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Parasitic Infestation in the Incidence of Diarrhea Among Toddlers in Jakarta, Bogor, Banjarmasin, and Makassar

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ABSTRACT

The occurrence of diarrhea in children under five years old (toddlers) is still a serious health problem because it can cause mortality and malnutrition in children. Diarrhea is one of the biggest causes of death in toddlers in the world. Data from the World Health Organization (WHO) reports that more than 10 million children under five years old die every year and around 20 percent of them die because of diarrhea. One etiology of diarrhea infection in children under five years old who often escapes attention is diarrhea caused by parasites. As a developing and tropical country, the incidence of diarrhea due to parasitic infections in Indonesia is quite high. Examination of diarrhea samples in children under five years old to identify the type of parasites that play a role in the incidence of diarrhea. Stool samples were collected from patients seeking treatment at several primary health care and hospitals in Jakarta, Banjarmasin and Makassar during 2015-2016. The stool specimens were collected in containers containing formaldehyde for microscopic examination. Blastocystis hominis was found to be the most prevalent parasite with an infection rate of 12.46% followed by Entamoeba coli 1.73%, Ascaris lumbrichoides 0.35%, Oxiuris vermicularis 0.35%, Endolomax nana 0.35%, and Hookworm (Ancylostoma sp and Necator americanus) 0.35%. Parasitic diarrhea increases susceptibility to other infections, should not be neglected, particularly in patients with chronic diarrhea. Accurate diagnosis decreases morbidity and mortality in patients with parasite infection.

Keywords: *toddlers, diarrhea, parasites*

1. INTRODUCTION

Diarrhea is defecation with a runny and liquid consistency and with frequency more than three times a day, while acute diarrhea is diarrhea that occurs suddenly and lasts briefly in a few hours to several days. The watery stool can be accompanied or without mucus and blood. In addition, diarrhea can also be accompanied by symptoms such as dehydration, fever, nausea and vomiting, anorexia, weakness, pale, abdominal keratin, sunken eyes, dry mucous membranes, decreased urine output, and others [1,2].

In children under five years old (toddlers), diarrhea is still one of the important health problems especially in developing countries, for instance, Indonesia. In Indonesia, diarrhea is still a major health problem because it often causes outbreak and sometimes even causes death [3]. Many risk factors that are suspected to be related to the incidence of diarrhea among children under five include hygiene, sanitation and inadequate drinking water supply, personal hygiene and improper preparation and storage of food for children. Hygiene in children under five is very much determined by their parents [4,5]. The magnitude of the problem due to diarrhea can be seen from the high morbidity and mortality rate. Many factors be a driving factor for diarrhea directly or indirectly. Diarrhea is one of the biggest causes of death in children under five in the world and malnutrition in children in developing countries [6].

World Health Organization (WHO) reports that more than 10 million children under five die every year. As many as 20 percent of them died due to diarrhea. At present the death rate caused by diarrhea is 3.8 per 1000 every year. Each year is estimated 2.5 billion incidents of diarrhea in children under five, and almost no change in the last two decades [7,8]. Based on a diarrhea morbidity survey conducted by the Diarrhea Subdit Ministry of Health's in 2010, the incidence of diarrhea in Indonesia in 2000- 2010 tends to increase. The diarrhea outbreak report from 2008 to 2016 stated that the CFR during the outbreak was still quite high (> 1%) except in 2011 the CFR when the outbreak was

0.40%, while in 2016 the CFR of diarrhea during the outbreak increased to 3.04%. In 2016 three outbreaks of diarrhea outbreaks were reported in three provinces, namely East Nusa Tenggara, Central Java and North Sumatra with 198 cases and 6 deaths (CFR 3.04%). In 2018, the number of diarrhea sufferers was 1,516,438 [9]. A study from Port Elizabeth South Africa reported that of 934 children, 26% were infected with A. lumbricoides and 22% with T. trichiura [10].

Diarrhea can be caused by infection or non-infection. Diarrhea because of infection can be caused by bacteria, viruses and parasites [11,12]. This study is a part of Identification of Enteric Pathogens, Analysis of Antimicrobial Resistance and Genotyping of Rotaviruses that Cause Diarrhea in Toddlers. The research aimed to identify various types of parasites that are the source of infection in the incidence of diarrhea in children under five. The results of the study are expected to be used as a basis for diarrhea control program policies for children under five in Indonesia.

2. METHOD

This study used a non-intervention descriptive laboratory design with cross sectional research design. The subjects of the study were children under five who went to the hospitals and health centers that had been determined in Jakarta, Bogor, Banjarmasin and Makassar during July 2015-March 2016. The number of research subjects was 500 respondents for each province. Inclusion criteria in the study subjects included children under five years old, fulfilling the diarrhea case definition refer to WHO definition, as well as obtaining approval from parents or guardians to participate in the study.

The diagnosis of diarrhea is made by the doctor in charge at the selected regional health center or hospital. Data collection activities include the submission of informed consent, form filling and specimen collection by trained personnel. After obtaining approval, the officer collected data by filling out the forms provided and collected the stool samples. The samples were put into containers containing 10% formalin. All the specimens and forms are sent to Infection Disease Research Laboratory of Prof. Sri Oemijati to do microscopic identification of parasites. Examination was done by direct examination of the stool to identify leukocytes contained in the stool. Cryptosporodium identification was carried out using modified Kinyoun staining. Stools that had been added to formalin were stained using a solution of lugol's iodine and observed under a light microscope to see the presence or absence of parasites. The data obtained was then analyzed statistically descriptively. Permission for conducting research has been obtained from the Ministry of Home Affairs. While the ethical approval was given by the Ethics Commission of National Institute of Health Research and Development, Ministry of Health, Republic of Indonesia.

3. RESULTS AND DISCUSSION

This research targets to be able to collect 500 specimens each place so that it is expected that from 4 places 2000 specimens will be obtained. However, only 77% of stool specimens can be tested for parasites received by Prof. Infection Disease Research Laboratory. Sri Sri Oemijati. Some of the stool containers received are empty without being filled with stool specimens.

Table 1. Number of specimen distribution base on city

City	Hospital / Regional Health Center	Number of Specimens
DKI Jakarta	PK Pademangan	50
	PKM Jatinegara	125
	RSPI	30
	RSUD Budi Asih	45
Bogor	RSUD Cibinong	167
	PKM Cirimekar	166
	PKM Ciawi	167
Banjarmasin	PKM Kelayan Timur	70
	RS Ulin	75
	RS Ansari Saleh	60
	PKM Kuin Raya	49
Makassar	RS Sayang Rakyat	40
	PKM Sudiang	125
	PKM Kaluku Bodoa	175
	RS Daya	80
Total		1424

The results of the confirmation to the officers in the field stated that the limited time of respondents while in health care facilities became a factor that could not collect stool specimens. Some patients who come to health care facilities sometimes also have received treatment that causes the frequency of diarrhea has decreased, so that when visiting health care facilities to get further treatment, feces samples expected to be research samples were difficult to obtain. Distribution of diarrhea patients who were examinated can be seen in Table 2. Based on gender, diarrhea sufferers with other types of males were males than females. Meanwhile, seen from the age group, some diarrhea sufferers were aged 12-35 months.

Table 2. Number of diarrhea patients

Characteristic	Number of patients (%)
Sex	
Male	58,5
Female	41,5
Age group (month)	
<12	30,7
12-35	54,4
36-59	14,9

Microscopic examination of stool specimens found several parasites that were manifest in the incidence of diarrhea among children under five, namely Ascharis lumbrichoides, Entamoeba coli, Oxiuris vermicularis, Blastocystis hominis, Endolomax nana, and Hookworm (Ancylostoma sp and Necator americanus). In some stool specimens found more than 1 type of parasitic infection. The types of parasites found can be seen in Table 3.

Table 3. Results of parasitic microscopic examination

No.	The type of parasite	Number of Specimens (%)
1.	*Ascaris lumbrichoides*	0,35
2.	*Entamoeba coli*	1,73
3.	*Oxiuris vermicularis*	0,35
4.	*Blastocystis hominis*	12,46
5.	*Entamoeba coli, Blastocystis hominis*	1,73
6.	*Endolimax nana, Blastocystis hominis*	0,35
7.	*Entamoeba coli, Blastocystis hominis, Ascaris lumbricodes*	0,35
8.	*Entamoeba coli, Blastocystis hominis, Hookworm*	0,35

Children under five are members of the community vulnerable to diarrhea. Diarrhea in children under five is a health problem that still often occurs in Indonesia. Parasites are one source of infection in the incidence of diarrhea that often goes unnoticed. Parasites can enter the body through the mouth because they are swallowed and can survive in the intestine or make holes in the intestinal wall. As a developing and tropical country, Indonesia has a high incidence of diarrhea because of parasitic infections. Knowledge about the type of parasite that is the source of infection in the incidence of diarrhea and symptoms caused, the provision of treatment is carried out more optimal [13,14].

Some types of parasites that can be manifest in the occurrence of diarrhea are protozoans (Giardia lamblia, Cryptosporidium sp., Isospora belli, Sarcocystis sp., Entamoeba histolytica, Nonpathogenic Amoeba, Balantidium coli), worm (Strongyloides stercoralis, Capillaria philippinensis, Trichinella spiralis, Trichostrongylus orientalis, Trematoda, Trichuris trichiura), dan fungi (Candida sp., Aspergillus sp., Zygomycosis sp) [11]. Diarrhea caused by parasitic infections is usually characterized by intermittent diarrhea and lasts longer than one week. Other symptoms can include abdominal pain, fever, anorexia, nausea, vomiting and fatigue (malaise) [15].

Ascaris lumbrichoides has infected more than 1 billion people worldwide and is found in all regions with tropical climates such as Indonesia. This parasite lives in the small intestinal cavity and can infect all age groups, especially in children under five. An environment with unhygienic sanitation has a greater risk of infection. Ascaris lumbrichoides eggs enter the body when it touches contaminated soil. Children who play on the ground and put their fingers in their mouths become the pathway for parasites to enter the body [16]. Bad habits that can also be a risk factor for infection include soil pollution caused by open defecation. This results in pollution in the soil around the house, washing place or landfill [17]. Infection can cause complications in the form of obstruction in the small intestine with symptoms resembling acute digestive obstruction with vomiting, abdominal distension, and cramps [18].

Entamoeba coli is a non-pathogenic species of Entamoeba. This parasite is often found as a commensal parasite in the human digestive tract. In staining and microscopic examination of stool, the form of Entamoeba coli is difficult to distinguish the pathogenic Entamoeba histolytica. To clarify usually a visual examination of the parasitic cyst using a light microscope. Detection of Entamoeba coli by the biomolecular method has been developed now. This parasitic infection can cause diarrhea accompanied by mucus and blood. Diarrhea sufferers in this phase have experienced a phase called dysentery. The occurrence of diarrhea can be mild or severe levels [19,20].

Oxiuris vermicularis is the most common worm parasite infecting humans. In different age groups, the incidence of Oxiuris vermicularis infection in children is higher than in adults. Oxyuriasis is one of the most significant parasitic infectious diseases in children and can cause loss of appetite, insomnia, gnashing of teeth, restlessness, endometritis, stomach cramps, diarrhea and other symptoms [21]. Oxiuris vermicularis lays eggs around the anus, causing itching and making itching and making infected children become fussy and have sleeping problem. This parasite can also migrate to the appendix and female genitals. Oxiuris vermicularis infection can occur with an intermediary between dust, hands, sleepwear, bed sheets, bedding and animal hair (dogs, cats) if the flying eggs land on animal fur [22].

Blastocystis hominis and Endolimax nana are intestinal parasites that are widespread throughout the world. The incidence of this infection is higher in tropical and sub-tropical regions. Concurrent infections of these two parasites occur because of the way they are transmitted that is identical through the fecal-oral route and ingestion of cysts from contaminated water sources. These parasites are generally pathogenic in individuals with immune system disorders. Symptoms that appear include mild abdominal pain and flatulence to acute and sometimes chronic diarrhea. The incidence of Blastocystis hominis infection is 30-50% in developing and tropical countries and 1.5-10% in developed countries. In Indonesia the incidence of Blastocystis hominis infection is 60% [23].

Research conducted on pediatric diarrhea in Iraq from 2003 to 2004 obtained data that Giardia lamblia became the most parasitic with a prevalence of 45.54% followed by Entamoeba histolytica 23.44%, Oxyuris vermicularis 12.7%, Hymenolepis nana 9.82%, Trichuris trichiura 5.4%, and Ascaris lumbricoides 2.2% [24]. Identification of the child's stool specimens in Peru also showed the most common infecting parasites were Ascaris lumbricoides 68%, Trichuris trichiura 44%, Oxyuris vermicularis 28%, Hymenolepis nana 21% and Strongyloides stercoralis 16%. Infections that occur by one type of parasite are 44% while two parasites are 42% with the most combination is Ascaris-Trichuris [25]. WHO data state that the highest incidence of diarrhea in children under five is 80% [26]. This is related to immune factors, hygiene and habits like putting something in the mouth. Something that is put into the mouth will be an intermediary for microorganisms as a source of infection that causes diarrhea [27].

A study conducted by Safrudin in 2009 obtained data that there was an influence of sanitation hygiene patterns with the incidence of diarrhea in toddlers in Primary Health Care of Ambal 1, Ambal District, Kebumen Regency [28]. The same thing was expressed by Jamaluddin (2013) about risk factors and the spatial distribution of Acute Diarrhea in Toddlers in

Kepil Subdistrict, Wonosobo Regency, Central Java Province which shows that one of the factors related to diarrhea in toddlers is sanitation of clean water facilities [29]. Another factor that is also dominantly a risk factor for diarrhea is the economic factor[28].

4. CONCLUSION

Based on the results of this study it is found that the incidence of parasitic diarrhea that occurs in children under five was mostly caused by Blastocystis hominis and Entamoeba coli. Diarrhea caused by a parasitic infection can increase susceptibility to other infections so that it should receive attention, especially in the incidence of chronic diarrhea. Rapid and precise diagnosis can reduce the morbidity and mortality of diarrhea sufferers due to parasitic infections.

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