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...
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 Rotavirus 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. Cryptosporidium 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.

| City          | Hospital / Regional   | Number of Specimens |
|--------------|----------------------|---------------------|
| DKI Jakarta  | PK Padémanan         | 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 Kulu 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 examined 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.

| 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 Ascaris lumbricoides, 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.
Ascaris lumbrichoides, Oxiuris vermicularis, Entamoeba coli, Blastocystis hominis, and Endolimax nana are parasites that can cause diarrhea. Infections with these parasites can be manifest in the form of obstruction in the small intestine with symptoms resembling acute digestive disorders. Symptoms that appear include mild abdominal pain and flatulence to acute and sometimes chronic diarrhea. The incidence of diarrhea caused by parasitic infections 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.

Infections that occur by one type of parasite are 44% while infections that occur by two parasites are 42% with the most combination is Ascaris-lumbricoides and Oxiuris vermicularis. Infections that occur by one type of parasite are 44% while infections that occur by two parasites are 42% with the most combination is Ascaris-lumbricoides and Oxiuris vermicularis. 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.

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%, Oxyurus 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%, Oxyurus 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 Giardia lamblia became the most parasitic with a prevalence of 45.54% followed by Entamoeba histolytica 23.44%, Oxyurus 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%, Oxyurus vermicularis 28%, Hymenolepis nana 21% and Strongyloides stercoralis 16%

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**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.  | Ascaris lumbricoides, Entamoeba coli, Blastocystis hominis | 0.35 |
| 8.  | Hookworm                     | 0.35                    |
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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