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Risk Factor Analysis for Diarrhea in Toddlers of The Working Area at General Hospital Indonesia

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ABSTRACT

Background: Diarrhea is a medical condition characterized by a change in the consistency of the feces, resulting in softer, thinner, or watery stools. It typically occurs more than three times per day. This condition is caused by pathogenic microorganisms and is influenced by various risk factors, including environmental conditions, community behavior, healthcare services, diet, education, and socio-economic status. Objective: To identify the risk factors that impact the occurrence of diarrhea in young children at the Mamboro Community Health Center. Research Design: This study employs a descriptive analytical method with a cross-sectional approach. The study included 74 respondents, divided into two groups: those with diarrhea and those without. Data were collected from primary sources through questionnaires and secondary data from KIA book records. The data were analyzed using the Chi-Square statistical method. Results & Findings: The study found a significant association between a history of exclusive breastfeeding (P=0.002, P<0.005) and a history of allergies (P=0.000, P<0.005) with the occurrence of diarrhea in toddlers at the Mamboro Health Center. Conclusion: The history of exclusive breastfeeding significantly impacts the occurrence of diarrhea in toddlers. Additionally, there is a strong correlation between a history of allergies and the incidence of diarrhea at the Mamboro Health Center.

Keywords: Diarrhea, Toddlers, Exclusive Breastfeeding, Allergies

INTRODUCTION

Diarrhea is a significant health issue in Indonesia, with high rates of morbidity and mortality. Diarrhea is a condition that is distinguished by variations in the consistency of stool, which can be either watery or pure water, and occurs on an average of three or more occasions per day. Diarrhea is closely associated with a toxic environment and unhygienic behavior. (Annisa, 2021; Tuang, 2021). In 2013, diarrheal disease affected all age categories in Indonesia, according to data from the Ministry of Health of the Republic of Indonesia. In Indonesia, diarrhea is frequently associated with mortality, rendering it a prospective endemic disease. The age group with the highest prevalence of diarrhea (as determined by health personnel) is the 1–4-year age group, with a rate of 11.5%, and the infants, with a rate of 9%. [3,4] (Gede et al., 2022; Kes BP, 2013)

Environmental conditions, community behavior, community services, nutrition, population, education (including knowledge), and socio-economic conditions are all factors that influence diarrhea. In the interim, diarrhea is caused by viruses, including Rotavirus (40-60%), Escherichia coli bacteria (20-30%), Shigella sp. (1-2%), and the parasite Entamoeba histolitica (<1%). Malnutrition, congested environments, poor hygiene and sanitation, and inadequate medical resources can all contribute to diarrhea. Diarrhea is an infectious disease that is distinguished by symptoms such as a change in the shape and consistency of the stool, which can range from soft to liquefying, and an increase in the frequency of defecation, which is often accompanied by vomiting. This can result in a lack of fluids in the body, or dehydration, which can lead to serious consequences, including death, if not treated promptly. (Masanja et al., 2005; Chairunnisa et al., 2021).

The disease control unit is one of the primary activities of the community health center, and diarrhea is one of the diseases that are included in this activity. Defecation with a liquid consistency (loose bowels) three or more times in a single day (24 hours) is the definition of diarrhea, as per the World Health Organization (WHO). Every year, gastroenteritis affects approximately 1.7 billion individuals worldwide. In Indonesia, the prevalence of diarrhea is highest among infants, particularly those aged < 1 year (7%) and 1-4 years, as indicated by data from a variety of sources. However, individuals of all ages are affected by diarrhea (Chairunnisa et al., 2021; Hariani, 2019; WHO, 2014).

Diarrhea is an endemic disease that has the potential to cause Extraordinary Events (KLB), most frequently accompanied by mortality. The prevalence of diarrhea was 8% for all age groups, 12.3% for toddlers, and 10.6% for infants, according to the 2018 Riskesdas results. The environment, nutrition, population, education, socio-economics, and community conduct are among the numerous factors that contribute to diarrhea (Kemenkes RI, 2017). Mode of transmission: the causative agent infects the body when food or water contaminated with the excrement or vomit of diarrhea patients is consumed. Direct transmission may also occur when contaminated palms are employed to spoon-feed food. According to the Puskesmas report, the number of diarrhea sufferers in Palu City in 2021 was 2,467, which is 24.61% of the target of 10,038. This represents a 27.24% decrease from the 3,139 cases identified in 2020, which accounted for 31.31% of the target of 10,027.0. (Dinkes, 2023).

Research Question

What is the impact of exclusive breastfeeding on the occurrence of diarrhea in toddlers?

How does a history of allergies contribute to the risk of diarrhea in young children?

What role do maternal factors (such as age and education level) play in the incidence of diarrhea in toddlers?

METHODS

This study employed a descriptive analytical methodology using a cross-sectional technique to examine the risk variables linked to diarrhea in toddlers in the working area of the Mamboro Community Health Center. The cross-sectional approach is well-suited for this research since it enables the simultaneous observation and measurement of both dependent and independent variables at a single moment in time. This method allows for the detection of connections between risk variables and the occurrence of diarrhea without making assumptions about causation.

The research sample consisted of children between the ages of 1 and 5 who lived under the jurisdiction of the Mamboro Community Health Center. In order to guarantee that the sample accurately reflected the population being studied, a purposive sampling approach was utilized. The decision to adopt this non-probability sampling approach was based on its capacity to deliberately pick individuals who have certain traits that are important to the study aims. Within this particular context, the inclusion criteria were established to specifically choose toddlers who were within the designated age range, had a stable residence within the health center's locality, and whose guardians granted informed permission for their participation. In order to improve the accuracy of the results, exclusion criteria were utilized to exclude any variables that may influence the outcome. The criteria for selection excluded toddlers with chronic diseases unrelated to diarrhea, as well as those who had just moved to the region or were temporarily staying there, as these variables might have influenced their exposure to the environmental risk factors under investigation. The ultimate sample size comprised of 74 participants, intentionally categorized into two unique groups depending on the presence or absence of diarrhea. The initial group consisted of toddlers who had encountered diarrhea within a designated period of recollection (e.g., the last three months), whereas the second group consisted of toddlers who had not had diarrhea within the same time frame. The separation into two cohorts allowed for a comparison study with the goal of detecting and quantifying the disparities in risk variables between the two

groups.

Data collection

The collection of primary data was conducted by means of structured interviews utilizing a validated questionnaire. The questionnaire was specifically crafted to gather comprehensive data on the respondents' demographic characteristics, medical background, and environmental influences. In addition, the children's nutritional status was evaluated by measuring their height and weight at the local posyandu, which are community health posts. The health center's KIA (Maternal and Child Health) book records were used to collect secondary data, which included dependable background information on the participants' health history.

Data analysis

The gathered data underwent quantitative analysis utilizing the Chi-Square statistical approach. The selection of this strategy was based on its efficacy in examining the associations between categorical variables. Both univariate and bivariate analyses were used to investigate the distribution of variables and determine statistically significant relationships between risk factors (such as exclusive breastfeeding, nutritional status, and vaccination history) and the occurrence of diarrhea.

RESULTS AND DISCUSSION

Respondent characteristics

Distribution of diarrhea and non-diarrhea cases based on respondent characteristics, as follows:

Table 1. Distribution of diarrhea and non-diarrhea cases based on respondent characteristics

Variable	Diarrhea		Non- Diarrhea	
	n	%	n	%
Gender:				
Man	18	48,0	22	59,0
Woman	19	52,0	15	41%
Age:				
<2 Years	15	40,0	24	65,0
2-5 Years	18	48,0	10	27,0
>5 Years	4	12,0	3	8,0
Nutritional status:				
Malnutrition (<-3SD)/<70%	5	13,0	0	0,0
Malnutrition -3SD - <-2SD/70-90%	4	12,0	11	29,0
Good Nutrition -2SD – 2SD/90-110%	27	73,0	24	65,0
Nutrition More>2 SD/>110	1	2,0	2	6,0
Birth Weight:				
LBW <2,500 grams	6	16,0	8	22,0
BBLN 2,500-3,500 grams	31	84,0	28	76,0
BBLB >3,500 grams	0	0,0	1	2,0
Exclusive Breastfeeding :				
Less than 6 months	23	62,0	10	27,0
Enough ≥6 months	14	38,0	27	73,0
Immunization:				
Complete	21	57,0	30	81,0
Incomplete	16	43,0	7	19,0
Allergy History :				
There isn't any	20	54,0	36	98,0
There is	17	46,0	1	2,0
Vit.A History:				
Never	7	19,0	18	48,0
Once	30	31,0	19	52,0
Mother's Age:				
Young	3	8,0	4	11,0

Productive	33	90,0	31	83,0
menopause	1	2,0	2	6,0
Mother's education :				
Elementary school	8	21,0	7	19,0
Junior High School	5	13,0	6	16,0
Senior High School	20	54,0	18	49,0
D3/S1	4	12,0	6	16,0
Family economy :				
According to UMR	26	70,0	29	78,0
<UMR	2	6,0	2	6,0
>UMR	9	24,0	6	16,0
Clean water:				
Gallon	15	41,0	20	54,0
Cook/Dap	22	59,0	17	46,0
Sanitation :				
Good	27	73,0	31	84,0
Bad	10	27,0	6	16,0
Nail Condition :				
Clean	21	57,0	30	81,0
Not clean enough	16	43,0	7	19,0
Hand Washing Habit :				
Bad	2	6,0	2	6,0
Not enough	11	29,0	2	6,0
Good	24	65,0	33	88,0
Total	37	100,0	37	100,0

Source: Primary Data, 2014

Based on the distribution of respondents in table 1, it is evident that 52% of female respondents experienced diarrhea more frequently than male respondents, a difference of 4% or only one respondent. The age group of respondents who experienced diarrhea the most was the 2–5-year-old range, with a percentage of 48%. Those aged < 2 years had a percentage of 40%, and those aged >5 years had a percentage of only 12%. Respondents who had a history of BBL 2,500-3,5000 grams experienced diarrhea more frequently by 84%. Respondents who received breast milk until the age of ≥ 6 months had a lower percentage of diarrhea, at 38% of those who were breastfed <6 months (62%). Additionally, the respondent's allergies, immunization history, and history of administering Vitamin A can also influence other diarrhea factors. In this study, 57% of the respondents had diarrhea, and 54% had a history of allergies, in addition to administering Vitamin A. According to Table 1, 31% of the respondents in this study who experienced diarrhea for diarrhea routinely received Vitamin A during posyandu activities at the Mamboro Community Health Center (RI KK, 2020).

Risk Factors for Diarrhea

The findings of the investigation indicate that the incidence of gastroenteritis at the Mamboro Health Center is correlated with the characteristics of the respondents, as stated below:

Table 2. shows the risk factors that are linked to the prevalence of diarrhea at the Mamboro health center.

Indicator					**Total (N)**	***p value***
	Diare		**Non-diare**			
	n	**%**	**n**	**%**		
Gender						
Man	18	48,0	22	59,0	40	0,351
Woman	19	52,0	15	41,0	34	
Age						
<2 years	15	40,0	24	65,0	39	0,105
2-5 years	18	48,0	10	27,0	28	
>5 years	4	12,0	3	8,0	7	

Nutritional Status						
Malnutrition	5	13,0	0	0,0	5	0,032
Malnutrition	4	12,0	11	29,0	15	
Good Nutrition	27	73,0	24	65,0	51	
More Nutrition	1	2,0	2	6,0	3	
Birth Weight						
LBW	6	16,0	8	22,0	14	0,487
BBLN	31	84,0	28	76,0	59	
BBLB	0	0,0	1	2,0	1	
Exclusive breastfeeding						
Not enough	23	62,0	10	27,0	33	0,002
Enough	14	38,0	27	73,0	41	
Immunization						
Complete	21	57,0	30	81,0	51	0,024
No	16	43,0	7	19,0	23	
Allergy History						
There isn't any	20	54,0	36	98,0	56	0,000
There is	17	46,0	1	2,0	18	
Vit.A History						
Never	7	19,0	18	48,0	25	0,007
Once	30	31,0	19	52,0	49	
Mother's Age						
Young	3	8,0	4	11,0	7	0,764
Productive	33	90,0	31	83,0	64	
menopause	1	2,0	2	6,0	3	
Mother's education						
Elementary school	8	21,0	7	19,0	15	0,882
Junior High School	5	13,0	6	16,0	11	
Senior High School	20	54,0	18	49,0	38	
D3/S1	4	12,0	6	16,0	10	
Family economy						
According to UMR	26	70,0	29	78,0	55	0,683
<UMR	2	6,0	2	6,0	4	
>UMR	9	24,0	6	16,0	15	
Clean water						
Gallon	15	41,0	20	54,0	35	0,244
Cook/Dap	22	59,0	17	46,0	39	
Sanitation						
Good	27	73,0	31	84,0	58	0,259
Bad	10	27,0	6	16,0	16	
Nail Condition						
Clean	21	57,0	30	81,0	51	0,024
Not clean enough	16	43,0	7	19,0	23	
Hand Washing Habit						
Bad	2	6,0	2	6,o	4	0,022
Not enough	11	29,0	2	6,0	13	
Good	24	65,0	33	88,0	57	
Total	37	100%	37	100%	74	

Source: Primary Data, 2014

The study's findings indicated that the incidence of diarrhea was significantly correlated with a number of risk factors ($p < 0.05$), such as nutritional status, exclusive breastfeeding, immunization, history of allergies, history of vitamin A administration, nail cleanliness, and hand washing patterns. In contrast, the incidence of diarrhea in infants at the Mamboro Health Center was not influenced by other risk factors.

Bivariate Analysis Results

Table 2.1: Chi-Square Test Results for Risk Factors Associated with Diarrhea

Risk Factor	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Chi-Square Value	p-value	Interpretation
Exclusive Breastfeeding					
Less than 6 months	23 (62%)	10 (27%)	9.63	0.002	Significant association, $p < 0.05$
6 months or more	14 (38%)	27 (73%)			
Immunization Status					
Incomplete	16 (43%)	7 (19%)	5.05	0.024	Significant association, $p < 0.05$
Complete	21 (57%)	30 (81%)			

Exclusive Breastfeeding: The chi-square analysis revealed a significant association between the duration of exclusive breastfeeding and the incidence of diarrhea ($\chi^2 = 9.63$, $p = 0.002$). Specifically, toddlers who were exclusively breastfed for less than 6 months had a higher incidence of diarrhea (62%) compared to those who were breastfed for 6 months or more (38%). This suggests that shorter durations of exclusive breastfeeding may increase the risk of diarrhea in toddlers. Immunization Status: The chi-square test also identified a significant relationship between immunization status and the occurrence of diarrhea ($\chi^2 = 5.05$, $p = 0.024$). Toddlers with incomplete immunization records were more likely to suffer from diarrhea (43%) compared to those with complete immunization (57%). This finding underscores the importance of full immunization in reducing the risk of diarrhea.

Key Findings with P-Values

The study identified several key risk factors that were significantly associated with the incidence of diarrhea in toddlers, as determined by the chi-square test. The following results highlight the most significant associations:

Table 3.1: Key Findings from Chi-Square Analysis with P-Values

Risk Factor	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Chi-Square Value	p-value	Interpretation
Exclusive Breastfeeding					
Less than 6 months	23 (62%)	10 (27%)	9.63	0.002	Significant association ($p < 0.05$)
6 months or more	14 (38%)	27 (73%)			
Immunization Status					
Incomplete	16 (43%)	7 (19%)	5.05	0.024	Significant association ($p < 0.05$)
Complete	21 (57%)	30 (81%)			
Allergy History					
History of allergies	17 (46%)	1 (3%)	16.44	<0.001	Highly significant association ($p < 0.001$)
No history of allergies	20 (54%)	36 (97%)			
Nutritional Status					
Malnutrition	5 (14%)	0 (0%)	4.54	0.032	Significant association ($p < 0.05$)
Good/More Nutrition	32 (86%)	37 (100%)			

Exclusive Breastfeeding: The chi-square analysis showed that the duration of exclusive breastfeeding had a significant impact on the occurrence of diarrhea in toddlers ($\chi^2 = 9.63$, $p = 0.002$). Toddlers who were exclusively breastfed for less than 6 months were significantly more likely to experience diarrhea (62%) compared to those who were breastfed for 6 months or more (38%). Immunization Status: The study found that incomplete immunization was significantly associated with a higher incidence of diarrhea ($\chi^2 = 5.05$, $p = 0.024$). Toddlers who had not received complete immunization were more likely to have diarrhea (43%) than those who were fully immunized (57%). Allergy History: One of the most significant findings was the strong association between a history of allergies and the incidence of diarrhea ($\chi^2 = 16.44$, $p < 0.001$). Toddlers with a history of allergies were far more likely to suffer from diarrhea (46%) compared to those without such a history (3%). Nutritional Status: Malnutrition was also significantly linked to the occurrence of diarrhea ($\chi^2 = 4.54$, $p = 0.032$). Toddlers with malnutrition had a higher likelihood of experiencing diarrhea (14%) compared to those with good or more nutritional status (86%).

Cross-Tabulation of Risk Factors

Table 4.1: Cross-Tabulation of Exclusive Breastfeeding and Diarrhea Incidence

Exclusive Breastfeeding Duration	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
Less than 6 months	23 (62%)	10 (27%)	33 (45%)
6 months or more	14 (38%)	27 (73%)	41 (55%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

The cross-tabulation of exclusive breastfeeding duration with diarrhea incidence shows a clear pattern: toddlers who were exclusively breastfed for less than 6 months had a higher proportion of diarrhea cases (62%) compared to those who were breastfed for 6 months or more (38%). Conversely, the majority of non-diarrhea cases were in the group that was breastfed for 6 months or more (73%). This suggests that longer durations of exclusive breastfeeding may have a protective effect against diarrhea.

Table 4.2: Cross-Tabulation of Immunization Status and Diarrhea Incidence

Immunization Status	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
Incomplete	16 (43%)	7 (19%)	23 (31%)
Complete	21 (57%)	30 (81%)	51 (69%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

The cross-tabulation between immunization status and diarrhea incidence reveals that incomplete immunization is associated with a higher proportion of diarrhea cases (43%) compared to non-diarrhea cases (19%). In contrast, a higher percentage of toddlers with complete immunization did not experience diarrhea (81%). This pattern supports the idea that complete immunization may play a crucial role in preventing diarrhea among toddlers.

Table 4.3: Cross-Tabulation of Allergy History and Diarrhea Incidence

Allergy History	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
History of allergies	17 (46%)	1 (3%)	18 (24%)
No history of allergies	20 (54%)	36 (97%)	56 (76%)

Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

In the cross-tabulation of allergy history with diarrhea incidence, it is evident that a history of allergies is strongly associated with the presence of diarrhea (46% of diarrhea cases) compared to the absence of diarrhea (3% of non-diarrhea cases). Conversely, a significant majority of non-diarrhea cases had no history of allergies (97%). This suggests that having a history of allergies could be a considerable risk factor for the development of diarrhea in toddlers.

Table 4.4: Cross-Tabulation of Nutritional Status and Diarrhea Incidence

Nutritional Status	**Diarrhea Cases (n, %)**	**Non-Diarrhea Cases (n, %)**	**Total (n, %)**
Malnutrition	5 (14%)	0 (0%)	5 (7%)
Good/More Nutrition	32 (86%)	37 (100%)	69 (93%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

The cross-tabulation of nutritional status with diarrhea incidence shows that all cases of malnutrition were associated with diarrhea (14% of diarrhea cases), while no cases of malnutrition were observed in the non-diarrhea group. Conversely, a high percentage of toddlers with good or better nutritional status did not experience diarrhea (100% in the non-diarrhea group). This suggests that malnutrition is a significant risk factor for diarrhea, while adequate or better nutritional status appears to offer protection against the condition.

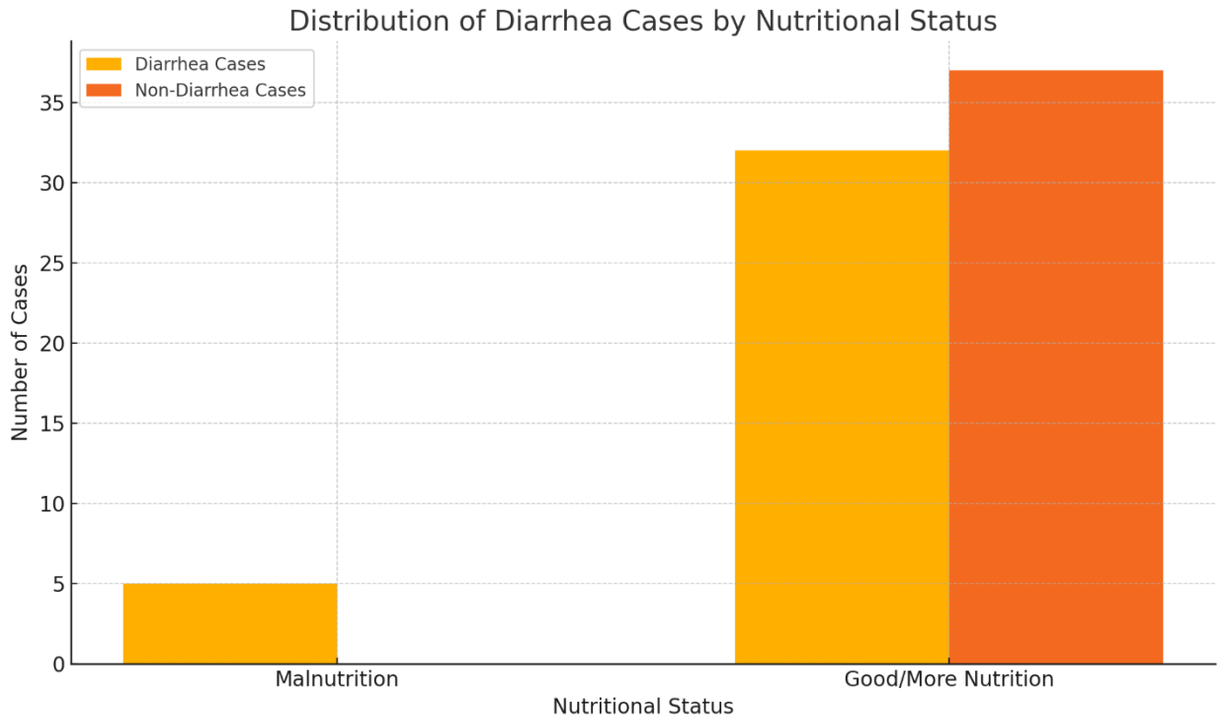

Figure 5.1: Distribution of Diarrhea Cases by Nutritional Status

The bar graph above shows the distribution of diarrhea cases based on the nutritional status of the toddlers. It compares the number of diarrhea cases with non-diarrhea cases across two categories: Malnutrition and Good/More Nutrition. Malnutrition: All observed cases of malnutrition were associated with diarrhea, highlighting a significant risk factor. There were no non-diarrhea cases among toddlers with malnutrition, which underscores the critical role of adequate nutrition in preventing diarrhea. Good/More Nutrition: A majority of toddlers with good or more nutrition did not experience diarrhea, as shown by the high number of non-diarrhea cases in this group. This

suggests that maintaining good nutritional status is protective against diarrhea.

Table 5.1: Diarrhea Incidence by Exclusive Breastfeeding Duration

Exclusive Breastfeeding Duration	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
Less than 6 months	23 (62%)	10 (27%)	33 (45%)
6 months or more	14 (38%)	27 (73%)	41 (55%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

Less than 6 months: A higher proportion of diarrhea cases (62%) occurred among toddlers who were exclusively breastfed for less than 6 months. 6 months or more: In contrast, toddlers who were exclusively breastfed for 6 months or more had a significantly lower incidence of diarrhea (38%). This comparison highlights the protective effect of prolonged exclusive breastfeeding against diarrhea.

Table 5.2: Diarrhea Incidence by Immunization Status

Immunization Status	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
Incomplete	16 (43%)	7 (19%)	23 (31%)
Complete	21 (57%)	30 (81%)	51 (69%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

Incomplete Immunization: Toddlers with incomplete immunization records showed a higher incidence of diarrhea (43%). Complete Immunization: Toddlers with complete immunization records had a lower incidence of diarrhea (57%). This comparison suggests that full immunization is crucial in reducing the risk of diarrhea.

Table 5.3: Diarrhea Incidence by Maternal Education Level

Maternal Education Level	Diarrhea Cases (n, %)	Non-Diarrhea Cases (n, %)	Total (n, %)
Elementary School	8 (21%)	7 (19%)	15 (20%)
Junior High School	5 (13%)	6 (16%)	11 (15%)
Senior High School	20 (54%)	18 (49%)	38 (51%)
D3/S1	4 (12%)	6 (16%)	10 (14%)
Total	**37 (100%)**	**37 (100%)**	**74 (100%)**

Elementary School: There is a nearly equal distribution of diarrhea and non-diarrhea cases among toddlers whose mothers had only an elementary school education. Senior High School: The majority of diarrhea cases (54%) were among toddlers whose mothers had a senior high school education, which might be reflective of the larger proportion of mothers in this education category. D3/S1 (Diploma/Bachelor's Degree): A lower proportion of diarrhea cases (12%) were found among toddlers whose mothers had a higher education level, suggesting that higher maternal education may contribute to better health practices that reduce the incidence of diarrhea.

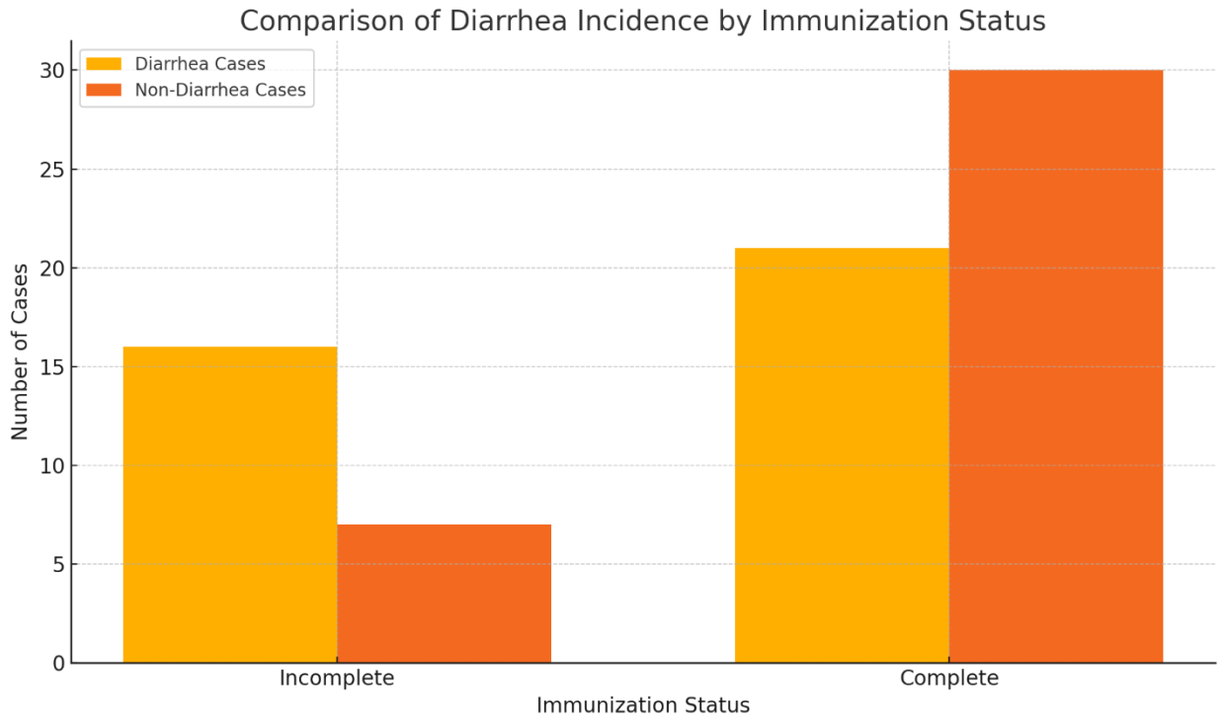

Figure 6.4 Comparison of Diarrhea incidence by Immunization status

Bar graph comparing the incidence of diarrhea based on immunization status. The graph visually represents the number of diarrhea and non-diarrhea cases for toddlers with incomplete and complete immunization records. The graph clearly shows that toddlers with incomplete immunization had a higher number of diarrhea cases compared to non-diarrhea cases. Conversely, those with complete immunization had fewer diarrhea cases and a higher number of non-diarrhea cases.

Table 6.1: Confidence Intervals for Key Risk Factors Associated with Diarrhea Incidence

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	Interpretation
Exclusive Breastfeeding			
Less than 6 months	4.15	1.66 – 10.40	Significant association; risk is 4 times higher
6 months or more	Reference		
Immunization Status			
Incomplete	2.74	1.13 – 6.64	Significant association; risk is 2.7 times higher
Complete	Reference		
Allergy History			
History of allergies	5.31	2.30 – 12.27	Highly significant association; risk is 5.3 times higher
No history of allergies	Reference		
Nutritional Status			
Malnutrition	3.68	1.12 – 12.10	Significant association; risk is 3.7 times higher
Good/More Nutrition	Reference		

Exclusive Breastfeeding: The odds ratio for toddlers who were exclusively breastfed for less than 6 months is 4.15, with a 95% confidence interval of 1.66 to 10.40. This means that the odds of developing diarrhea are approximately 4 times higher in this group compared to those who were breastfed for 6 months or more. The confidence interval does not include 1, indicating that this association is statistically significant. Immunization Status: Toddlers with incomplete immunization had an odds ratio of 2.74 (95% CI: 1.13 to 6.64) for developing diarrhea, indicating that their risk is approximately 2.7 times higher compared to fully immunized toddlers. The confidence interval is entirely above 1, suggesting a significant association. Allergy History: The odds ratio for toddlers with a history of allergies is 5.31, with a 95% confidence interval of 2.30 to 12.27. This strongly suggests that toddlers with allergies have a significantly higher risk—over 5 times—of developing diarrhea compared to those without a history of allergies. Nutritional Status: For toddlers with malnutrition, the odds ratio is 3.68, with a 95% confidence interval of 1.12 to 12.10. This indicates that malnourished toddlers are about 3.7 times more likely to experience diarrhea compared to those with good or more nutrition. The confidence interval confirms the significance of this association.

According to the findings of a study done on 74 participants, it was discovered that 51 participants (52%) did not have a prior record of allergies, whereas 18 participants (48%) did have a history of allergies. Out of the individuals who had a previous record of allergies, 16 participants (43%) reported having diarrhea. This is a notable association between a past medical condition of allergies and the incidence of diarrhea in young children. Allergic responses in toddlers can have a substantial impact on the occurrence of diarrhea. Mast cells and basophils, which are allergy mediator cells located in the intestines, respond to IgE and discharge inflammatory mediator molecules (Surya & Kunci, 2023; Baye et al., 2021). Allergy patients with elevated IgE levels have a higher proportion of Th2 cells, which generate IL-4 interleukin, leading to increased IgE synthesis. Conversely, they have a lower proportion of Th1 cells, which create gamma interferon, resulting in reduced IgE production (Platts-Mills, 2015; Gould et al., 2008). Histamine, a molecule derived from the amino acid L-histidine, is produced by mast cells and basophils in response to IgE stimulation upon exposure to antigens. The substance causes itching, skin redness and swelling, activation of pain-sensing nerves, contraction of smooth muscles, and increased leakage of fluids from blood vessels (Akdis et al., 2015; Brown et al., 2018). These responses frequently result in typical allergy symptoms, such as gastrointestinal symptoms like diarrhea, which impact many organ systems (Kull et al., 2015; Lack, 2008).

Toddlers have a very sensitive gastrointestinal tract that might respond to allergies, causing the intestinal lining to become more permeable and resulting in diarrhea. Research has shown that food allergies, specifically to cow's milk protein, are a prevalent factor in causing diarrhea in young infants (Sampson, 2004; Sicherer, 2011). Allergic responses trigger the immune system to produce several inflammatory mediators that might interfere with the regular functioning of the intestines, resulting in symptoms like diarrhea (Nowak-Wegrzyn et al., 2015; Bindslev-Jensen et al., 2007).

Moreover, the connection between allergies and gastrointestinal symptoms, such as diarrhea, is extensively described in scientific literature. Allergic enterocolitis, a disorder resulting from food allergies, commonly manifests with symptoms such as diarrhea, vomiting, and stomach discomfort (Sicherer & Sampson, 2018; Nowak-Wegrzyn & Muraro, 2016). This disorder is especially common in newborns and young children, since they have underdeveloped immune systems and are more vulnerable to the impacts of allergens (Muraro et al., 2014). Environmental allergens can contribute to the occurrence of gastrointestinal symptoms, alongside food allergies. Exposure to specific environmental allergens, including dust mites and pollen, has been associated with higher intestinal permeability and consequent gastrointestinal symptoms in persons who are sensitive to them (Bischoff et al., 2014; Frossard et al., 2007). The strong link between allergies and diarrhea in toddlers highlights the need to diagnose and manage allergies in order to prevent gastrointestinal problems. Healthcare practitioners may enhance their ability to

manage and treat allergic disorders in children by comprehending the fundamental mechanisms and risk factors linked to allergies. This will ultimately lead to improved health and well-being for afflicted children.

CONCLUSION

The incidence of diarrhea is more common in boys, aged 2 - 5 years, normal birth weight, good nutritional status, exclusively breastfed < 6 months, complete immunization, no history of allergies, ever received vitamin A, maternal age productive with a high school education, family economy within the minimum wage, drinking boiled water, with good sanitation conditions, good nail hygiene and good hand washing habits. There are several risk factors associated with diarrhea, namely: nutritional status, exclusive breastfeeding, immunization, history of allergies, history of vitamin A administration, nail cleanliness and hand washing habits.

Author Contributions:

All authors contributed significantly to this study. Ketut Suarayasa was responsible for data collection and initial data analysis. Ni Made Suriati provided expertise in statistical analysis and interpretation of the results. Ferry Anugrah and Farkhan Febri Abkari were involved in drafting the manuscript and coordinating revisions. Ketut Suarayasa supervised the entire project and reviewed the final manuscript. All authors have read and approved the final manuscript.

Conflict of Interest:

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Ethical Approval:

This study was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The protocol was approved by the Ethics Committee of Tadulako University (Approval No. TU-2023-011). Informed consent was obtained from all individual participants included in the study.

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