FACTORS ASSOCIATED WITH THE INCIDENCE OF INFANT DIAPER RASH IN THE NICU ROOM PKU MUHAMMADIYAH HOSPITAL, YOGYAKARTA

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ABSTRACT

Diaper rash is one of the most common skin problems in infants, especially in the *Neonatal Intensive Care Unit* (NICU), due to the infant's vulnerable skin condition and exposure to urine, feces, and diaper friction. The incidence of diaper rash may increase due to various risk factors that have not been conclusively identified, especially in the context of care in the NICU. This study aimed to analyze the factors associated with the incidence of diaper rash in the NICU room of PKU Muhammadiyah Yogyakarta Hospital. The study used an analytic descriptive design with a cross-sectional approach. A sample of 38 infants was taken using *consecutive sampling* technique based on inclusion and exclusion criteria. Data were obtained through observation using the *Diaper Dermatitis Severity Index Score (DDSIS)* instrument and medical records. Univariate, bivariate (*Chi square*), and multivariate (multiple logistic regression) analyses were conducted. There was a significant association between the use of diaper cream (p=0.006) and the use of antibiotics (p=0.006; OR=0.055; CI 95%=0.006-0.491) with the incidence of diaper rash. Conclusion The use of diaper cream and antibiotics showed a significant association with the incidence of diaper rash, the most dominant factor affecting the incidence of diaper rash was the use of antibiotics with OR 0.055, meaning that patients with antibiotic use reduced the incidence of diaper rash by 94.5% after being controlled by the use of diaper cream. These results emphasize the importance of evaluation in infant care practices related to the use of skin care products and antibiotic administration in the NICU room to prevent the incidence of diaper rash.

Keywords: Infant diaper rash, NICU, diaper cream, antibiotics, DDSIS

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1. Introduction

Diaper rash (*diaper dermatitis*) is a common skin inflammation problem in infants, especially those admitted to the *Neonatal Intensive Care Unit* (NICU). This condition is caused by a combination of irritation from urine and feces, excess moisture, diaper friction, and the immaturity of the baby's skin. According to WHO in Sofyan et al. (2024) reported an increase in the prevalence of diaper rash globally, especially in infants aged 9-12 months, with the incidence reaching 65%. In Indonesia, specific prevalence data is still limited, but studies show the incidence rate ranges from 7-35%. Various factors have been known to be associated with the incidence of diaper rash, including microorganism infection, antibiotic use, length of hospitalization, and care habits such as frequency of diaper changes and use of topical creams. Infants with diaper rash experience inflammation of the genital area which will cause the baby pain, so the baby will be more fussy than babies who do not have diaper rash. In addition, diaper rash will be the reason for increasing the length of stay of infants and increasing the cost of hospitalization. Preliminary study in the NICU room of PKU Muhammadiyah Yogyakarta Hospital recorded 29 cases of diaper rash during the period August 2024 - January 2025. This study aims to analyze the factors associated with the incidence of diaper rash in infants in the NICU room of PKU Muhammadiyah Yogyakarta Hospital, as a basis for improving neonatal nursing practice and preventing diaper dermatitis more effectively.

2. Research Methods

This study was a descriptive analytic study with a *cross-sectional* approach conducted in the NICU room of PKU Muhammadiyah Yogyakarta Hospital in May-June 2025. The sample amounted to 38 infants selected using *consecutive sampling* technique**,** based on the inclusion criteria of infants aged 0-12 months who were treated ≥48 hours and had complete medical data. Data were collected through two methods: (1) direct observation using the Diaper *Dermatitis Severity Index Score (*DDSIS) instrument to assess the incidence and degree of diaper rash, and (2) recording medical record data to identify risk factors (over, sex, gestational age, birth weight, diet, medical diagnosis based on birth weight and gestational age, infection diagnosis, antibiotic use, diaper cream use, diaper change frequency, length of stay, bathing frequency, diarrhea and gastrointestinal infection, cleaning tools). Data were analyzed univariately for frequency distribution, bivariately using the *Chi-Square* test, and multivariately with multiple logistic regression to identify the dominant factors associated with the incidence of diaper rash. This study has received *Ethics Committee Approval* from the ethics *committee* of PKU Muhammadiyah Yogyakarta Hospital with No. 00184/KT.7.4/V/2025.

3. Results and Discussion

3.1 Results

Table 1 Characteristics of infants in the NICU room of PKU Muhammadiyah Yogyakarta Hospital

June, 2025 (n=38)

Characteristics	Frekuency	Precentage (%)
Age		
0-1 month	32	84,2
1 - 12 months	6	15,8
Gender		
Male	23	60,5
Female	15	39,5
Birth weight		
<2500 grams	14	36,8
≥2500grams	24	63,2
Gestational age		
<37 weeks	13	34,2
Infant diet		
BREAST MILK	22	57,9
Infant Formula	3	7,9
Breast milk and infant formula	11	28,9
Fasting	2	5,3
Medical diagnosis (based on birth weight and gestational age)		
NKB KMK (Low Birth Weight Infant, Small for Gestational Age (SGA))	2	5,3
NKB-SMK (Low Birth Weight Infant, Appropriate for Gestational Age (AGA))	9	23,7
NCB-KMK (Normal Birth Weight Infant, Small for Gestational Age (SGA))	3	7,9
NCB-KMK (Normal Birth Weight Infant, Appropriate for Gestational Age (AGA))	24	63,2
Medical diagnosis (based on Infection and Non Medical)		
Infection	34	89,5
Non-infectious	4	10,5

Characteristics	Frekuency	Precentage (%)
Length of stay		
<4 days	10	26,3
>4 days	28	73,7
Frequency of bathing		
Bath	38	100
No bathing	0	0
Frequency of diaper change		
Once every 3-4 hours	38	100
>4 hours	0	0
Diarrhea or gastrointestinal infection		
Yes	8	21,1
No	30	78,9
Use of diaper cream		
Yes	5	13,2
No	33	86,8
Antibiotic use		
Yes	24	63,2
no	14	36,8
Diaper cleaning tools		
Wet wipes	2	5,3
Water and Cotton	34	89,5
Wet Wipes and Water and Cotton	2	5,3
Total	38	100

Source: Primary Data 2025

Table 1 shows the characteristics of respondents, it is known that of the 38 respondents in this study, most were aged 0-1 month 32 babies (84.2%), the gender was male 23 babies (60.5%). Birth weight is above 2500 grams as many as 24 babies (63.2%), the most gestational age is >37 weeks as many as (65.8%). The most infant diet was breast milk as many as 22 babies (57.9%). Medical diagnosis based on birth weight and gestational age was mostly NCB-SMK (neonatal full term-appropriate gestational age) as many as 24 babies (64.2%), while medical diagnosis of infection was mostly 34 babies (89.5%). The length of hospitalization was mostly more than 4 days with 28 infants (73.7%). Frequency of bathing and diaper changing was found in all 38 infants (100%). Patients with diarrhea or gastrointestinal infection were 8 infants (21.1%), the use of diaper cream was 5 infants (13.2%). The use of antibiotics was found in 24 infants (63.2%) and the most diaper cleaning tools used water and cotton 34 (89.5%).

Table 2 Distribution of Respondents Based on Erythema, Erosion, and Papules/Pustules on the DDSIS Instrument June 2025 (n=38)

Variable	f	Percentage (%)
Erythema \		
None	24	63,2
Mild (Pink)	6	15,8
Medium (Red)	7	18,4
Heavy (Flesh Red)	1	2,6
Erosion		
None	27	71,1
Yes	11	28,9
Papules/Pustules		
None	33	86,8
Few (1-10)	3	7,9
Multiple (11-20)	1	2,6
Multiple (21-40)	1	2,6
A lot (>40)	0	0
Total	38	100

Source: Primary Data 2025

Table 2 shows the assessment of diaper rash severity in this study using the DDSIS (Diaper Dermatitis Severity Index Score) instrument which consists of three main indicators, namely erythema, erosion, and papules/pustules. These three indicators are used to describe the clinical condition of the skin of infants who experience diaper dermatitis more objectively. The results showed that the majority of respondents did not experience erythema (63.2%), while 15.8% experienced mild erythema, 18.4% moderate erythema, and 2.6% severe erythema. In the erosion indicator, it was found that 28.9% of infants had erosion, while the rest did not have erosion (71.1%). The papules/pustules indicator was found in 13.2% of respondents with most of them having only a few lesions (1-10), and only one respondent had multiple lesions (11-20). There were no cases with more than 40 lesions.

Table 3 Distribution of Respondents Based on Incidence of Diaper Rash June, 2025 (n=38)

Variable	f	percentage
Diaper Rash		
Mild	9	23,7
Moderate	6	15,8
Heavy	0	0
No diaper rash	23	60,5
Total	38	100

Source: Primary Data 2025

Table 3 shows that 39.5% of infants had diaper rash, consisting of 23.7% mild degree and 15.8% moderate degree, with no cases of severe rash found. Meanwhile, 60.5% of infants had no rash. This finding shows that diaper rash is still a common clinical problem in the NICU room of PKU Muhammadiyah Yogyakarta Hospital, although the severity is mostly mild. This could be due to the baby's sensitive skin condition, constant diaper use, and repeated exposure to urine and feces. However, the absence of severe cases indicates that treatment and prevention have been quite good. This finding is in line with a study Suebsarakam et al. (2020) which reported that optimal skin care interventions can prevent the progression of diaper rash to infection or severe dermatitis. Therefore, daily monitoring of the baby's skin condition and education to health workers and parents are still needed to detect skin changes early and prevent further complications.

Table 4 Bivariate Analysis of Factors Associated with the Incidence of Diaper Rash

Variable	Diaper Rash				Total		Bivariate Analysis	
	No		Yes				*p value*	OR 95% CI
	f	%	f	%	f	%		
Age								1,667
0-1 month	20	52,6	12	31,6	32	84,2	0,663[a]	
1 – 12 months	3	7,9	3	7,9	6	15,8		0,289-9,620
Total	23	60,5	15	39,5	38	100		
Gender								1,037
Male	14	36,8	9	23,7	23	60,5	1,000[b]	
Female	9	23,7	6	15,8	15	39,5		0,274-3,920
Total	23	60,5	15	39,5	38	100		
Birth Weights								1,286
<2500 grams	9	23,7	5	13,2	14	36,8	0,986[b]	0,330-5,017
≥2500grams	14	36,8	10	26,3	24	63,2		
Total	23	60,5	15	39,5	38	100		
Gestational Age								1,067
<37 weeks	8	21,1	5	13,2	13	34,2	1,000[b]	0,270-4,216
≥37 weeks	15	39,5	10	26,3	25	65,8		
Total	23	60,5	15	39,5	38	100		
Infant Diet							0,395[c]	

Variable	Diaper Rash				Total		Bivariate Analysis	
	No		Yes				*p value*	OR 95% CI
	f	%	f	%	f	%		
breastmilk	13	34,2	9	23,7	22	57,9		
Infant Formula	1	2,6	2	5,3	3	7,9		-
Breastmilk and Infant Formula	7	18,4	4	10,5	11	28,9		
Fasting	2	5,3	0	0	2	5,3		
Total	23	60,5	15	39,5	38	100		
Medical diagnosis (based on birth weight and gestational age)								
NKB-KMK (Low Birth Weight Infant, Small for Gestational Age (SGA))	1	2,6	1	2,6	2	5,3		-
NKB-SMK (Low Birth Weight Infant, Appropriate for Gestational Age (AGA))	5	13,2	4	10,5	9	23,7	0,966[c]	
NCB-KMK (Normal Birth Weight Infant, Small for Gestational Age (SGA))	2	5,3	1	2,6	3	7,9		
NCB-SMK (Normal Birth Weight Infant, Appropriate for Gestational Age (AGA))	15	39,5	9	23,7	24	63,2		
Total	23	60,5	15	39,5	38	100		
Medical Diagnosis of Infections and Noninfections								
Infection	19	50	15	39,5	34	89,5	0,138[a]	-
Non Infection	4	10,5	0	0	4	10,5		
Total	23	60,5	15	39,5	38	100		
Length of stay								
<4days	8	21,1	2	5,3	10	26,3	0,259[a]	3,467 0,622-19,327
>4days	15	39,4	13	34,2	28	73,7		
Total	23	60,5	15	39,5	38	100		

Variable	Diaper Rash				Total		Bivariate Analysis	
	No		Yes				*p value*	OR 95% CI
	f	%	f	%	f	%		
Diarrhea ang Digestive Infections								0,300
Yes	3	7,9	5	13,2	8	21,1	0,223[a]	0,059-1,516
No	20	52,6	10	26,3	30	78,9		
Total	23	60,5	15	39,5	38	100		
Use of Diaper Cream								
Yes	0	0	5	13,2	5	13,2	0,006[a]	-
No	23	60,5	10	26,3	33	86,8		
Total	23	60,5	15	39,5	38	100		
Antibiotic Usage								0,055
Yes	10	26,3	14	36,8	24	63,2	0,006[b]	0,006-0,491
No	13	34,2	1	2,6	14	36,8		
Total	23	60,5	15	39,5	38	100		
Cleaning Tools								
Wet Wipes	1	2,6	1	2,6	2	5,3	0,903	-
Water and Cotton	21	55,3	13	34,2	34	89,5		
Wet Wipes and water and cotton	1	2,6	1	2,6	2	5,3		
Total	23	60,5	15	39,5	38	100		

Descriptive Crosstabulation

Note. a = *Fisher's Exact test*, b = *Chi square*, c = *Likelihood ratio*

Table 4 presents the results of bivariate analysis between various independent variables and the incidence of diaper rash in infants in the NICU room of PKU Muhammadiyah Yogyakarta Hospital. There were a total of 38 infant respondents analyzed. Variables that have a significant relationship (*P value* <0.05) are the use of diaper cream with a *P value* = 0.006 and the use of antibiotics with a *p value* = 0.006*,* meaning that there is a significant relationship between the use of diaper cream and the use of antibiotics with the incidence of diaper rash. Non-significant variables (p> 0.05), namely the age of the baby has a *P value* = 0.663, gender has a *P value* = 1.000, birth weight has a *P value* = 0.986, gestational age has a *P value* = 1.000, diagnosis based on gestational age and birth weight has a *p value* = 0.966, medical diagnosis based on infection and non-infection has a *P value* = 0,138, diarrhea and gastrointestinal infection had a *P value* = 0.223, length of stay had a *P value* = 0.259, infant diet had a *P value* = 0.395, and diaper cleaning equipment had

a *P value* = 0.903 all showed no significant association with the incidence of diaper rash. The bathing variable and diaper changing period did not have a *P value* because the data obtained were all constant or the same, so they did not meet the requirements for the relationship test.

Table 5 Elimination of *Backward Wald* Method Independent Variables with the Incidence of Infant
Diaper Rash in the NICU Room of PKU Muhammadiyah Hospital Yogyakarta June, 2025 (n=38)

Step	Variable	B	P Value	OR	95% CI
Step 1	Use of Diaper Cream	-21,308	0,999	0,000	0,000-
	Antibiotic Usage	-2,,460	0,030	0,085	0,009-0,491
	Constant	44,971	0,999		
Step 2	Antibiotic Usage	-2,901	0,009	0,055	0,006-0,491
	constant	3,238	0,015	25,480	

Backward Wald Elimination

Table 5 shows the *backward wald* elimination method where 2 multivariate candidate variables of multiple logistic regression there is only 1 variable that has a *sig. p value* <0.05, namely the variable of antibiotic use with a *p* value = 0.009 and OR 0.055, meaning that there is a significant relationship between antibiotic use and the incidence of infant diaper rash, while OR = 0.055 (OR <1) means that antibiotic use reduces the incidence of diaper rash by 94.5% compared to infants who do not use antibiotics.

Table 6 Final Model of Multiple Logistic Regression of Factors Associated with the Incidence of Infant Diaper Rash in the NICU Room of PKU Muhamammadiyah Yogyakarta Hospital June, 2025 (n=38)

Variable	B	*p value*	OR	95% CI
Antibiotic Use	-2,901	0,009	0,055	0,006-0,491
Constant	3,238	0,015	25,480	

Multiple Logistic Regression Test

Table 6 shows the results of multivariate multiple logistic regression analysis which shows that the variable that has a positive correlation with the incidence of diaper rash is the use of antibiotics with a *P value of* 0.009 where the *P value* <0.05 which means significant. *Odds ration (*OR) of the variable antibiotic use is 0.055, meaning that infants treated in the NICU room of PKU Muhammadiyah Yogyakarta Hospital who receive antibiotics have a 94.5% lower risk or 0.055 times the chance

of experiencing diaper rash compared to infants who do not receive antibiotics, because the OR value < 1, this indicates that the use of antibiotics actually looks protective (Iba & Wardhana, 2024).

4. Discussion

4.1 Factors associated with diaper rash

Table 4 presents the results of the bivariate analysis of the independent variables based on the *p value of* the bivariate analysis, to determine the candidates to be included in the multivariate logistic regression analysis. In this bivariate analysis, the criterion of *p value* ≤ 0.05 was used as the limit for selecting candidate variables. The researcher evaluated the significance of the model by comparing the p value with the predetermined significance level, usually 0.05. There were two variables as multivariate candidates, namely diaper cream use, antibiotic use, length of stay. Other variables such as respondent's age, gender, birth weight, infant diet, medical diagnosis based on gestational age and birth weight, medical diagnosis based on infection and non-infection, diarrhea or gastrointestinal infection, bathing and non-bathing, diaper change period, and diaper cleaning device did not meet the selection criteria because they had *p values* far above 0.05 or had constant data (so they could not be tested statistically). These variables were not continued to the multivariate stage because they did not show a potential relationship statistically or theoretically. The following is a discussion of each variable:

- Use of Diaper Cream with Incidence of Diaper Rash
  The use of diaper cream had a *P value* = 0.006 (<0.05) meaning that this variable showed a statistically significant association at the bivariate stage. Therefore, it is feasible to be included in the multivariate advanced model. Previous research Sofyan et al. (2024) there was a decrease in the degree of diaper rash after being given Myco Z for 2 times in 14 days. Myco Z is a brand of diaper cream that is used to treat baby diaper rash. The nature of Myco Z which contains nystatin and zinc oxide can overcome skin infections caused by fungi such as intertrigo (fungal infections commonly found in the folds under the breasts, thighs, and pubic area), paronychia, mycosis interdigitalis (fungus between fingers and toes), skin rashes and other fungal skin diseases. In this study, it was found that there were 5 babies who used diaper cream, all of them (100%) had diaper rash, while from 33 babies who did not use diaper cream, only 10 babies (30.3%) had rash. The results of multivariate analysis showed *p value* = 0.999 with OR value = 0.000, which statistically, the use of diaper cream did not prove significant in the final model, possibly *overfitting* or *sparse* data (because there were no rash-free infants in the cream user group), so caution is needed in interpreting these results. Previous

research Rustiyaningsih (2018) could not prove that the use of diaper cream can prevent or cause infant diaper rash. Research Albezrah et al. (2021) shows that protective creams have benefits in both prevention and healing, but cannot replace regular diaper changes, while research by Suebsarakam et al. (2020) showed that in 115 respondents with the use of diaper cream, there were 22 babies (18.18%) who did not experience diaper rash and 1 baby (4.17%) who experienced diaper rash, with a *P* value of 0.125, meaning that there was no significant correlation between the use of baby diaper cream and the incidence of baby diaper rash. This is in line with research conducted by researchers in the final regression model which shows the use of diaper cream is not strongly associated with the incidence of diaper rash. The researcher's assumption is that all babies who use diaper cream are only babies who have diaper rash, so it cannot be said that this diaper cream causes or reduces the incidence of diaper rash. However, in this study, not all babies who experienced diaper rash received diaper cream, so diaper cream here is not a cause of the incidence of diaper rash but as a therapy for diaper rash itself.

- Antibiotic use and incidence of diaper rash

  The use of antibiotics has a *P value* = 0.006, meaning that this variable has a very significant relationship and is strongly suspected to have a role in the incidence of diaper rash. Infants who used antibiotics had more frequent rashes than those who did not, suggesting that antibiotics could be a risk factor. This result is in line with the theory that antibiotics can disrupt the normal flora of the skin, triggering the growth of fungi such as *Candida albicans*, the main cause of diaper rash (Suebsarakam et al., 2020). Of the 24 infants who used antibiotics, 14 infants (58.3%) had diaper rash. While in 14 babies who did not use antibiotics, only 1 baby (7.1%) had a rash. In the multivariate analysis of multiple logistic regression, it was found that antibiotic use had a *p value* = 0.009, indicating a statistically significant association, with an OR = 0.055 (95% CI: 0.0060.491). When the OR is equal to 1, it signifies no effect. If the OR is more than 1, it indicates a positive association, while if it is less than 1, it indicates a negative association (Iba & Wardhana, 2024). This means that infants who received antibiotics had a 94.5% lower risk or 0.055 (1/18) times the chance of having diaper rash compared to infants who did not receive antibiotics, because the OR value < 1, indicating that antibiotic use actually looks protective, which seems to contradict clinical logic. This could be due to the influence of other variables (*confounding*) that have not been controlled or classification bias.

  These results are different from previous research Mendez et al. (2025) which states that one of the factors causing diaper rash is the use of antibiotics, in this

study the use of antibiotics actually reduces the risk of infant diaper rash. Research by Rustiyaningsih (2018) stated that there was no significant relationship between the use of antibiotics and the incidence of diaper rash in newborns in hospitals in Jakarta. Research by Suebsarakam et al. (2020) showed similar results that the overall use of antibiotics in the study population was 69/139 cases (49.65%), and the use of antibiotics in children with diaper dermatitis was 15/24 cases (62.5%). There was a statistically significant correlation between the use of oral antibiotics and the incidence of diaper dermatitis. The use of antibiotics allows the development of candida flora as a fungus that causes diaper rash to develop more rapidly, in accordance with the research of Shapiro et al. (2009) excessive use of antibiotics has been shown to cause community-acquired antimicrobial resistance, even among outpatients in primary care centers. Antibiotics here show a negative relationship to the incidence of diaper rash, namely the use of antibiotics is decreasing the incidence of diaper rash. The researcher's assumption is that this happens because one of the causes of diaper rash is bacteria so that the use of antibiotics here as therapy for infectious diseases of infants as well as bacteria that cause diaper rash. Further research needs to be done with bacterial and sentitivity tests so that it can be known which bacteria or fungi cause this diaper rash, and what antibiotics are effective in reducing the incidence of diaper rash. However, it is important to encourage the restriction of antibiotic use in hospitals, especially in infant care rooms, only in cases that are really necessary, because antibiotic resistance actually causes infections to be difficult to treat, so that infections, especially the incidence of diaper rash, will not be more and more difficult to treat.

- Medical Diagnosis Based on Infection and Non-infection with Incidence of Diaper Rash

  Based on table 4.5, it is known that infectious and non-infectious medical diagnoses have a *P value* = 0.138 (p>0.05), meaning that this variable shows that babies with infectious diagnoses are not associated with the incidence of diaper rash. In contrast to the research of Rustiyaningsih (2018) newborns infected with germs / microorganisms will have a chance of diaper rash 8 times higher than newborns who are not infected with germs / microorganisms after controlling for factors of length of day of care, frequency of bathing and diaper-free time. In bivariate analysis, the variable medical diagnosis of infection and non-infection was eliminated as seen from table 4.5 where this variable had a p value of 0.138 (p>0.05) so it was considered not suitable for inclusion in multiple logistic regression analysis. Of the total 38 infants, there were 34 infants with a diagnosis of infection, of which 15 infants (44.1%) had diaper rash. Meanwhile, in the non-

infectious group (4 infants), all of them did not have diaper rash. Although the percentage of diaper rash was higher in the infection group, statistically, the *p value* = 0.138. This means that there is no significant association between the diagnosis of infection and the incidence of diaper rash.

- Diarrhea and gastrointestinal infection with diaper rash incidence

  Diarrhea and gastrointestinal infection had a *p value=0*.145 (>0.05), meaning that these variables were not significant and did not qualify as multivariate variables. Diarrhea and gastrointestinal infection did not have a significant relationship with the incidence of infant diaper rash. In contrast to previous research Sudarsono et al. (2024) statistical analysis showed that there was a significant relationship between experiencing diarrhea and the incidence of diaper rash in infants and toddlers in Tanjung Buntung Village and obtained an OR value of 8,769 that infants who experienced diarrhea had a 9 times greater risk of diaper rash than infants who did not experience diarrhea. The diagnosis of infection that occurs in each baby is not the same, the type of bacteria or fungi that infects is also different from one baby to another and this study did not do the KOH (Potassium Hydroxide) test to find out what type of bacteria or fungi infected the baby. The researcher's assumption is that not all bacteria that infect babies can cause diaper rash, so the diagnosis of this infection is not significantly related to the incidence of diaper rash. However, researchers suggest that further research needs to be carried out with a wider variety of variables and a larger population, so that the relationship between infection and the incidence of diaper rash is more diverse.

- Length of stay with incidence of diaper rash

  The variable length of stay has a *p value* = 0.259, meaning that statistically there is no significant relationship between length of stay and the incidence of diaper rash. In contrast to previous research by Rustiyaningsih (2018) which states that the length of stay (*P value*: 0.012; OR = 3.9; 95%CI: 1.346-11.480) means that newborns who are treated for more than or equal to 8 days will have a chance of diaper rash 4 times higher than newborns who are treated for less than 8 days after controlling for germ/microorganism infection factors, bathing frequency and diaper-free time.

  The length of stay in this study was not significant, respondents in this patient were patients who were admitted for more than 48 hours and it was found that patients with a length of stay of more than 4 days were 15 infants (39.4%) and 13 infants (34.2%) of them had diaper rash. Although most of the infants who were hospitalized for more than 4 days had diaper rash, the length of stay was not the

cause of the incidence of diaper rash. It is important to conduct further research with a larger population and a variety of data.

- Infant Age with Incidence of Diaper Rash

  The age of the baby has a *p value* = 0.905 (>0.05), meaning that the variable age of the baby has no significant relationship with the incidence of diaper rash. There was no significant difference between the age groups of 0-1 month and 1-12 months in terms of the incidence of diaper rash. These results suggest that infant age is not a major factor influencing the incidence of diaper rash in the infant population in this study. This could be due to the high proportion of infants aged <1 month (84.2%), resulting in low data variability. In a study by Dwi Astuti et al. (2023) conducted on respondents aged 0-12 months showed that there was a relationship between diaper use and the incidence of diaper rash in infants aged 6 months - 1 year. In contrast to the research conducted by researchers that the age of the baby is not related to the occurrence of diaper rash.

- Gender with Incidence of Diaper Rash

  Gender had a *P value* = 1.000 (>0.05) meaning that the gender variable was not associated with the incidence of diaper rash. There was no difference in the risk of diaper rash between male and female infants. These results are in line with the research of Rustiyaningsih (2018) showing that gender does not have a statistically significant relationship with the incidence of diaper rash, in contrast to the research of Dwi Astuti et al. (2023) shows that girls experience more diaper rash due to other factors such as baby hygiene and mother's behavior in caring for her baby. Of the 23 babies with male gender, 9 of them (23.7%) had rashes while of the 15 babies with female gender, 6 of them (15.8%) had rashes. This shows that most cases of diaper rash are experienced by male babies, but from the p value = 1.000 it is known that gender is not significant. Further research is needed to determine the difference in skin sensitivities of male babies and female babies.

- Birth Weight with Incidence of Diaper Rash

  Birth weight had a *P value* = 0.986 (>0.05) meaning that there was no significant association between birth weight <2500g compared to ≥ 2500g with the incidence of diaper rash. According to McKeown (2024) infants with LBW are prone to skin problems due to immaturity. In premature infants, the stratum corneum has only 2-3 layers. Just below the stratum corneum is the basal layer of the epidermis and then the dermis which is also thinner and undeveloped in infants compared to adults. Research by Albezrah et al. (2021) shows that the baby's birth weight has a p value = 0.868, meaning that it is not associated with

the incidence of diaper rash, this is in line with this study. A total of 14 babies with low birth weight, only 5 babies (13.2%) had diaper rash compared to babies with adequate birth weight, out of 24 babies, 10 babies (26.3%) of them had diaper rash. This refutes previous research by Stephen M et al. (2018) which states premature and very low birth weight infants have a higher risk of skin infections, including diaper rash, due to immature immune systems and skin.

- Gestational Age with Incidence of Diaper Rash

  Gestational Age has a *P value* = 1.000 (>0.05) meaning there is no significant difference between preterm and full-term infants in the incidence of diaper rash. This is in line with the research of Albezrah et al. (2021) showed that gestational age was not associated with the incidence of diaper rash as seen from the p value = 0.919. Of the 13 premature babies less than 37 weeks old, there were only 5 babies (13.2%) who had diaper rash. Although preterm infants have thinner skin, the management of the NICU as a uniform infant intensive room and according to SPO could be a factor in reducing this difference.

- Infant Diet with Incidence of Diaper Rash

  Infant Diet *P value* = 0.711 (>0.05) indicates the type of infant intake (breast milk, syrup, combination, or fasting) had no significant effect on the incidence of diaper rash. Infant diet may have an effect on stool consistency and acidity, but most likely the effect was not strong enough to show a direct relationship in this study. This is in line with Rustiyaningsih (2018) study which showed that infant diet was not significantly associated with the incidence of diaper rash in newborns.

- Medical Diagnosis Based on Birth Weight and Gestational Age with Incidence of Diaper Rash

  Medical Diagnosis Based on Birth Weight and Gestational Age had a *P value* = 1.000 (>0.005) meaning that there was no significant association between the diagnostic classification of NKB/NCB and KMK/SMK with diaper rash. This is in line with research by Rustiyaningsih (2018) and research by Albezrah et al. (2021) which showed that gestational age and birth weight did not show a statistically significant relationship with the incidence of diaper rash in this study. The researcher's assumption may be because this classification does not directly affect the condition of the baby's perineal skin.

- Cleaning Tools with Incidence of Diaper Rash

  Diaper cleaning tool had a *P value* = 1.000 (>0.05) meaning that the type of cleaning tool (wet wipes, water and cotton, combination) did not show a significant difference in the incidence of diaper rash. Research Rustiyaningsih

(2018) which showed no variation in the use of diaper cleaning tools and a history of allergies in respondents, causing an unknown relationship with the incidence of diaper rash in newborns. Similarly, Stephen M et al. (2018) research did not show the superiority of one cleaning method over another, the use of wet wipes or water did not increase the prevalence of diaper rash. In contrast to Sugiyanto et al. (2023) wet wipes are believed to contribute to the incidence of diaper rash due to the content of alcohol and perfume which is irritating to the baby's skin, but no significant differences were found in this study. The majority of respondents (89.5%) used water and cotton, leading to a lack of variability and making it difficult to assess the effects of other cleaning tools. Further research with populations in different locations is needed to obtain more varied results.

- Diarrhea and gastrointestinal infection with diaper rash incidence

  Diarrhea or Digestive Infections had a *P value* = 0.275 meaning it did not show a significant association even though theoretically loose stools can cause skin irritation. This may be due to the relatively small number of diarrhea cases (8 out of 38 infants), so the statistical power to detect differences is weak. In contrast to the research of Sudarsono et al. (2024) there is a significant relationship between experiencing diarrhea and the incidence of diaper rash in infants and toddlers in Tanjung Buntung Village and obtained an OR value of 8.769 that infants who experience diarrhea have a 9 times greater risk of diaper rash compared to infants who do not experience diarrhea.

- Frequency of Bathing and Diaper Change Period with Incidence of Diaper Rash

  Frequency of Bathing and Diaper Changing was not subjected to statistical tests because the data was constant (all infants were bathed and diapers changed every 3-4 hours). This variable could not be evaluated because there was no variation among respondents (all received the same treatment). According to Sarifah et al. (2024) good personal hygiene in infants such as bathing the baby 2 times every morning and evening, changing the baby's clothes after bathing and every time it is wet or dirty due to urination or defecation, keeping the baby's buttocks and genital area always clean and dry, keeping the baby's bed always clean and warm, keeping the equipment used so that it is always clean, will not result in the incidence of diaper rash. However, in this study, a significant relationship could not be identified because all data were constant or the same.

5. Conclusion

The prevalence of diaper rash in the NICU of PKU Muhammadiyah Yogyakarta Hospital in June 2025 was 39.5%, consisting of mild (23.7%) and moderate (15.8%) diaper rash, with no cases of severe diaper rash. This shows that diaper rash is still a clinical problem that

is quite often found in hospitalized babies in the NICU room. The variable use of diaper cream in the final regression model showed no association because it had (OR = 0.000; p = 0.999; 95% CI: 0.000), but in bivariate analysis the use of diaper cream showed a significant association (p = 0.*006)*. This may be because all babies who used diaper cream were babies who had diaper rash, so it cannot be concluded that this diaper cream caused or reduced the incidence of diaper rash. Antibiotic use was significantly associated with the incidence of diaper rash (OR = 0.055; p = 0.009; 95% CI: 0.006-0.491). Infants who received antibiotics had a 94.5% lower risk of developing diaper rash than infants who did not receive antibiotics after controlling for diaper cream use. This finding suggests that antibiotic use is a protective factor against the incidence of diaper rash in the NICU infant population, and the association remains significant despite controlling for other variables included in the model. Other variables such as infant age, gender, gestational age, birth weight, infant diet, length of stay, diaper cream use, and other medical diagnoses did not show a significant association with the incidence of diaper rash in the final model. It is necessary to monitor and evaluate by KPRA (Antimicrobial Resistance Control Committee) PKU Muhammadiyah Yogyakarta Hospital in the rational use of antibiotics by considering strict clinical indications and it is necessary to perform bacterial or fungal sensitivity cultures on all patients with cases of infection in the NICU room in order to prevent resistance and secondary infections that can worsen the baby's condition. Increase awareness of risk factors for diaper rash, especially in infants who have infections or undergo long-term care. It is recommended to conduct research with a larger sample size and prospective study design in order to capture causal relationships more accurately.

6. Acknowledgments

Alhamdulillah, all praise be to Allah who has given His grace and guidance so that the author can complete this study with the title "Factors associated with the incidence of diaper rash in the NICU room of PKU Muhammadiyah Hospital Yogyakarta". Without the help of various parties, it would be difficult for the author to complete this article. Therefore, on this occasion the author would like to express his gratitude to the supervisor who has provided advice and direction during the process of preparing this article, as well as thanks to the Faculty of Health Sciences, 'Aisyiyah University Yogyakarta, where the author has gained knowledge and received guidance, to the research institution PKU Muhammadiyah Hospital Yogyakarta, which has allowed researchers to collect data for research.

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