ORIGINAL RESEARCH ARTICLE

Assessment of Intestinal Parasitic Infection and Personal Hygiene Practice Among School Children in A Primary School in A Village in Jakarta, Indonesia

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ABSTRACT

Background: Intestinal parasitic infections (IPI) are still among developing countries' most prevalent parasitic infections. IPI is closely linked to nutrition, personal hygiene, environmental sanitation, income, climate, and education. Aims/Objectives: To assess the IPI and personal hygiene status among school children in the flood-prone area in Jakarta, Indonesia.

Methodology: A cross-sectional study was conducted in a government primary school in South Jakarta, Indonesia, involving 157 students. A structured questionnaire was developed to assess the personal hygiene behavior of the students. A physical examination of the nail fingers was conducted as well. Feces samples were collected from each student and examined using direct smear techniques to identify intestinal parasite infection.

Results: The prevalence of IPI was 38.2% in single and mixed infections. Intestinal parasites recorded in this study were Blastocystis hominis, Giardia lamblia, Trichuris trichiura, hookworm eggs, and non-pathogen protozoa Entamoeba coli. There is no significant difference between the prevalence of IPI with footwear usage, nail-cutting once a week (p=0.718), handwashing before the meal (p=0.688), handwashing after defecations (p=0.618); however, there is a significant difference between nail cleanliness and IPI (p=0.003).

Conclusions: The prevalence of IPI in these school children was high and required interventions like health education and action on nail and hand hygiene behavior from school personnel or teachers.

Key-words: Intestinal Parasitic Infection, flood-prone area, primary school, personal hygiene, nail cleanliness

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INTRODUCTION

Parasitic infection is still considered one of the major health issues in developing countries, including Indonesia. Intestinal parasitic infections (IPI) are among the most prevalent parasitic infections in humans in developing countries.[1] People of all ages are prone to infection by intestinal parasites; however, children are the most predominant host.[2] Even though the morbidity rate of parasitic intestinal infection is not as high as any other disease, it may have several impacts on many aspects, such as children's growth and development, nutritional status, anaemia, and productivity.[2,3] Clinical manifestations include abdominal pain, diarrhoea, nausea, vomiting, bloating, dysentery, rash or itching in the rectum or vulva, stomach tenderness, malaise, weight loss, and worms in the stool.[2] This disease may impact many life aspects, such as children's growth and development, nutritional status, and anaemia.[4]

Helminthes and protozoan parasites cause IPI and are closely linked to personal hygiene, nutrition, income, education level, climate, and environmental sanitation.[5,6] Personal behaviour hygiene is one important factor that carries out disease transmission.[7] Personal hygiene includes handwashing, bathing, fingernails, toenails cleanness, location of defecation, drinking water, and footwear.[6,8] The prevalence of intestinal protozoan infection among primary schoolchildren in suburban areas of Myanmar was 10.6%.[9] Assavapongpaiboon et al[10] reported that intestinal parasite rates were 22.1% (15.6% single infection and 6.5% multiple infections) in Suburban Public Primary Schools in Thailand. In Maluku, Indonesia, 40.6% of fourth- and fifth-grade primary schoolchildren were infected with one or more intestinal protozoans, and the lack of hygiene knowledge was a significant risk factor for this infection.[11]

Kalibata village is one of the most flood-prone areas in Jakarta, Indonesia.[12] Kalibata village has annual flooding events because the winding Ciliwung River passes it, and this village has a high population density.[13] Han et al[14] reported the prevalence of helminth infection was 24% in flood-prone villages in Myanmar. Meanwhile, intestinal protozoa infections such as amoebiasis, cryptosporidiosis, and blastocystosis increased post-floods.[15] In addition to environmental and geographical conditions, local habits and behavior factors can increase the risk of parasitic infections transmitted via the fecal-oral route. Following this, it is important to know the prevalence of parasitic infection in flood-prone areas and the relationship with people's behavior to improve control measures.

This study aimed to examine prevalence of intestinal parasite infections and personal hygiene practices among primary school children in a flood-prone village in South Jakarta, Indonesia. By knowing the specific personal hygiene practice in a population associated with the incidence of intestinal parasite infections, especially the group of school children, appropriate education and action can be determined to prevent infection

METHODOLOGY

The study was conducted in a primary school in Kalibata village, Pancoran subdistrict, South Jakarta, Special Capital Region of Jakarta, Indonesia. Kalibata is an area in South Jakarta with a high frequency of floods. It is expected that the environment will have a low hygiene rate. The school was near the Ciliwung River, the only river in Jakarta and most of the students lived around the school area.

This school-based cross-sectional was executed for six months, from January until June. The study subjects were Sekolah Dasar Negeri (SDN) Kalibata students in grades 1–5 who attended the school. The total number of students from grades 1-5 was 1345. The inclusion criteria were elementary students grade 1-5 SDN Kalibata, live around the school (Pancoran District), present during data collection, have parental consent for participating in the study, and agree to collect faeces in stool containers. Exclusion criteria are that the child had a serious illness or had been consuming antibiotics or anti-parasite in the past months, subjects with inadequate stool samples and who didn't return the container. The sample size was calculated using the single proportion sample size formula: $n= (Z\alpha^2 \times P \times Q)/ d^2$. The number of required samples was 137 students. The stool container was distributed two times the number of samples needed to reach the minimal sample size.

After the parents signed the informed consent, face-to-face interviews using a structured questionnaire were conducted with students accompanied by the parents regarding the practice of cutting nails, the habit of washing hands before eating, the habit of washing hands after defecating, and the habit of wearing footwear. Cutting nails practice was evaluated as good if the student cut their nails every week and bad if this habit was made every or more than two weeks. The habit of washing hands after defecating and before eating was good if the students always washed their hands using soap or before eating and bad if they never or rarely washed their hands. The habit of wearing footwear was good if the student always wore shoes or slippers outside the house. Additionally, their nails were also examined to assess nail hygiene. It was evaluated based on the length of the nails (long or short) and the cleanliness of the nails (dirt or no dirt). Good if the nails were short and had no dirt; Bad if they were short or long and dirty.

After collecting the information, all the selected students got a labelled container to collect stool the next day. The collected stool was immediately transported to the laboratory at room temperature. The stool examination took place in the laboratory of the Department of Parasitology Faculty of Medicine, Universitas Indonesia. Every stool sample was directly examined microscopically at 100x and 400x magnification by two parasitologists using Lugol staining. The parasitologists followed the standard operating procedures described in the World Health Organization Manual of Basic Techniques for Health Laboratory to ensure the accuracy of the results.[16] The sample is positive if egg and/or larvae for helminth infection and cyst for protozoa infection were found. In this research, all the intestinal parasites will be observed.

The data were processed with the SPSS 20 program and then served on tables in the descriptive-analytic method. Bivariate analysis was done using the Chi-square test with a significance level of 5% (α=0,05). Informed consent was given to the subject's parents, including research procedure, examination and questionnaire to get personal hygiene information, and stool examination taken from the subject of this research. The research has obtained ethics approval No. 468/UN2.F1 from the Ethical Committee on Health Research of the Faculty of Medicine Universitas Indonesia.

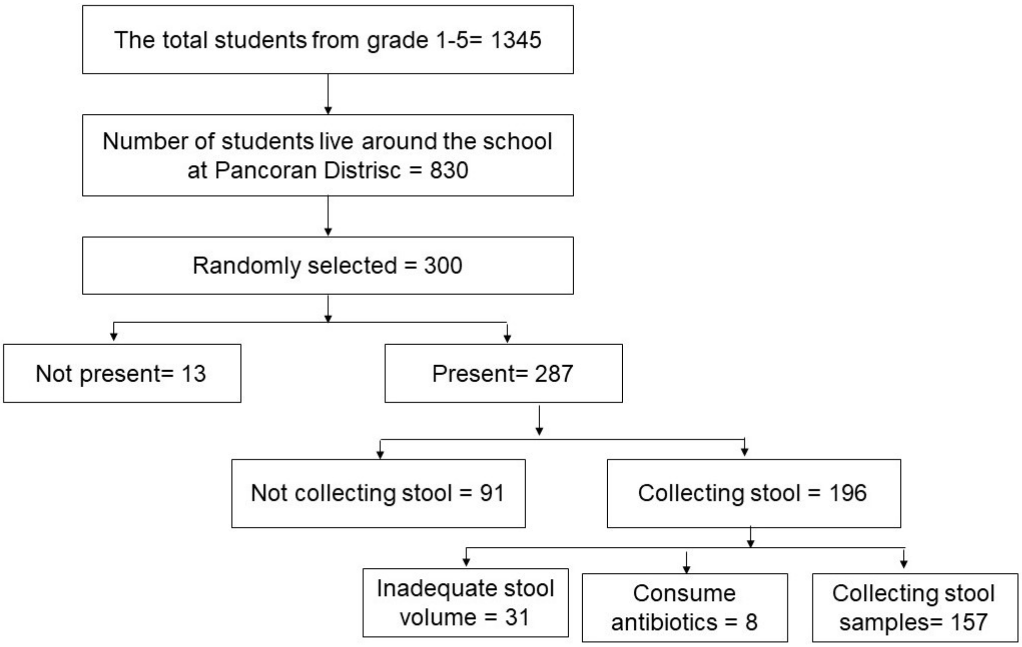

Figure 1: The Scheme of Subjects Participants

RESULTS

A total of 157 students were involved in the study; eight students consumed antibiotics, and 31 students did not collect the appropriate volume of stool (Figure 1). Of 157 students, there were 78 (49.7%) girls and 79 (50.3%) boys (Table 1). Positive IPI was detected in 60 (38.2%) students; 54 students were infected by a single IPI, while mixed intestinal parasites infected six. The prevalence of IPI was higher in boys (44.3%) than girls (32.1%) and also in higher levels of education (46.8%) than in first to third grade (30%).

Intestinal parasites were recorded in this study *Blastocystis hominis, Giardia lamblia, Trichuris trichiura,* hookworm, and non-pathogen protozoa *Entamoeba coli* (Tabel 2). The most prevalent parasite infection was *B. hominis* as a single infection (28%) or mixed infection with other parasites (3.8%) and followed by *G. lamblia* (5.1%), *T. trichiura (0.6%)*, and hookworm (0.6%). Multiple infections include *B. hominis* with *E. coli* infection (3 students) and *B. hominis* with *G. lamblia* (3 students).

Table 1: Level of Education and Gender wise distribution of cases with Intestinal Parasitic Infection

Characteristics	Intestinal Parasitic Infection		Total (%)	P Value
	Positive (%)	Negative (%)		
Total cases	**60 (38.2)**	**97 (61.8)**	**157 (100)**	
Level of education (grade)				
1-3 grade	24 (30)	56 (70)	80 (51)	0.31
4-5 grade	36 (46.8)	41 (53.2)	77 (49)	
Gender				
Boys	35 (44.3)	44 (55.7)	79 (50.3)	0.11
Girls	25 (32.1)	53 (67.9)	78 (49.7)	

Table 2: Distribution of Parasite Infection Based on Level of Education and Gender

Characteristics	Single Infection (n=54)				Mix Infection (n=6)	
	Protozoa		Helmint		Protozoa	
	Bh (%)	*Gl (%)*	*Tt (%)*	*Hw (%)*	*Bh+Ec (%)*	*Bh+Gl (%)*
Level of education (grade)						
1-3 (n=80)	16 (20)	3 (3.8)	0	1 (1.3)	2 (2.5)	2 (2.5)
4-5 (n=77)	28 (36.4)	5 (6.5)	1 (1.3)	0	1 (1.3)	1 (1.3)
Boys (n=79)	23 (29.1)	6 (7.6)	1 (1.3)	1 (1.3)	2 (2.5)	2 (2.5)
Girls (78)	21 (26.9)	2 (2.6)	0	0	1 (1.3)	1 (1.3)
Total (n=60)	44 (28)	8 (5.1)	1 (0.6)	1 (0.6)	3 (1.9)	3 (1.9)

Bh: *Blastocystis hominis*; Gl; *Giardia lamblia*; Tt: *Trichuris trichiura*; Hw: *hookworm*; Ec: *Entamoeba coli*

Table 3: Distribution of Intestinal Parasites Infection According to Personal Hygiene Aspects

Personal Hygiene Aspects	Positive IPI (%)	Negative IPI (%)	Total (%)	P-value*	Odds ratio	95% CI
Nail Cleanliness						
Good	22 (27.2)	59 (74.1)	81 (100)	0.003*	0.373	0.192-0.725
Bad	38 (50.0)	38 (50.0)	76 (100)			
Nail cutting habits						
Good	36 (37.1)	61 (62.9)	97 (100)	0.718*	0.885	0.457-1.714
Bad	24 (40.0)	36 (60.0)	60 (100)			
Handwashing before meal						
Good	46 (37.4)	77 (62.6)	123 (100)	0.688*	0.853	0.393-1.852
Bad	14 (41.2)	20 (58.8)	34 (100)			
Handwashing after defecations						
Good	50 (36.2)	88 (63.8)	138 (100)	0.168*	0.511	0.195-1.342
Bad	10 (52.6)	9 (47.4)	19 (100)			
Footwear usage habits						
Good	49 (38.3)	79 (61.7)	128 (100)	0.972*	1.015	0.442-2.329
Bad	11 (37.9)	18 (62.1)	29 (100)			

IPI - Intestinal Parasites Infection

Table 3 shows that based on the physical examination, nail cleanliness significantly affected the presence of IPI (Chi-square test, p= 0.003; 95% Cl 0.192-0.725). Of 157 students, 59 students (74.1%) with good nail cleanliness were negative for IPI, while 50% had unclean nails positive for IPI. On the other hand, even though 97 students had good nail-cutting habits, 36 were positive for IPI. Of 123 students who had handwashing before a meal, 46 (37.4%) had positive IPI. We also found that from 138 students who washed their hands after defecation, 36,2% of students had positive IPI. Footwear use was not statistically associated with the prevalence of IPI (Chi-square test, p = 0.972; 95% Cl 0.442-2.329).

Discussion

The study investigated the association between parasitic intestinal infections (IPI) and the personal hygiene behavior of primary school children in a primary school in Kalibata Village in South Jakarta. In this cross-sectional study, the prevalence of IPI in primary schools was 38.2%. The IPI cases, especially helminth infection, are considered lower than expected despite the selected area, a frequent flooding location. This occurrence may be caused by the previous intervention from the Ministry of Health in this primary school, such as hand washing and deworming with albendazole 400 mg once a year. The cure rate (CR) of a single dose of albendazole 400 mg as a treatment of ascariasis has been reported to be 96%, with an egg reduction rate (ERR) of almost 100%. Still, a lower efficacy was reported against *T.trichiura* dan hookworm.[17]

The low helminth infection may be due to environmental conditions not being optimum for developing soil-transmitted helminths (STH). The soil, which used to be humid and muddy after flooding, could form a favourable environment for STH development. It is known that the developmental stages of helminths in the environment before infecting the host depend on humidity.[18] The environmental and weather conditions at the elementary school at the time of the study were hot, dry seasons, which did not support the development of worm eggs. In addition, the school environment and most students' houses do not have yards with land but cast cement. STH eggs require soil to mature and cannot develop in dry areas with direct sunlight exposure.[2]

The Ministry of Health has assisted some primary schools in improving the quality of life by maintaining personal hygiene behaviour. One of the programs aimed at the children in this school is to do handwashing before a meal frequently, and it also has already provided the primary school with handwashing with soap (HWS).[19] Ubhayawardana et al[20] also found zero prevalence of helminthic infections in those affected by floods in Srilangka. These results could be due to anti-helminthic prophylaxis, good personal hygiene, and proper sanitation.

It can be seen that the most significant proportion of parasite findings is *B. hominis*, at 28%. *B. hominis* is classified in the Sporozoa class. The disease caused by this parasite is blastocystosis, and it can easily be found in tropical and subtropical areas. The prevalence of *B. hominis* infection in Jakarta reaches 15% of all cases of intestinal parasitic infections caused by protozoa.[21,22] *G.lamblia* is a protozoan with the second-highest prevalence in this study (5.1%). The prevalence rate of giardiasis compared to the previous study in Southwest Sumba, Indonesia, was lower (19%).[23] Albendazole single dose 400 mg is effective for treating STH infections but is less effective for protozoa infection. The suggested albendazole dosage for giardiasis for children is 10 mg/kg daily for five days. Inadequate doses of albendazole may contribute to increased giardiasis prevalence in some areas and the emergence of drug resistance.[17] Three students had *E. coli* in the stool as a non-pathogenic parasite, and its presence is considered harmless. Alzate, et al[18] found that this commensal amoeba probably contributes to maintaining gut-favourable conditions for beneficial bacteria like *Akkermansia*. However, when a person is infected with this parasite, it could be related to a healthy gut status.[18]

Infection with multiple intestinal parasites (mixed infections) was 3.8% among children in the current study. Six children were infected with mixed parasites; three were infected with *B.hominis* and *E.coli*, and three others were infected with *B.hominis* and *G. lamblia*. Blastocystis spp. often detected with other parasites such as *G. lamblia*, *E. histolytica*, or *E. coli*. In endemic areas of parasitic infections, especially in tropical or subtropical countries with low levels of education and sanitation, mixed parasitic infections occur frequently and do not present with specific gastrointestinal symptoms, resulting in late or underdiagnoses, especially in children.[24]

This research also revealed no association between nail cutting every week, handwashing before meals, handwashing after defecations, and footwear usage with IPI. Several reasons may contribute to this result, such as nutritional status, unhygienic food intake, or food handler.[25] The footwear used was corralled with the risk of worm infection[26], especially hookworms. In our study, the positive of helminth infection was very low. In this study, there is a significant association between nail cleanliness and IPI prevalence (p=0.003). Galgamuwa et al[27] found the statistically significant factors with intestinal protozoa infection are eating unwashed fruits, nail-biting, and sucking fingers. It is necessary to develop a questionnaire to assess students' behavior related to the transmission of protozoa intestinal infection, such as the source of water used, type of snacks (packaged food or fresh food) and ownership or familiarity with a domesticated or wild animal in school or house.

Our study has several limitations. First, the cross-sectional design only reflects judgments once and does not describe the children's behavior. Second, we examined a single stool sample using the direct examination technique, affecting many intestinal parasite species that may be undiagnosed. Still, two parasitologists' stool examinations helped improve the diagnostic reliability. Third, the questionnaire's limitations do not include questions related to the risk of protozoa transmission (consumption of raw food, sources of drinking water) and socioeconomic factors. Fourth, no pre- and during-flood of parasite infection data to see the infection changes. Lastly, the selection of samples from one school does not reflect the infection conditions in the district. Despite these limitations, this study adds valuable information about intestinal parasitic infections in flood-prone areas to design appropriate parasite infection prevention and management programs.

However, future studies should be conducted in this area with the large sample size by random sampling involving other schools, adding other diagnostic techniques to investigate the actual prevalence of parasite infection and using a standardized questionnaire to assess attitudes and behavior related to the risk of worm and intestinal protozoa infection. This study can add to the surveillance data because research on the prevalence of parasitic infections in Indonesia, a tropical country with varying levels of sanitation and hygiene, has not been carried out widely and continuously, even though epidemiological information is needed to support control efforts and eradicate parasitic diseases.

Conclusion

The prevalence of IPI in a primary school in a flood-prone village of Jakarta was 38.2%. This study found no association between handwashing, footwear usage, and nail-cutting behavior with IPI. Only the nail status of the children has an association with IPI. Intervention regarding the cleanness of nails must be done to reduce parasitic intestinal infection through education to parents and children.

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