



Risk Factors Associated With Acute Diarrhea Among Toddlers In The Working Area of Bendahara Health Center Aceh Tamiang District

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ABSTRACT

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Keywords Acute Diarrhea; Risk Factors; Toddlers **Background**: Diarrhea was the first leading cause of death among toddlers in Indonesia in 2019, with a proportion of 10.7% in Indonesia. Aceh Province occupies the second position with the highest prevalence of diarrhea among toddlers. There is a comparison of the incidence of diarrhea among toddlers in 2022, Puskesmas Bendahara has an Incidence Rate of 90.75/1000 toddlers.

Method: The research uses a cross-sectional design. The research sample was 87 mothers of toddlers, using the formula of estimating the cross-sectional proportion, and Accidental Sampling was used as a sampling technique.

Results: Univariate analysis found that most mothers had good knowledge 62.1%, poor handwashing behavior 50.6%, history of exclusive breastfeeding behavior 63.2%, qualified toilet ownership 86.2%, and low economic level 58.9%. The results of the bivariate analysis were that there was a relationship between maternal knowledge (*p*-value= 0.008; PR (CI95%) = 4.909 (1.431-16.842)) and maternal handwashing behavior (*p*-value= 0.006; PR(CI95%) = 10,750 (1,450-79,711)) with the incidence of acute diarrhea in toddlers at the Bendahara Health Center, Aceh Tamiang Regency.

Conclusion: The frequency of Toodlers with acute diarrhea in the workspace of the Bendahara Public Health Center, Aceh Tamiang Regency, is correlated with mothers' knowledge and handwashing behavior (Hand Hygiene).

1. Introduction

The condition of the body experiences an increase in the frequency of defecation three times a day or more; there is a change in the consistency of mushy and watery feces, which is called diarrhea. Diarrhea is an infection of the digestive tract, especially the intestines, caused by bacteria, parasites, and viruses transmitted from contaminated food & beverages, and poor behavior sanitation (1). Diarrhea can happen to anyone but predominantly affects babies and toddlers because their immunity is vulnerable to bacteria and disease. Common causes of diarrhea in toddlers are infectious factors caused by bacteria, such as Escherichia coli and Salmonella, viruses such as Rotavirus and Norovirus, or parasites, such as Giardia lamblia, gastrointestinal infections, food intolerances, and others (2).

According to the United Nations Children's Fund (2020), the leading causes of death from diarrhea in children under five years old are dehydration, water quality, sanitation environment, and improper hygiene (3). As described by WHO and UNICEF in the Indonesian Ministry of Health (2022), about ± 2 billion cases of diarrhea and cases of diarrhea worldwide each year have as many as 1.9 million toddlers (4). Diarrhea was the first leading cause of death among children under five in



Indonesia in 2019, with a proportion of 10.7% in Indonesia (5). In addition, the proportion of underfive deaths caused by diarrhea is still the largest in 2020, namely 4.55% (6), and the proportion of under-five deaths caused by diarrhea increased in 2021 with a proportion of 10.3% (7).

Aceh Province is one of Indonesia's provinces, consisting of 18 districts and five cities. In the 2018 Riskesdas national report, Aceh Province has the second highest prevalence of diarrhea among under-fives in Indonesia at 13.8% (8). Districts in Aceh Province that have high diarrhea cases with fluctuating numbers recorded at the Health Office are Aceh Tamiang District. The proportion of under-five diarrhea in Aceh Tamiang District in 2020 was 34.55%; under-five diarrhea in 2021 was 31.97%; and under-five diarrhea in 2022 was 31%.

Based on a preliminary study by a researcher at the Aceh Tamiang Health Office, Aceh Tamiang Regency has 15 health centers. In the annual report, data results show that acute diarrhea occurs based on the diagnosis of doctors/nurses. There is a comparison of the incidence of diarrhea among children under five in 2022, where Puskesmas Bendahara has an IR (Incidence Rate) of 90.75 per 1000 children under five (9). In Puskesmas Bendahara, the proportion rate in 2022 at age \geq 5 years was 69.95%; the proportion rate of diarrhea at age \leq 5 years was 30.05%. The proportion rate of diarrhea in Puskesmas Bendahara from January to November 2023 at the age of \geq 5 years was 80%; the proportion rate of diarrhea aged \leq 5 years was 20%. The occurrence of diarrhea in toddlers is influenced by various factors, namely breastfeeding history, maternal knowledge, maternal handwashing habits, latrine type factors, and fly density factors (1).

Several factors influence diarrhea; the existence of the basic concept of Epidemiology according to John Gordon in 1950, namely Triangel Epidemiology, which describes the relationship between 3 factors that play a role in each other, namely: Agent, Host, and Environment. The purpose of this study was to identify risk variables associated with acute diarrhea among children under five years of age at the Bendahara Health Center, Aceh Tamiang Regency, where cases of diarrhea among children under five years of age have not been studied in the working area of the Bendahara Health Center, Aceh Tamiang Regency.

2. Method

This study was conducted at the Bendahara Health Center, Aceh Tamiang Regency, in January-March 2024. The dependent variable in the study was the incidence of acute diarrhea in toddlers. In contrast, the independent variables were maternal knowledge, maternal handwashing behavior (hand hygiene), exclusive breastfeeding history behavior, latrine ownership, and economic level. The research subjects were mothers who had toddlers in the Bendahara Health Center Working Area in 2022, it was known that the study population of 573 aged 12-59 months, and a research sample of 87 respondents was obtained from the calculation of the Cross-Sectional proportion estimation formula.

This research instrument uses a modified questionnaire from previous research to measure maternal knowledge, maternal handwashing behavior (Hand Hygiene), exclusive breastfeeding history, latrine ownership, and socioeconomics. In January 2024, 30 respondents were tested for validity and reliability at the Karang Baru Health Center work area, Aceh Tamiang District. While this research is in the working area of the Bendahara Health Center. This study used an analytic observational method with a cross-sectional design. The chi-square test used aims to describe univariate and bivariate analysis. The method of sampling is the accidental sampling technique. The accidental sampling method by chance or available at the research site using a questionnaire.

In determining the sample of respondents, researchers used inclusion criteria, namely the availability of mothers of toddlers to be respondents, mothers of toddlers can communicate well to researchers, mothers who have toddlers aged 12-59 months and live in the Bendahara Puskesmas Working Area. Researchers also used exclusion criteria, namely toddlers who were not cared for by biological mothers in the Bendahara Health Center Working Area, mothers who had toddlers with measles, and toddlers who visited and sought treatment at the Bendahara Health Center who were delivered other than by their biological mothers. This study has Ethical Approval with number



012312330 issued by the research ethics committee (KEP UAD) Universitas Ahmad Dahlan Yogyakarta.

3. Result

A. Univariate Analysis

The univariate analysis of this study included data related to the characteristics of respondents and the distribution of the incidence of acute diarrhea among respondents.

Table 1. Distribution Characteristics of mother and toddler						
Categories	n	%				
Mother's Characteristics						
Mother's Last Education						
	2	2.3				
Not in School/Not Graduated	1	1.1				
Elementary School Graduate	12	13.8				
Junior High School Graduates/Equivalent	64	73.6				
High School Graduates/Equivalent	8	9.2				
Higher Education						
Mother's Occupation						
Not Working	81	93.1				
Self Employed	5	5.7				
Civil Servant (PNS)	1	1.2				
Characteristics of Toddlers						
Age						
12-23 Month	23	26.4				
24-59 Month	64	73.6				
Gender						
Mala	43	49.4				
Female	44	50.6				
Indeks Massa Tubuh (IMT)						
Poor Nutrition	2	2.3				
Under Nutrition	3	3.4				
Good Nutrition (Normal)	71	81.6				
At Risk of Over-Nutrition	6	6.9				
Over Nutrition (Overweight)	3	3.5				
Obesity	2	2.3				
Obesity	-					

Table 1 shows that the number of toddlers is highest at the age of 24-59 months, with as many as 64 toddlers (73.6%) with a female gender of 44 toddlers (50.6%), and the highest body mass index of toddlers in the normal nutrition category as many as 71 toddlers (81.6%). The characteristics of mothers under five with the highest maternal last education were 64 mothers (73.6%), with 81 mothers (93.1%) working as housewives (93.1%).





V	n	(%)	
Disease Diagnosis	Acute Diarrhea	12	13.8
	No Acute Diarrhea	75	86.2
Mother's Knowledge	Good	54	62.1
	Bad	33	37.9
The Behavior of Washing Hands with	Good	43	49.4
Breast Soap	Bad	44	50.6
History of Exclusive	Exclusive Breastfeeding	55	63.2
Breastfeeding – Behavior	No Exclusive Breastfeeding	32	36.8
Latrine Ownership	Qualify	75	86.2
	Not Eligible	12	13.8
Economy Level	Low (< Rp. 3,413,666)	51	58.9
	High (≥ Rp. 3,413,666)	36	41.1

Table 2. Distribution risk factor of Acute Diarrhea

Table 2 shows that the total respondents of this study are 87. Toddlers who experienced acute diarrhea were 13.8%. The mothers' knowledge level was good at 62.1%, while mothers with bad handwashing behavior were 50.6%. Toddlers who have a history of exclusive breastfeeding behavior are 63.2%, the majority of families of toddlers who have latrines meet the requirements by 86.2% and have a low family economic level (<Rp. 3.413.666 per month) of 58.9%.

B. Bivariate Analysis

Bivariate analysis explains the results of the research relationship between the dependent variable and the independent variable of this study.

Variable	Incidence of Diarrhea			Total		p-	PR			
	Acute D	ute Diarrhea No Acute diarrhea		No Acute diarrhea			value	(95%		
	Ν	%	Ν	%	n	%		CI)		
Mother's Knowledge										
Bad	9	27.3	24	72.7	33	100	0.008	4.909		
Good	3	5.6	51	94.4	54	100		(1.431-		
Total	12	13.8	75	86.2	87	100		16.842)		
	I	Mother's Ha	and Washing Be	ehavior (Ha	nd Hygie	ne)				
Bad	11	25	33	75	44	100	0.006	10.750		
Good	1	2.3	42	97.7	43	100		(1.450-		
Total	12	13.8	75	86.2	87	100		79.711)		
	History of E	xclusive B1	reastfeeding							
No Exclusive	6	18.8	26	81.3	32	100	0.345	1.719		
Breastfeeding Exclusive								(0.605- 4.884)		
Breastfeeding	6	10.9	49	89.1	55	100				
Total	12	13.8	75	86.2	87	100				
	Toilet Ownership									
Not Eligible	2	16.7	10	83.3	12	100	0.669	1.250		
Qualify	10	13.3	65	86.7	75	100		(0.311-		
Total	12	13.8	75	86.2	87	100		5.021)		
Economy Level										
Low	8	15.7	43	84.3	51	100	0.754	1.412		
High	4	11.1	32	88.9	36	100		(0.460-		
Total	12	13.8	75	86.2	87	100		4.335)		

Table 3. Correlation Risk Factor of Acute Diarrhea





Bivariate Analysis

Bivariate analysis explains the results of the research relationship between the dependent variable and the independent variable of this study.

Variable	I	Incidence of Diarrhea			Total		p-	PR (95%			
	A	cute	No Acute				value	CI)			
	Dia	rrhea	diarrhea								
	n	%	п	%	Ν	%					
	Mother's Knowledge										
Bad	9	27.3	24	72.7	33	100	0.008	4.909 (1.431-			
Good	3	5.6	51	94.4	54	100		16.842)			
Total	12	13.8	75	86.2	87	100					
		Mother's H	land Washi	ng Behavior	r (Hand H	ygiene)					
Bad	11	25	33	75	44	100	0.006	10.750			
Good	1	2.3	42	97.7	43	100		(1.450-			
Total	12	13.8	75	86.2	87	100		79.711)			
	History of Ex	clusive Brea	astfeeding								
No Exclusive	6	18.8	26	81.3	32	100	0.345	1.719 (0.605-			
Breastfeeding								4.884)			
Exclusive	C	10.0	10	00.4		100					
Breastfeeding	0	10.9	49	89.1	55	100					
Total	12	13.8	75	86.2	87	100					
	Toile	et Ownershi	р								
Not Eligible	2	16.7	10	83.3	12	100	0.669	1.250 (0.311-			
Qualify	10	13.3	65	86.7	75	100		5.021)			
Total	12	13.8	75	86.2	87	100					
			Ecor	nomy Level							
Low	8	15.7	43	84.3	51	100	0.754	1.412 (0.460-			
High	4	11.1	32	88.9	36	100		4.335)			
Total	12	13.8	75	86.2	87	100					

Table 3.	Correlation	Risk	Factor	of	Acute	Diarrhea	
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Table 3 shows that among the study's five variables, two correlate with diarrhea in toddlers: maternal knowledge and maternal handwashing behavior (hand hygiene). The results of the calculation of knowledge Prevalence Risk (PR) value = 4.909 (CI 95%:1.431-16.842) show that mothers with a poor level of knowledge are at risk of 4.909 times having a toddler with an acute diarrhea incidence compared to mothers who have a good level of knowledge. In hand hygiene behavior, the PR value = 10,750 ((CI95%: 1.450-79.711), which means that mothers with poor hand washing behavior have a 10,750 times risk of having a toddler with an acute diarrhea incidence compared to mothers who have a maternal handwashing behavior. Other research variables, namely the history of exclusive breastfeeding behavior, socioeconomic status, and ownership of latrines, are not associated with the incidence of diarrhea in toddlers with a p-value > 0.05.

4. Discussion

Based on the results of research in the field on the variable of maternal knowledge, there is a significant relationship between the level of maternal knowledge and the incidence of acute diarrhea in toddlers (*p*-*value* = $0.008 \le 0.05$). The value of Prevalence ratio (PR) = 4.909 and CI 95% value = (1.431-16.842) means that mothers with a poor level of knowledge are 4.909 times more likely to have a toddler with an acute diarrhea incidence than mothers who have a good level of knowledge and are a risk factor for the occurrence of acute diarrhea in toddlers. The findings of researchers in the field of maternal knowledge are influenced by education, where the highest maternal education in the work area of the Bendahara Health Center is High School Graduation, which is 73.6%.

Mothers who have a high school education/equivalent increase their knowledge by attending educational activities held by the Health Center, mothers can absorb the information they have received



to improve their quality of life for a better time. In addition, mothers with high school education can absorb information from various media that can be easily reached anywhere. A person's knowledge comes partly from formal and informal education, the environment, as well as personal experiences as well as the experiences of others. Good mothers will make various efforts to anticipate the occurrence of diarrhea and things related to children's diarrhea, while mothers with poor knowledge will affect the management, prevention, and treatment of diarrhea which results in an increased incidence of pain and death due to diarrhea (10).

A person's educational background influences a learning process; mothers will receive more information the higher their education, one of which is health information. Education can provide new knowledge so that positive behavior changes occur and increase. A low level of knowledge can result in mothers having different points of view on acute diarrheal disease in toddlers (11). in low maternal knowledge, mothers have difficulty preventing diarrhea transmission (12).

The part of the human body that is most contaminated with microorganisms and disease germs is the hands (13). Based on the results of the research on the relationship between mother's handwashing behavior (Hand Hygiene), there is a significant relationship with a *p*-value of 0.006 (≤ 0.05) and a PR value (CI 95%) = 10.750 (1.450-79.711). Acute diarrhea is one of the factors of personal hygiene for the mother and the child. Based on researchers' findings in the field, the agent factor is that microorganisms enter a healthy child's body when eating; namely, the mother or child puts her hands in the mouth without washing her hands with soap and running water first. The number of disease-causing microorganisms in the skin's surface area on both palms can be reduced mechanically through hand washing with soap and running water. Washing your hands correctly and adequately can prevent diarrhea, cholera, typhoid, and other infectious diseases (14). Transmission factors that occur in toddlers that can cause diarrhea include the transmission of microorganisms in the form of *E.Coli bacteria, Salmonella typhi, Vibrio cholera*, and other microorganisms with a large number of pathogenic (15).

The host factor is that as many as 44 mothers (50.6%) wash their hands using water only without soap because mothers do not know the good and correct handwashing procedures; when feeding/feeding children, mothers are used to washing their hands only by rubbing both palms with water. Some mothers do not know the proper and correct handwashing procedure, so the respondent only washes their hands with water without soap between the fingers disappearing from the dirt. A person who does not wash his hands with soap and running water cannot kill the microorganisms on his hands because the microorganism particles and fat that stick to them do not disappear. Before hand washing the number of bacteria was 1.89 colonies/cm², the number of bacteria after hand washing was 0.89 colonies/cm² (16). Hands are one of the main ways of transmission for the entry of disease-causing microorganisms, so the risk of diarrhea will increase In the medical scope, washing hands with running water and soap when washing hands takes about 40 seconds -1 minute (15). Environmental factors, namely inadequate handwashing facilities in the respondent's residence located outside the house, water taken for handwashing comes from dug wells and drilled wells, and rainwater.

Breast milk contains lysozyme and has 300 times more lysozyme than cow's milk, so it can protect the child from bacteria (*E.Coli* and *Salmonella*). Exclusive Breastfeeding is breast milk that is given to children from birth to 6 months of age without giving or replacing it with other foods or drinks, including water, except medicines, vitamins, or minerals (17). In the results of this study, there was no significant relationship between exclusive breastfeeding history and the incidence of acute diarrhea in toddlers in the Working Area of the Bendahara Health Center with a *p-value* of 0.345 (>0.05) and obtained a PR value (95% CI) = 1.719 (0.605-4.884) meaning that children with a history of not exclusively breastfeed have a risk of acute diarrhea 1.719 times higher than children who have a history of exclusive Breastfeeding and is a risk factor for the incidence of acute diarrhea in toddlers but not statistically significant.

Based on the findings of researchers in the field, what is seen from the results of the bivariate analysis is that there is a comparison of exclusive breast milk and non-exclusive breast milk in diarrhea toddlers, which is 1:1. There are other factors besides exclusive Breastfeeding that cause diarrhea in toddlers, this is influenced by some mothers who already understand the importance of Breastfeeding



without giving complementary foods or drinks for six months, even though the child has received exclusive Breastfeeding. However, it was still detected that the toddler had diarrhea. In this case, it can occur when the mother finishes the exclusive breastfeeding period and then gives formula milk through a milk bottle or additional food; there is a possibility of allergies to formula milk and lack of hygiene in cutlery and milk bottles.

Latrines are among other places in the transmission of diarrhea because the place of human feces is very effective for developing E.Coli bacteria before infecting the human body. Based on the results of this study, there is no significant relationship between latrine ownership and the incidence of acute diarrhea in toddlers; the *p*-value is 0.669 (>0.05), and the value of PR (CI95%) = 1.250 (0.311-5.021) means that families with latrine ownership that do not meet the requirements have a risk of 1.250 times having toddlers with acute diarrhea compared to families who have latrine ownership that meets the requirements and risk factors but is not statistically significant.

Agents cause diarrhea through oral-fecal transmission caused by several factors such as flies, feces, food, drinks, and others. Host is the behavior of the family, especially the mother, towards preventing diarrhea, namely using healthy latrines. The environmental factor in this study is the ownership of latrines, where respondents have latrines based on univariate data with a type of closed squatting latrines of 86.2%. So, the ownership of latrines is unrelated to the incidence of acute diarrhea in toddlers. According to researchers' findings, families have latrines at home, generally using a squat latrine (flushes). However, some families are still mixed with using latrines for other family members, which can cause the latrines not to be cleaned regularly to invite flies and cockroaches. For toddlers who experience diarrhea, one of the factors in the field is several families that have decent latrines, but these are inadequate because the walls and floors are mossy and crusty. This is because the latrines are located outside the house and are united with the well where water is taken for daily life. The water used is susceptible to contamination by microorganisms, which can cause diarrhea.

The socio-economic aspect of this study is assessed through the income of parents of toddlers every month. So the monthly income is obtained, it is categorized as low if the income is obtained below the UMR Aceh Tamiang, which is Rp. 3,413,666 is categorized as high 63 if the parents of toddlers have a monthly income above the UMR Aceh Tamiang. Based on the statistical results of this study, the *p*-value is 0.754 (>0.05), which is that there is no significant relationship between economic level and the incidence of acute diarrhea in toddlers, and the PR value (CI95%) = 1.412 (0.460-4.335) means that families with low economic levels have a 1.412 times risk of having a toddler with an acute diarrhea incidence compared to families with high economic levels.

Agent factors can be in the form of living or inanimate objects and from mechanical factors, the host is a factor contained in a person's characteristics that affect the onset of disease, one of which is income, a person's income affects aspects of residential facilities. While the environmental factors in this study are the family socio-economic environment, a low socio-economic environment has limited or slum facilities that cause contamination between agents, hosts, and the environment so that children's immunity decreases and causes diarrhea. One sick family member will impact the socio-economy, where emergency expenses will be incurred outside of routine needs.

Based on the findings of researchers in the field, from the results of univariate statistics, diarrhea in toddlers is more experienced by children with a low parental economic level of 58.9% because only male parents work with jobs with a fixed monthly income. Based on filling out the research questionnaire, as many as five parents of female toddlers work. The average female parent stays at home as a housewife. According to the Ministry of Health, diarrhea tends to occur a lot in low family incomes, so the percentage of children with diarrhea receiving treatment from health workers is more significant in parents with high incomes than other children (18). Families who have a high level of can guarantee home sanitation facilities, especially the provision of clean water and good latrines, and they will be kept clean. Meanwhile, families of toddlers who have low incomes will be late in handling diarrhea because the cost of treatment at health facilities is limited, resulting in more severe diarrhea (19). The limitation of this study has the potential to bias information on the variable of latrine ownership because the latrine ownership questionnaire only uses 2 questions, namely about latrine



ownership, and the type of latrine used, without paying attention to the requirements of building criteria and health requirements.

5. Conclusion

This study's results show a relationship between the level of maternal knowledge, maternal handwashing behavior (Hand Hygiene), and the incidence of acute diarrhea in toddlers in the working area of the Bendahara Health Center, Aceh Tamiang Regency. Cases of diarrheal disease in toddlers at the Bendahara Health Center in 2024 have decreased from the previous year. However, several policies and actions are still needed to improve the community, especially for mothers with toddlers. One of them is to improve education and communication strategies (KIE) to the level of primary health services in overcoming diarrhea problems; this can increase mothers' knowledge about the signs and symptoms when children experience dehydration diarrhea, handling diarrhea in children, and the function of oral rehydration salts (ORS) an effort to prevent acute diarrheal diseases in toddlers. In addition, education is carried out evenly, repeatedly focuses on excellent and correct handwashing procedures, and provides an understanding of the negative impact of not washing hands.

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