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EFFECTIVENESS OF GIVING PROBIOTICS IN PREVENTING ACUTE DIARRHEA WITH A HISTORY OF RECURRENT DIARRHEA

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ABSTRACT
One of the public health problems that occurs in infants and toddlers in Indonesia is diarrhea, and is one of the causes of death in toddlers. One of the efforts to prevent acute diarrhea with a history of recurrent diarrhea is therapy using probiotics. This study aims to determine the effectiveness of probiotic administration in treating diarrhea in toddlers with a history of recurrent diarrhea. The design of this study was a quasi-experiment with a non-randomized pre-test-post-test design, pretest and posttest in the intervention group (standard therapy and given probiotic therapy) and control group (standard therapy without probiotic therapy, analysis using t-paired test and independent test. Consecutive sampling technique, obtained 40 respondents (20 toddlers given probiotic therapy and 20 toddlers given standard therapy without probiotics). structured questionnaire instruments made by the researchers themselves and have been tested for validity ($p < 0.05$) and reliability ($\alpha = 0.961$).

Keywords: children; diarrhea; probiotics

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INTRODUCTION

Diarrhea is a digestive tract infection that is one of the factors causing death and malnutrition in toddlers. From WHO and UNICEF data, 1.9 million toddlers out of 2 billion cases of diarrhea die each year. 78% of these cases occur in developing countries, especially in Africa and Southeast Asia (UNICEF, 2024). Based on WHO data in 2019, diarrhea is one of the causes of decreased life expectancy by 1.97 years in sufferers, below respiratory tract infections (2.09 years). Based on data from the 2018 Basic Health Research, the prevalence of diarrhea in all age groups was 8%, in toddlers 12.3%, while in infants it was 10.6%. Based on data from the 2018 Sample Registration System, diarrhea remains one of the main causes of death in neonates at 7% and in infants aged 28 days at 6%. And based on data from the Indonesian Ministry of Health (2023) in the period January-November 2021, 14% of post-neonatal deaths were caused by diarrhea (Kemenkes RI, 2023).

The latest data from the results of the 2020 Indonesian Nutritional Status Survey, the prevalence of diarrhea in Indonesia is at 9.8%. Diarrhea is closely related to the occurrence of stunting cases. Repeated diarrhea in infants and toddlers can cause stunting. Based on data from the 2020 Indonesian Health Profile, infectious diseases, especially diarrhea, are a contributor to death in the group of children aged 29 days - 11 months. Similar to the previous year, in 2020, diarrhea was still a major problem causing 14.5% of deaths. In the group of toddlers (12 - 59 toddlers), deaths due to diarrhea were 4.55% (Kemenkes RI, 2022).Prevention of diarrhea in toddlers according to the Ministry of Health with reference to the World Health Organization (WHO) guidelines, namely rehydration using oralit, zinc given for 10 consecutive days, breast milk (ASI) and food continued, selective antibiotics and advice to parents. Oralit as an oral rehydration fluid has indeed been proven effective in treating diarrhea but some can fail as a result of increased intestinal hyperperistalsis and excessive fluid production, which prevents optimal water absorption. It is very important to

increase oral rehydration fluids because oral rehydration efforts fail because secretion is higher than absorption. Increasing oral rehydration fluids involves the addition of probiotics, prebiotics, zinc, and polymer proteins, as well as substrates for glucose replacement and salt co-transport. To evaluate the impact of probiotics and prebiotics on children with diarrhea, several studies have been conducted (Kemenkes RI, 2022).

The use of probiotics as prevention and therapy of diarrhea has shown satisfactory results in developing countries. Various types of organisms such as Lactobacillus and Bifidobacterium have been proven to be quite safe but have not been used as a standard in therapy. The most effective and safe organisms have not been identified, further research and evaluation are still needed including their effectiveness and safety. The administration of prebiotics to acute diarrhea in children has also been widely studied with varying results (I Wayan, 2023). Based on this background, the researchers are interested in conducting research related to the Effectiveness of Probiotics in the Prevention of Acute Diarrhea with a History of Recurrent Diarrhea, with the aim of knowing the effectiveness of probiotics in treating diarrhea in toddlers with a history of recurrent diarrhea.

METHOD

This research design is a quasi-experimental study with a non-randomized pre-test-post-test without control design. This study uses a pretest and posttest method in the intervention group (standard therapy and given probiotic therapy) and the control group (standard therapy without probiotic therapy), and sample selection is based on inclusion and exclusion criteria. The study was conducted in November - December 2024. From this study there were 40 respondents who were divided into 2 groups. There were 20 toddlers given probiotic therapy and 20 toddlers who were given standard therapy without probiotics. The sampling technique used in this study was Consecutive Sampling. There are criteria that are considered in selecting samples, the criteria are divided into two, namely inclusion criteria are criteria that need to be met by each member of the population to become a sample while exclusion criteria are those that cannot be taken to become samples. The instrument used in the data collection process is a structured questionnaire prepared by the researcher himself and tested for validity ($p < 0.05$) and reliability ($\alpha = 0.961$). The parametric test used is bivariate analysis using the t-paired test and the independent test.

RESULT

Table 1.
Respondent characteristics (n=40)

Respondent characteristics	f	%
Age		
1 year	9	22,5
2 year	24	60,0
3 year	5	12,5
4 year	2	5,0
Gender		
Man	18	45,0
Woman	22	55,0

Based on table 1. Frequency distribution of characteristics of respondents of toddlers with diarrhea with 40 respondents, most of them are toddlers who are 2 years old as many as 24 respondents (60.0%) experiencing acute diarrhea with a history of recurrent diarrhea. And when viewed from the characteristics of respondents based on gender, most are women as many as 22 respondents (55.0%).

Table 2.
Frequency distribution of diarrhea in toddlers (n=40)

Diarrhea in toddlers	f	%
Pre being given probiotics		
Diarrhea > 3 times	12	30,0
Diarrhea 3 times	18	45,0
Diarrhea < 3 times	10	25,0
Post being given probiotics		
Diarrhea > 3 times	1	2,5
Diarrhea 3 times	8	20,0
Diarrhea < 3 times	31	77,5

Based on table 2, the frequency distribution of the difference in the incidence of recurrent diarrhea before and after being given probiotics to toddlers, where out of 40 respondents, 12 respondents (30.0%) experienced diarrhea more than 3 times a day, most of them experienced diarrhea 3 times a day, as many as 18 respondents (45.0%). However, after receiving probiotic therapy, most of the diarrhea decreased to less than 3 times a day, as many as 31 respondents (77.5%).

Table 3.
Analysis of differences in diarrhea frequency before and after probiotic administration in toddlers

Frequency of diarrhea	Mean	SD	N	*P value*
Pre	3,050	0,932	20	0,000
Post	1,400	1,081	20	

From the results of the bivariate analysis, the frequency of diarrhea before and after being given probiotics in table 2 can be seen in the criteria before being given probiotics, the average frequency of diarrhea was 3,050 times with a standard deviation of 0.932. While after being given probiotics, the average diarrhea decreased to 1,400 times with a standard deviation of 1.081. Based on the statistical test, a p value of <0.05 (0.000) was obtained, which means that there is a significant difference between the frequency of diarrhea before and after being given probiotic therapy in toddlers with acute diarrhea with a history of recurrent diarrhea.

DISCUSSION

Diarrhea (diarrheal disease) is a disease that occurs when defecation is abnormally more liquid than usual and in an amount of three or more times in a 24-hour period. Diarrhea is one of the diseases caused by microorganism infection (Asda & Sekarwati, 2020). Diarrhea occurs when there is a sudden change in stool consistency due to the water content in the stool exceeding normal (10ml/kg/day) with an increase in the frequency of defecation more than 3 times in 24 hours and lasting less than 14 days. Abnormal or unusual stool output, characterized by an increase in the volume of thinness, and a frequency of more than 3 times a day in children and in infants more than 4 times a day with or without blood mucus. Defecation with liquid or semi-liquid (semi-solid) stool, the water content of the stool is more than usual more than 200gr or 200ml/24 hours with a frequency of more than 3x per day and usually accompanied or without mucus and blood. Acute diarrhea is diarrhea that lasts less than 15 days. Acute diarrhea is caused by many factors including infections (bacteria, parasites, viruses), food poisoning, effects of drugs, and others.

Diarrhea can occur in both girls and boys of all ages, depending on several factors such as nutrition, food, socio-economic, and environment Based on the results of the study, the frequency distribution of the characteristics of respondents to toddlers with diarrhea with 40 respondents, most of whom were 2 years old, as many as 24 respondents (60.0%). In line with the results of research conducted by (Maharani et al., 2023) which showed that most toddlers

in the 12-59 month age group are groups that are vulnerable to health problems. According to Kusyani (2020) Most toddlers who experience diarrhea are caused by several common factors related to their age development. Toddlers tend to be more active and start exploring their surroundings. Toddlers often put their hands or objects in their mouths, increasing the risk of exposure to germs, viruses, or bacteria that cause diarrhea (Kusyani & Khayudin, 2022). At a younger age, toddlers have a greater tendency to diarrhea. This is because the immune system in toddlers is not yet mature, so they are more susceptible to infectious diseases including diarrhea. Toddlers' immune systems are not fully developed so they are more susceptible to gastrointestinal infections, such as rotavirus or bacterial infections such as Escherichia coli and Salmonella.

At the age of 2 years, toddlers tend to be active, and often put their hands and objects in their mouths so that the risk of diarrhea is also greater. At this age, the immune system has not fully developed so that it is susceptible to viruses that cause diarrhea. Toddlers do not yet understand the importance of maintaining cleanliness, such as washing their hands before eating or after using the toilet, making it easier for pathogens that cause diarrhea to spread. This age is also a transition from complementary foods (MPASI) to family food and because it has not been balanced with clean eating habits or hygienic food presentation, it can potentially become a source of infection in the toddler's digestive tract.The results of the study on the frequency distribution of characteristics of respondents' gender of toddlers with diarrhea with 40 respondents, most of whom were female, 22 respondents (55.0%). According to Khairana (2020) in general, there is no strong scientific evidence that female toddlers experience diarrhea more often than male toddlers. However, if there is data showing a higher prevalence of diarrhea in female toddlers in a particular area or group, several factors that can influence such as culture or environment, female toddlers may be more often involved in certain activities, such as helping in the kitchen or playing in less hygienic areas, thus increasing the risk of exposure to contaminated food or objects (Khairana, 2020). Parents or caregivers may have different treatments for female and male toddlers in terms of hygiene habits. If the hygiene of female toddlers is less considered, this can increase the risk of diarrhea. Specific environmental conditions, such as access to clean water or sanitation, which may have a greater impact on female toddlers due to certain behaviors or habits.

Based on the results of the study, the frequency of diarrhea in toddlers before receiving probiotic therapy was 12 respondents (30.0%) toddlers had more than 3 bowel movements a day, and most of them had diarrhea 3 times a day, 18 respondents (45.0%). After being given probiotics, 31 respondents (77.5%) had diarrhea less than 3 times a day. That in patients with diarrhea before probiotic intervention, the average frequency was 3 times a day. This study is in line with the study which showed that the results of the use of probiotics were effective as prevention and treatment of diarrhea (Yonata & Farid, 2016).Beneficial live bacteria called probiotics help in the absorption of nutrients and protect the digestive system from harmful bacteria (Frej-Mądrzak et al., 2020). The term "probiotic" refers to beneficial microorganisms that can be consumed by humans. As a probiotic, you protect the mucosal lining of the digestive tract, which includes the epithelial layer, mucus layer, peristalsis, and epithelial desquamation. You also secrete immunoglobulin A (IgA), which plays a major role in influencing the adhesion of harmful germs and in modulating the immune system both locally and systemically (Sánchez et al., 2017). Some of the beneficial bacteria included in probiotics are members of the lactic acid bacteria family. Three genera of lactic acid bacteria Streptococcus, Bifidobacterium, and Lactobacillus are commonly used as probiotics. Bacteria such as Lactococcus and Enterococcus are commonly used in probiotics (Masood et al., 2011).

Among the many types of beneficial bacteria used in food, the most common are Lactobacillus, Bifidobacterium, and Streptococcus thermophilus, of which there are more than ten varieties (Barrangou & Dudley, 2016; Reed et al., 2018; Shori et al., 2021). It is estimated that around 10 billion bacteria, representing more than 100 species, call the human gut home. Gut bacteria can be categorized into two groups: beneficial and harmful. Probiotics work by competing with harmful microbes for colony-forming units (CFUs) in the gut. Once CFUs are present, they can no longer attach to other bacteria, preventing their growth and nutrient absorption (Markowiak & Śliżewska, 2017; Mookiah et al., 2014). The absorption of nutrients in the gut and maintenance of water absorption disorders are aided by the good bacteria found in probiotics, which in turn improves stool consistency. Hydrogen ions produced by probiotics will reduce the pH of the gut through lactic acid, creating an acidic environment that can inhibit the growth of harmful bacteria (Hanita Christiandari et al., 2023). The study concluded that probiotics have an important role in treating acute diarrhea in toddlers, especially by reducing its duration and severity. In vivo, it has been shown that supplementing milk with the probiotic Lactobacillus casei can reduce the clinical symptoms of diarrhea. In addition, histopathologically, probiotics have been shown to reduce histopathological changes caused by rotavirus infection. In toddlers, probiotics appear to have a more specific role in treating diarrhea due to viral infections (Freedman et al., 2022; Romero-Arguelles et al., 2023). This effect is thought to be related to increased IgA secretion and the ability of probiotics to prevent the spread of viruses in the intestine through immune mechanisms. Although there are variations in probiotic strains, doses, and populations used in various studies, probiotics still show an important contribution in the management of gastrointestinal disorders.

CONCLUSION

Probiotic administration was shown to be effective in preventing acute diarrhea in toddlers with a history of recurrent diarrhea. The results showed that the frequency of diarrhea was significantly reduced after probiotic administration. Statistical analysis also confirmed the positive effect of probiotics in preventing recurrent diarrhea. Thus, probiotics can be an effective intervention to manage acute diarrhea in toddlers with a history of recurrent diarrhea.

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