the impact of nutrition, helminth infection, and lifestyle on elementary school students' achievement.

MATERIALS AND METHODS

This is an observational analytic study with cross sectional design located in Pasir Panjang Elementary School, Kupang City, East Nusa Tenggara, Indonesia.

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Table 2. p53 and surviving expression results before and after the induction phase chemotherapy

Variable	*Number*	*Percentage (%)*
Gender:		
Male	33	50.77
Female	32	49.23
Age :		
8 years old	6	9.23
9 years old	21	32.31
10 years old	20	30.77
11 years old	14	21.54
12 years old	4	6.15
Nutritional indicator:		
(BMI for age)		
Very thin (< - 3 SD)	11	16.92
Thin(- 3 SD to - 2 SD)	21	32.31
Normal (- 2 SD to 2 SD)	31	47.69
Obese (> 2 SD)	2	3.08
Lifestyle :		
Good	51	78.46
Not good	14	21.54
Student's Achievement:		
Good	26	40.00
Not good	39	60.00
Helminth infection:		
Negative	58	89.23
Positive	7	10.77
Type of helminth infection:		
Ascaris lumbricoides	4	57.1
Enterobius vermicularis	2	28.6
Strongyloides stercoralis	1	14.3

Samples were chosen by consecutive sampling technique. Sixty-five students consisted of grade 3, 4, and 5 joined the study, with exclusion criteria, sick or absent in the day of sampling, and refuse to adhere to the study. Student's Parents permitted all participant by signing an informed consent.

Parasitic infection was diagnosed by microscopic examination of the sample's stool to identify helminth's egg, larva, or protozoa. Nutritional status was determined by comparing the sample's weight and age with the table on weight/age scale. Student's achievement was determined by looking at the student's ranking in the class and classified into good and not good. The student's clean and healthy lifestyle was determined by questionnaire on the habits of washing hand before having a meal, cutting nails regularly, using shoes/sandals when playing on the ground or yard, defecation in the proper toilet, and changing bedding regularly.

RESULTS AND DISCUSSION

The total population of students in the 3rd, 4th, and 5th grade is 151 students. The sample of this research is 65 student, which was counted with the Lameshow formula for cross-sectional studies. There are 33 (50.77%) male respondents and 32 (49.23%) female respondents for this study. All of the respondents aged between 8 and 12 years old, with the most (32.31%) are 9 years old children. Most of the students (60%) did not get a good achievement in their study, only 40% considered getting a good performance. Nutritional status was calculated using z-score for body mass index (BMI) according to age (BMI/age) and classified into very thin, thin, normal and obese. The result showed that most students are less than normal (49.23%), either very thin (16.92%) or thin (32.31%), with only 3.08% were obese (Table 1).

Although a majority of students had practiced a healthy lifestyle (78.46%), 7 students (10.77%) found to be infected by an intestinal parasite: 4 students infected by *Ascaris lumbricoides*, 2 infected by *Enterobius vermicularis*, and 1 infected by *Strongyloides stercoralis*. The infections were determined by microscopic analysis of the feces where eggs of *A. lumbricoides* or *E. vermicular* is were found. Rhabditiform larvae of S. *stercoralis* were found in the feces of 1 students.

The prevalence of parasitic infections found in this study is 10.77%. This is consistent with Liena Sofiana's study in Salatiga, Indonesia with the prevalence of 9.1%. *A. lumbricoides* is the highest parasitic infections which are found in 4 students of Pasir Panjang Elementary School Kupang City. This is different from two previous studies. Hookworm is found to be the highest parasitic infections in Africa, and *Trichuris triciura* is the highest in Kalimantan [11, 12, 13, 14, 15].

Table 2 shows statistically significant difference between positive and negative intestinal parasitic infection group on student's achievement (p = 0.036). This is consistent with Cheng Fang Liu's research in the inland China in 2013.1 A chi-square statistical analysis of the clean and healthy lifestyle on student's achievement showed no difference (p – 0. 768). Exposure to clean and healthy lifestyle to the students of Pasir Panjang Elementary School has frequently been done, for example about the correct hand wash and how often and when to do it. This is shown by 51 out of 65 respondents has applied the clean and healthy lifestyle. This

Table 2. The correlation the intestinal parasitic infection, lifestyle and nutrition to the student's achievement

Parameters	*Criteria*	*Achievement*			*p*
		Good (N)	*Not Good (N)*	*Total (N)*	
Intestinal Parasitic Infection	Negative	26	32	58	0.036
	Positive	0	7	7	
	Total	26	39	65	
Clean & Healthy Lifestyle	Good	21	30	51	0.768
	Not Good	5	9	14	
	Total	26	39	65	
Nutritional status	Normal	14	19	33	0.917
	Thin	8	13	21	
	Very thin	4	7	11	
	Total	26	39	65	

might be the reason why there was no significant difference in the application of clean and healthy lifestyle on student's achievement. This result is consistent with Liena Sofiana's study in Salatiga, Indonesia which found that most of the respondents have been implemented clean and healthy lifestyle [16].

Moreover, the nutritional status had no difference on student's achievement in Pasir Panjang Elementary School, Kupang City (p = 0.917). This result is contradictive to Cheng Fang Liu's research in the inland China in 2013 and to Rosita Hayatus Sa'adah's research in Padangpanjang Indonesia which suggested that there were statistically significant differences of nutritional status on student's achievement. The different result showed by this study might be caused by differences in the way student's achievements were measured. We measured achievement from students' ranking in the class, not average of every school subject grade [1, 2, 11, 14].

Although a majority of the students in Pasir Panjang Elementary School Kupang City have good nutritional status (31 students; 47.69%), there were some students in the thin (21 students; 32.31%) and very thin (11 students; 16.92%) nutritional status. However, only two students were found to be obsessed (3.08%). The prevalence of parasitic infections in Pasir Panjang Elementary School Kupang City is found to be as high as 10.77%. The majority of the students in Pasir Panjang Elementary School has been implementing clean and healthy lifestyle (78.46%), while the rest 21.54% has not. The parasites infections found in the students of Pasir Panjang Elementary School Kupang City were *A. lumbricoides*, *E. vermicularis*, and *S. stercoralis*.

CONCLUSION

This study showed that there was a significant difference between the parasites infected group and non-infected group on the student's achievement. However, there were no significant differences of nutritional status variable and clean and healthy lifestyle variable on the student's achievement in Pasir Panjang Elementary School Kupang City.

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