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Analysis Of Risk Factors For Diarrhea In Toddlers In The Mulyorejo Community Health Center Working Area

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ABSTRACT

Background: Diarrhea is still the leading cause of morbidity and mortality in children under five, with millions of cases each year globally and thousands of cases in Indonesia. Objective: This study aims to analyze factors related to the incidence of diarrhea in toddlers in the work area of the Mulyorejo Health Center. Methods: The study used a quantitative approach with a cross sectional study design. The sample consisted of 105 mothers who had toddlers, selected using stratified random sampling techniques. Data were collected through questionnaires and analyzed univariate and bivariate using Chi-Square tests, as well as multivariate. Results: The results showed that there was a significant relationship between the incidence of diarrhea and parental income ($p = 0.114$), history of breastfeeding ($p = 0.024$), mother's hand washing ($p = 0.044$), nutritional status of toddlers ($p = 0.017$), clean water sources ($p = 0.026$), family toilet conditions ($p = 0.044$), and garbage disposal ($p = 0.019$). On the other hand, there was no significant relationship between the incidence of diarrhea and maternal education level, age of toddlers, and wastewater disposal ($p > 0.05$). Multivariate analysis showed that the nutritional status of toddlers was the most influential factor in the incidence of diarrhea ($p = 0.009$). Conclusion: Environmental sanitation factors and socioeconomic conditions, especially parental income, significantly affect the incidence of diarrhea in toddlers. Interventions to improve sanitation and family economic empowerment need to be a priority in efforts to prevent diarrhea.

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INTRODUCTION

Diarrhea remains a major health problem in Indonesia due to its high morbidity and mortality rates, especially among children under five years of age. The WHO defines diarrhea as three or more loose stools in 24 hours, caused by various microorganisms such as E. coli, Rotavirus, and Ascaris lumbricoides. Globally, diarrhea causes approximately 1.7 billion cases each year and is the second leading cause of death in children under five, with approximately 525,000 deaths annually.

In Indonesia, the prevalence of diarrhea remains high, especially among children aged 1–4 years. Ministry of Health data shows variations in the coverage of diarrhea treatment between provinces, with North Sumatra being one of the regions with high case numbers. In 2023, there were 48,469 cases of diarrhea in North Sumatra, 5,446 of which occurred in toddlers. In Deli Serdang District, diarrhea is among the 10 most common diseases, with 12,123 cases in 2023. In the Mulyorejo Community Health Center working area, diarrhea is also among the top three most common diseases, with 1,030 cases throughout 2024 and 202 of these cases occurring in children under five.

Basic sanitation conditions in the region are still poor, with only 39.21% of households having access to safe toilets and 86.60% having access to safe drinking water, falling short of the 90% target. In addition, the low rate of exclusive breastfeeding in North Sumatra (57.83%) and Deli Serdang (47.26%) also increases the vulnerability of toddlers to diarrhea. Other factors such as low maternal education, improper hand washing

behavior, and the lack of adequate sanitation facilities also contribute to the high incidence of diarrhea.

Initial observations in the Mulyorejo Community Health Center working area show that there are still environmental problems such as indiscriminate waste disposal and household waste into rivers. These conditions reinforce the evidence that environmental factors and community behavior play an important role in the transmission of diarrhea. Based on this, the researcher is interested in conducting a study entitled "Analysis of Risk Factors for Diarrhea Incidence in Toddlers in the Mulyorejo Community Health Center Working Area in 2025."

RESEARCH METHOD

This study is a quantitative cross-sectional study that aims to determine the relationship between various risk factors such as maternal education level, parental income, hand washing habits, age and gender of toddlers, nutritional status, clean water sources, family toilet conditions, waste disposal systems, and wastewater disposal facilities with the incidence of diarrhea in toddlers. Data collection was conducted simultaneously at one point in time (point time approach). This study was conducted in the working area of the Mulyorejo Community Health Center, Sunggal District, Deli Serdang Regency, North Sumatra Province, from January to June 2025. The population in this study consisted of all toddlers aged 0–59 months, totaling 5,302 toddlers. Based on calculations using the Lemeshow formula, a sample of 95 respondents was obtained, then 10% was added as a reserve to anticipate invalid data, bringing the total to 105 respondents. The sampling technique used stratified random sampling, which involved dividing the population into several strata based on village, then taking a proportional random sample from each village.

The variables studied consisted of independent variables (mother's education level, parental income, hand washing habits, age and gender of toddlers, history of exclusive breastfeeding, nutritional status, clean water sources, toilet conditions, waste disposal systems, and sewage disposal facilities) and dependent variables, namely the incidence of diarrhea in toddlers. The data used consisted of primary data, obtained directly through interviews and measurements, and secondary data taken from documents such as the Health Card (KMS) and local health reports. Data management was carried out through the stages of editing, scoring and coding, data entry, cleaning, and tabulating so that the data was ready for analysis. Data analysis included univariate analysis to describe the distribution of each variable, bivariate analysis using the Chi-Square test to examine the relationship between independent and dependent variables at a significance level of 0.05, and multivariate analysis using logistic regression to determine the variables that most influenced the incidence of diarrhea in toddlers.

RESULT

Respondent Characteristics

Teble 1. Distribution of Characteristic Frequencies of Toddlers in the Working Area of the Mulyorejo Community Health Center

Respondent Characteristics	N	%
Gender		
Man	51	48,6
Woman	54	51,4
Age		
0-11 months	23	21,9
12-59 months	82	78,1
Total	**105**	**100,0**

From Table 1, which shows the characteristics of respondents, it can be seen that the proportion of female toddlers is higher than that of male toddlers. The proportion of males was 51 infants (48.6%), while the proportion of females was 54 infants (51.4%). In terms of infant age characteristics, there were 23 infants (21.9%) aged 0-11 months and 82 infants (78.1%) aged 12-59 months.

Table 2. Distribution of Characteristics of Mothers of Toddlers in the Working Area of the Mulyorejo Community Health Center

Respondent Characteristics	N	%
Age		
< 25 Years	19	48,6
25-40 Years	84	51,4
> 40 Years	2	1,9
Level of Education		

< High School	49	46,7
≥ High School	56	53,3
Total	**105**	**100,0**

Based on Table 4.2, the age of respondents (mothers of toddlers) was mostly in the 25–40 age group, namely 84 people (51.4%), which is a productive and active age for child care. There were 19 respondents (48.6%) under the age of 25, and only 2 respondents (1.9%) over the age of 40. Based on educational level, it was found that the majority of respondents had a high school education or higher, namely 56 people (53.3%), while 49 respondents (46.7%) had an education below high school level.

Univariate Analysis

Tabele 3. Univariate Analysis

Variable	N	%
Incidents of Diarrhea		
Yes	59	56,2
No	46	43,8
Mother's Education Level		
Low Education	49	46,7
High Education	56	53,3
Income Level		
Low Income	61	60,0
High Income	44	40,0
History of Exclusive Breastfeeding		
Non-Exclusive Breastfeeding	62	59,0
Exclusive Breast Milk	43	41,0
Handwashing Actions by Mothers		
Not Eligible	70	66,7
Eligible	35	33,3
Maternal Nutrition Status		
Malnutrition	58	55,2
Good nutrition	47	44,8
Clean Water Source		
Not Eligible	97	92,4
Eligible	8	7,6
Family Toilet Conditions		
Not Eligible	47	44,8
Eligible	58	55,2
Landfill		
Not Eligible	83	79,0
Eligible	22	21,0
Wastewater Disposal Facilities		
Not Eligble	8	7,6
Eligible	97	92,4
Total	**105**	**100,0**

Based on the table above, of the 105 respondents studied, 59 toddlers (56.2%) experienced diarrhea and 46 toddlers (43.8%) did not, indicating that more than half of the toddlers still experienced diarrhea in the study area. Based on the mothers' education levels, most had a high level of education (53.3%), while 46.7% had a low level of education. In terms of parental income level, there were more families with low income (60.0%) than those with high income (40.0%). Regarding exclusive breastfeeding history, the majority of infants did not receive exclusive breastfeeding (59.0%), while those who did receive exclusive breastfeeding amounted to 41.0%. Based on mothers' handwashing practices, the majority met hand hygiene requirements (66.7%), while 33.3% did not. In terms of toddler nutritional status, more than half of toddlers were classified as malnourished (55.2%), and 44.8% were well-nourished.

In terms of clean water sources, the majority of families use water that does not meet the requirements (92.4%), while only 7.6% meet the requirements. In terms of family latrines, 55.2% meet sanitation requirements, and 44.8% do not. For waste disposal sites, the majority are still unsanitary (79.0%), while 21.0% are sanitary. Finally, in terms of wastewater disposal facilities, almost all respondents (92.4%) have sanitary facilities, while 7.6% do not.

Biviariate Analysis

Table 4. Bivariate Analysis

Variable	Incidents of Diarrhea				Total	PR (95%Cl)	*P-Value*
	Yes		No				
	N	%	N	%			
Level Education							
Low Education	32	65,3	17	34,7	49	2,022 (0,920 –	0,114
High Education	27	48,2	29	51,8	56	4,445	
Level Income							
Low Income	40	65,6	21	34,4	61	2,506 (1,130 –	0,029
High Income	19	43,2	25	56,8	44	5,560)	
History Exclusive Breastfeeding							
Non-Exclusive	41	66,1	21	33,9	62	2,712 (1,216 –	0.024
Exclusive	18	42,9	25	58,1	22	6,049)	
Handwashing Actions							
Not Eligible	25	71,4	10	28,6	35	2,647 (1,109 –	0,044
Eligible	34	48,6	36	51,5	70	6,320(	
Toddler Age							
0 – 11 months	14	60,9	9	39,1	23	1,279 (0,498 –	0,784
12 – 59 months	45	54,9	37	28,6	82	3,286)	
Nutrition Status							
Malnutrition	39	67,2	19	32,8	58	2,571 (1,164 –	0,017
Good Nutrition	20	42,6	27	57,4	47	5,682)	
Clean Water Source							
Not Eligible	58	59,8	39	40,2	97	10,410 (1,232 –	0,026
Eligible	1	12,5	7	87,5	8	87,973)	
Family Toilet Conditions							
Not Eligible	32	68,1	15	31,9	58	2,449 (1,099 –	0,044
Eligible	27	46,6	31	53,4	47	5,459)	
Landfill							
Not Eligible	52	62,7	31	37,3	83	3,594 (1,321 –	0,019
Eligible	7	31,8	15	68,2	22	9,784)	
Wastewater Disposal Facilities							
Not Eligible							
Eligible	6	75,0	2	25,0	8	2,491 (0,479 –	0,461
	53	54,6	44	45,4	97	12,961)	

Based on the results of bivariate analysis, it was found that of the nine variables studied, six had a significant relationship with the incidence of diarrhea in toddlers. Mothers with low levels of education had a higher proportion of infants with diarrhea (65.3%) compared to mothers with high levels of education (48.2%), but this relationship was not statistically significant (p = 0.114; PR = 2.022; 95% CI: 0.920–4.445). Income level showed a significant association with the incidence of diarrhea, with more infants from low-income families experiencing diarrhea (65.6%) than those from high-income families (43.2%), with a p value of 0.029 and PR = 2.506 (95% CI: 1.130–5.560). Maternal handwashing practices were also significantly associated with the incidence of diarrhea (p = 0.044; PR = 2.647; 95% CI: 1.109–6.320), with mothers who did not meet handwashing requirements having infants who experienced diarrhea more frequently (71.4%) than those who met the requirements (48.6%).

Furthermore, the nutritional status of toddlers also showed a significant relationship with the incidence of diarrhea (p = 0.017; PR = 2.571; 95% CI: 1.164–5.682), with a higher proportion of diarrhea in malnourished toddlers (67.2%) compared to well-nourished toddlers (42.6%). Environmental factors such as clean water sources had a very significant effect (p = 0.026; PR = 10.410; 95% CI: 1.232–87.973), with almost all cases of diarrhea occurring in households with unsatisfactory water sources (59.8%). The condition of family toilets was also significantly associated (p = 0.044; PR = 2.449; 95% CI: 1.099–5.459), with diarrhea occurring more frequently in families whose toilets were unsanitary (68.1%). Similarly, the condition of waste disposal sites showed a significant association with the incidence of diarrhea (p = 0.019; PR = 3.594; 95% CI: 1.321–9.784), with households with unsanitary waste disposal sites having a higher proportion of diarrhea

(62.7%).

Meanwhile, toddler age and wastewater disposal facilities (SPAL) did not show a significant relationship with the incidence of diarrhea (p = 0.784 and p = 0.461, respectively). Thus, it can be concluded that the most influential factors affecting the incidence of diarrhea in infants are family income level, maternal handwashing practices, infant nutritional status, clean water sources, toilet conditions, and waste disposal facilities.

Multivariate Analysis

Multivariate analysis in this study used backward logistic regression analysis. This analysis served to test independent variables that had a greater influence on the dependent variable (incidence of diarrhea in toddlers). The initial stage of this analysis involved bivariate selection. Bivariate selection involved selecting variables to be included in the analysis, namely variables with a p-value <0.25.

Table 5. Final Results of Multivariate Modeling of Independent Variables

No	Variabel Independen	*P-Value*	OR	Description
1	Nutrition Status	0,009	3,192	Entered
2.	History Exclusive Breastfeeding	0,033	2,612	Removed
3.	Family Toilet Conditions	0,067	2,274	Removed
4.	Wastewater Disposal Facilities	0,103	6,336	Removed

Based on the table, logistic regression modeling was performed using the backward likelihood ratio selection method, resulting in one main variable that remained in the final model, namely nutritional status with a PR value of 3.192. This indicates that toddlers with abnormal nutritional status have more than three times the risk of experiencing diarrhea compared to toddlers with good nutritional status. Meanwhile, the other three variables, namely history of exclusive breastfeeding, family toilet conditions, and clean water sources, were eliminated despite having high Prevalence Ratio (PR) values. This elimination process was carried out based on the statistical significance contribution to the model.

DISCUSSION

The results showed that there was no significant relationship between the mother's level of education and the incidence of diarrhea in toddlers (p = 0.114). This is in line with several previous studies that also found similar results. However, the distribution of data showed that toddlers with low-educated mothers tended to experience more diarrhea. The mother's knowledge and behavior in maintaining hygiene and preventing disease had a greater influence than formal education alone. Highly educated mothers do not necessarily have good awareness and preventive behaviors against diarrhea, because behavioral factors and access to health information also play an important role.

In contrast to the education variable, family income level showed a significant relationship with the incidence of diarrhea (p = 0.029; PR = 2.506). Toddlers from low-income families have a higher risk of diarrhea due to limited access to clean water, sanitation, and nutrition. These findings reinforce the theory that socioeconomic factors are the main determinants of public health. Therefore, improving family economic welfare is one of the important efforts in preventing diarrhea.

The results also showed a significant association between a history of exclusive breastfeeding and the incidence of diarrhea (p = 0.024; PR = 2.712). Toddlers who were not exclusively breastfed were 2.7 times more likely to experience diarrhea than toddlers who were exclusively breastfed. The main factors contributing to the lack of exclusive breastfeeding include mothers' busy work schedules and the misconception that formula milk is better than breast milk. Continuous education for mothers and expectant mothers on the importance of exclusive breastfeeding is needed through health center activities and health education.

In addition, there is a significant relationship between nutritional status and the incidence of diarrhea (p = 0.017; PR = 2.771). Toddlers with poor nutrition are at higher risk of diarrhea due to low immunity. Health workers need to strengthen counseling and nutritional status monitoring activities so that prevention can be carried out early on.

Mothers' handwashing habits were also found to be associated with the incidence of diarrhea (p = 0.044; PR = 2.647). Toddlers whose mothers did not wash their hands properly had a higher risk of developing diarrhea. Low awareness of the importance of washing hands with soap, especially after defecating and before eating, was one of the main causes. Therefore, education on clean and healthy living behaviors (PHBS) needs to be continuously promoted.

Meanwhile, the age of toddlers has no significant relationship with the incidence of diarrhea (p = 0.784). Although toddlers aged 0–11 months are more susceptible to infection, the results of the study show that other factors such as parenting, hygiene, and nutrition play a greater role in determining the risk of diarrhea.

The study also found a significant relationship between clean water sources and the incidence of diarrhea (p = 0.026; PR = 10.410). Infants from homes that use unsafe water have a much higher risk of diarrhea than those who use clean water. Contaminated water can be a medium for the transmission of various microorganisms that cause diarrhea.

In addition, the condition of family toilets was also associated with the incidence of diarrhea (p = 0.044; PR = 2.449). Households with toilets that did not meet sanitation requirements had a higher risk due to the potential for fecal contamination of the environment and clean water.

Finally, waste disposal sites that do not meet the criteria are also significantly correlated with the incidence of diarrhea (p = 0.019; PR = 3.594). Poor waste management, such as open disposal and accumulation around the house, increases the risk of transmission through vectors such as flies. Lack of public awareness about proper waste management is a challenge in diarrhea prevention efforts.

CONCLUSION

The results showed that there was no association between maternal education level, toddler age, and sewage disposal with the incidence of diarrhea among toddlers in the working area of the Mulyorejo Community Health Center. However, a significant relationship was found between parental income level, history of exclusive breastfeeding, maternal hand washing practices, toddler nutritional status, clean water sources, family toilet conditions, and waste disposal sites with the incidence of diarrhea in toddlers. Based on the results of multivariate analysis using logistic regression with the backward method, the variable that most influenced the incidence of diarrhea in toddlers in the Mulyorejo Community Health Center working area was toddler nutritional status.

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