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ORIGINAL ARTICLE

Intestinal Protozoa Infections in Relation to Nutritional Status of the Mandangin Island Elementary School 6 Students in Sampang Regency

Marlinda Kurniati[1], Budiono[2*], Sri Wijayanti Sulistyawati [3]

[1] Faculty of Medicine, Universitas Airlangga, Surabaya.
[2] Department of Public Health and Preventive Medicine, Faculty of Medicine, Universitas Airlangga, Surabaya.
[3] Department of Parasitology, Faculty of Medicine, Universitas Airlangga, Surabaya.

A B S T R A C T

Introduction: Intestinal protozoa infections is a tropical infectious disease that can be found mainly in developing countries. It will cause some health problem such as undernutrition and stunting. This study was aiming to determine the correlation between the prevalence of intestinal protozoa infections with the nutritional status of Mandangin Island Elementary School 6 students in Sampang Regency.

Methods: The *cross-sectional* study was used as the design in this research. The prevalence of protozoa intestinal infections was performed by doing a stool examination on a light microscope. Meanwhile, the nutritional status was calculated using *BMI-for-age*and *height-for-age*index, recruited from Mandangin Island Elementary School 6 students. Both variables were analysed using SPSS.

Results: On microscopic examination has found 71.4% (n=30) positive samples and 28,6% (n=12) negative samples. On *BMI-for-age* measurement there were 4,8% obesity, 7,1% overweight, 73,8% normal, 9,5% thinness, and 4,8% severe thinness. Meanwhile, on *height-for-age* measurement there ware 73,8% normal and 26,2% stunted . The prevalence of intestinal protozoa infections was correlated with the nutritional status using SPSS (p= 0,375, p= 0,539, a= 5%).

Conclusion: There was no significant correlation between intestinal protozoa infections with the nutritional status of Mandangin Island Elementary School 6 students in Sampang Regency. These conditions caused by the pathogenicity stage to cause a decrease in the nutritional state has not been reached.

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* Correspondence: budiono@fk.unair.ac.id

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Introduction

Undernutrition and stunting are one of many kind health problems that found in developing countries, including Indonesia. This condition usually was associated with helminth and other chronic infections. If we see it holistically, undernutrition and stunting can also cause by bacterial infections and intestinal protozoa infections.

Intestinal protozoa infections is a tropical infectious disease that mainly can be found in developing countries. A study in West Sumba shows 95.5% of all samples were infected by Intestinal Parasitic Infections[1]. Protozoa infections can occur in the intestine or other organs according to their life cycle. The protozoa that commonly found as intestinal protozoa infections include *Blastocystishominis*, *Entamoebahistolytica*, *Giardia lamblia*, *Balantidiumcoli*, and *Cryptosporidium sp*. Intestinal protozoa infections can be found as single-infection or mix-infection[2]. Infections caused by intestinal protozoa from different species will cause different symptoms but also have common symptoms such as weight loss[3].

Intestinal protozoa infections mainly found in elementary school age children. This is because of their knowledge about personal hygiene and healthy life behaviors are still improving[4]. Infections caused by intestinal protozoa will lead to physiological changes which over a long time will reduce the host's nutritional status[5].

Intestinal protozoa infections usually occur in areas with poor sanitation status, low economic status, inadequate water sources and health facilities. These characteristics representeted by the general condition of Mandangin Island, Sampang District, Sampang Regency.

Based on the background, This study was aiming to determine "Intestinal Protozoa Infections in Relation to Nutritional Status of the Mandangin Island Elementary School 6 in Sampang Regency" to find out the correlation between the two variables.

Methods

This research was a *cross-sectional* study. The research variables were the prevalence of intestinal protozoa infections and nutritional status of the students. This research had received approval of ethical clearance from ethics commission of Faculty of Medicine Universitas Airlangga Surabaya.

Stool samples were obtained using random sampling technique according to inclusion criterias which were the samples collected from 2nd – 6th grade student of Mandangin Island Elementary School 6. The stool samples were examined using direct smear method. For the statistical analysis there were any consideration such as the samples must be equipped by identity, questionnaire, measurement of height and weight, and the results of the microscopic examination, especially for the positive samples, were included in the 5 species that studied in this study (*E. histolytica, G. lamblia, B. hominis, B. coli,* and *Cryptosporidium sp)*.

Initially the prevalence of intestinal protozoa infections, nutritional status measurements, and associated factors were assessed descriptively by using Microsoft Excel 2010. Risk factors were identified using chi-square test. Then, the correlation between the prevalence of intestinal protozoa infections with the nutritional status was determined by chi-square test. *P* values less than 0.05 were considered statistically significant. SPSS software (Statistical Package for the Social Sciences) for windows version 16 was used for statistical analysis.

Results

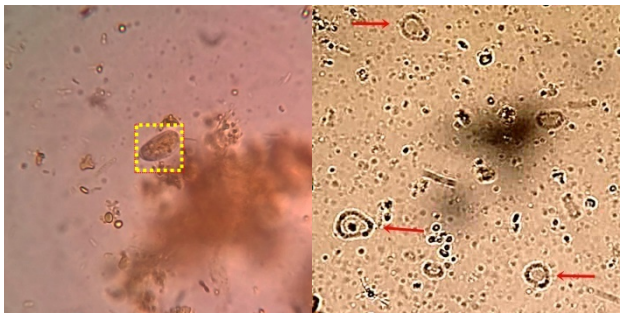
Prevalence of Intestinal Protozoa Infections

The study included 42 elementary school students, consisted of 21 males (50.0%) and 21 females (50.0%). The age was ranging between 6 and 15 years old, which were categorized into two age groups (Table 2). About 71.4% (30) of the participants were infected by intestinal protozoa. *B.hominis*was the most prevalent species (40.5%; 17) followed by *G.lamblia which* prevalence rates was 19.0% (8) (Table 1). For the 2nd table, the number of the samples (n) can be <47 due to missing values. Both single infection of *B. hominis* and *G. lamblia* added with 5 mix infection.

Table 1.Distribution of Intestinal Protozoa Infections by species

Protozoa Infections	n	%
Single Infection		
Blastocystis hominis	17	40,5
Giardia lamblia	8	19,0
Mix Infection		
*Blastocystis hominis*and *Giardia lamblia*	5	11,9
Negative	12	28,6
TOTAL	**42**	**100**

Source: Research Data, Processed



(A) (B)

Figure 1. On light microscopic examination has found *Giardia lambia* cysts (A) and vacuolar form of *Blastocystis hominis* (B)

Table 2.Prevalence of Intestinal Protozoa Infections by age and gender

	n	Negative (%, n)	*Blastocystis hominis*(%, n)	*Giardia*

				lamblia (%, n)
Gender				
Male	23	12,8 (6)	23,4 (11)	12,8 (6)
Female	24	12,8 (6)	23,4 (11)	14,9 (7)
Age				
≤ 10 years	29	12,8 (6)	29,8 (14)	19,1 (9)
> 10 years	18	12,8 (6)	17,0 (8)	8,5 (4)

Source: Research Data, Processed

Intestinal Protozoa Infections and risk factor

Risk factors associated with intestinal protozoa infections in relation to personal hygiene, self habit, and environmental sanitation were assessed by chi square test. The data on risk factors are summarized in 3rd table. And it showed no significant correlation with the intestinal protozoa infections ($p > 0.05$). As a note, the number of the samples (n) can be <47 due to missing values. Both single infection of *B. hominis* and *G. lamblia* added with 5 mix infection.

Table 3.Associated risk factors

	N	Negative (%, n)	Positive (%, n)	*P*-value
Hand washing before eating				
Yes	41	25,0 (11)	68,2 (30)	0,807
No	3	2,3 (1)	4,5 (2)	
Wash ingredients before cooking/eating				
Yes	42	23,9 (11)	67,4 (31)	0,959
No	4	2,2 (1)	6,5 (3)	
Snacking habits outside				
Yes	42	24,4 (11)	68,9 (31)	0,787
No	3	2,2 (1)	4,4 (2)	
Having diarrhea lately				
Yes	16	6,5 (3)	28,3 (13)	0,408
No	30	19,6 (9)	45,7 (21)	
Water source				
PDAM	6	2,1 (1)	10,6 (5)	0,594
Others	41	23,4 (11)	63,8 (30)	
Playing with cattle				
Yes	27	13,0 (6)	45,7 (21)	0,477
No	19	13,0 (6)	28,3 (13)	

Source: Research Data, Processed

Intestinal Protozoa Infections and Nutritional Status

Prevalence of intestinal protozoa infections in relation to food intake status was assessed by chi square test in Table 4. It showed no significant correlation between them ($p > 0.05$). And also there is no correlation between nutritional state and intestinal protozoa infections. As a note, a total of the positive samples on Table 5 obtained from single infection (25) + mix-infection (5) = 30.

Table 4.Food intake status

	N	Negative (%, n)	Positive (%, n)	*P*-value
Eating frequency				
< 3 times per day	19	12,8 (6)	25,5 (12)	0,334
≥ 3 times per day	28	12,8 (6)	48,9(23)	
Healthy four perfectly five				
Yes	21	12,8 (6)	31,9 (15)	0,668
No	26	12,8 (6)	42,6 (20)	

Source: Research Data, Processed

Table 5.Nutritional State based on Intestinal Protozoa Infections

Prevalence of IPI / Nutritional State index	Positive (%, n)	Negative (%, n)	Total (%, n)	*P*-value
Height for age				
Stunting	21,4 (9)	4,6 (2)	26,2 (11)	0,375
Normal	50,0 (21)	23,8 (10)	73,8 (31)	
BMI for age				
Severe thinness	2,4 (1)	2,4 (1)	4,8 (2)	
Thinness	4,8 (2)	4,8 (2)	9,6 (4)	
Normal	54,8 (23)	19,0 (8)	73,8 (31)	0,539
Overweight	7,1 (3)	0 (0)	7,1 (3)	
Obesity	2,4 (1)	2,4 (1)	4,8 (2)	

Source: Research Data, Processed

Discussion

On microscopic examination,*B. hominis* is the most frequent, followed by *G. lamblia* and *Blasto-Giardia* mixed infection. In a study conducted by Sungkar on Sumba, *B. hominis* infection was 34.4% and *Giardia lamblia* 4.5%[1]. And a study on Samosir Island which received 23.1% positive samples of protozoa with 4.9% *B.hominis* infection and *G. lamblia* at 12.2%[6]. It can be concluded that the prevalence of *B.hominis* on Mandangin Island is higher than in other regions. *B. hominis* and *G.lamblia* infection in boys and girls have the same prevalence. Meanwhile, based on the age both of them are found in children less than 10 years.

On the results of the questionnaire variable analysis with the prevalence of intestinal protozoa infection, there was no significant correlation in personal hygiene, habits, sanitation aspects. It caused by several things such as the small number of samples, the questionnaire questions are not answered completely, and the students have difficulty in understanding the contents of the question constrained by language problems. Although there was no significant relationship between them, based on an analysis of the numbers obtained, the majority of these children had snack habits outside where it had a high chance of being contaminated by various microorganisms including protozoan intestinal cysts. In addition, they also have the habit of playing with the cattle, and well is their mainwater sources.A study conducted in Bali shows that a high number of open defecation has a significant correlation in *Blastocystis spp.* Infection[7]. Meanwhile in Mojo, parent's knowledge about diarrhea and behavior of washing hands after playing have a significant correlation in intestinal parasite infection[9].

Based on table 4, mostly they eat ≥3 times per day, but the foods were not meet the healthy four perfectly five criteria. The frequency of eating and the diversity of food is calculated as the intake status, where the amount of intake with energy use must be balanced to get a normal nutritional status. Sachithananthan in his study proved that eating frequency did not have a significant correlation to

body mass index in children in Abha City[9]. In addition, a study conducted by Christina concluded that consuming a variety of foods has a relationship to nutritional status in children[10].

Theoretically, intestinal protozoa infections have a correlation with nutritional status, this can be intestinal protozoa infections that cause changes in nutritional status, or nutritional status, especially a decrease in nutritional status can affect the host's immune system so that it is more easily infected by pathogenic organisms[11]. In the analysis, for the prevalence of mixed intestinal protozoa infection of *B. hominis-G. lamblia* was included in the category of single infection by *G. lamblia* based on the statement that *B. hominis* could be pathogenic if at least 5 organisms were observed from the whole field of view using 400 times magnification and no other parasitic infections[12].

Based on table 5, it describes the correlation of intestinal protozoa infections and overall nutritional status statistically. It showed that there was no significant correlation. There are several theories that can underline this situation. First the high frequency and quality of food consumption will increase the food intake status, so even though the energy use was high, it will be compensated by the food intake status, at least the nutritional status will be in the normal-obesity range[3]. Secondly, for the positive samples, especially positive infected by *B. hominis*, it can be caused by the low level of pathogenicity.

For the nutritional status based on the *height-for-age* index of 42 students found that 73,8% were normal and 26,2% stunted. Epidemiologically, the percentage of stunted is still high. On Nutritional Status Observationin 2017 based on the *height-for-age* index, showed the prevalence of stunted in Indonesia was 19,8%. In NTT, anendemic area of malaria infections showed the prevalence of stunted was 22,3% and the lowest in Bali was 14,7%[13]. It can be concluded thatthe prevalence of stunted in Mandangin Island is higher than NTT and Bali. Stunted represents chronic undernutrition that can be lead to growth disturbance in children.

Conclusion

High prevalence of intestinal protozoa infections in Mandangin Island Elementary School 6 students was not followed by a decrease in nutritional status. This situation caused by the degree of pathogenicity that has not reached the limit where it can cause clinical manifestations such as decrease in nutritional status. Meanwhile, a high prevalence of stunting based on the *height-for-age* indexmay be associated with the lack of varied food consumption over a long period.

CONFLICT OF INTEREST

The author stated there is no conflict of interest.

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