

Original research article

The Relationship between Diaper Usage Duration and the Severity of Diaper Dermatitis in Children Aged 1–24 Months at the Integrated Health Post for Toddlers in the Working Area

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ABSTRACT

Background: Diaper dermatitis cases have not been extensively documented despite many cases, particularly those seeking treatment in clinics and hospitals. The causes of diaper dermatitis are multifactorial, and the clinical symptoms that arise are varied. This research aims to investigate the relationship between the duration of diaper usage and the severity of diaper dermatitis. **Methods:** The primary data comprises demographic characteristics and severity diagnosis, which are directly measured through physical examinations, a checklist based on an adaptation from Stamatas, and a questionnaire. The research sample was determined using purposive sampling techniques, consisting of 40 children aged 1-24 months attending the Integrated Health Post for toddlers in the working area of Putri Ayu Community Health Center, diagnosed with diaper dermatitis. **Results:** This research is dominated by girls with an age range of 1-6 months. They all use disposable diapers. The most widely used cleaning material is non-alcohol-wet wipes. The respondents' parents were mainly in the age range of 26-35 years. Most respondents wore diapers for ≤ 3 hours; the most common severity level was mild. Based on the Spearman rank correlation test results, a P value of 0.000 was obtained, indicating a significant relationship between the duration of diaper usage and the severity of diaper dermatitis. **Conclusion:** There is a significant relationship between diaper use duration and diaper dermatitis severity.

Keywords: Diaper dermatitis; Duration of diaper use; Risk factors

INTRODUCTION

Diaper dermatitis negatively impacts the lives of affected individuals and can lower their quality of life. In children, diaper dermatitis can influence a mother's quality

of life, with some mothers experiencing heightened anxiety.¹ Additionally, diaper dermatitis causes itching, prompting sufferers to continuously scratch the

lesions, which may lead to crusting or even lichenification in chronic cases.

The prevalence of diaper dermatitis varies across countries. According to hospital data in the United States, diaper dermatitis is the most common skin disorder in children and represents the most frequent skin issue in infants and newborns, accounting for 10–20% of all skin conditions.² Continuous diaper use can lead to diaper dermatitis in individuals of all age groups, but newborns (neonates) and infants under 1 year of age are at higher risk, with an incidence of up to 50%.³ Among children, the highest frequency of diaper dermatitis occurs between the ages of 9–12 months and 12–24 months.⁴ Morbidities caused by diaper dermatitis in children commonly include pain and itching in the affected area.⁵

Diaper dermatitis, also known as diaper rash, is an inflammatory skin condition characterized by eruptions in areas covered by diapers, typically the thighs, buttocks, and genitals.⁶ Clinical symptoms of diaper dermatitis vary among individuals, with common signs including erythematous and papulovesicular lesions distributed across the lower abdomen, genital area, and buttocks.² The clinical symptoms differ based on the severity of the condition. According to Tri Irfanti et al., as cited in Stamatias (2014), the severity of diaper dermatitis is classified into five grades: very mild (0.5), mild (1.0), moderate (2.0), moderate-severe (2.5), and severe (3.0).^{4,7}

The causes of diaper dermatitis are multifactorial, including excessive moisture due to prolonged contact with urine and faeces, hygiene practices, and other irritants.⁷ Continuous exposure of the skin to urine and faeces causes friction between the diaper and skin, affecting moisture levels, leading to irritation and damage to the skin barrier.⁸ Diaper usage duration significantly influences the onset of diaper dermatitis. According to Andreas's study, children with diaper changes fewer than six times a day are likelier to develop diaper dermatitis than those with more frequent changes.² The Indonesian Pediatric Society (IDAI) recommends changing diapers every 2–3 hours or after each urination or defecation.⁹

Given the background above, it is evident that diaper dermatitis remains a skin condition that is concerning, particularly in children. Beyond the issues affected children face, the condition also impacts family members involved in caregiving. Diaper dermatitis cases have not been widely reported in Jambi City, either in health centres or hospitals.

METHOD

This study is an observational analytic study with a cross-sectional design aimed at analyzing the relationship between diaper usage duration and the severity of diaper dermatitis in children aged 1–24 months at the Integrated Health Post for toddlers in the working area of Putri Ayu Community Health Center, Jambi

City. The primary data used in this study included demographic characteristics and severity diagnoses. These were directly assessed through physical examinations conducted by a general practitioner, and a dermatologist determined the severity levels. Additional tools included a checklist adapted by Tri Irfanti et al., based on Stamatas, and a questionnaire.

The study was conducted at the Integrated Health Post for toddlers in Putri Ayu Community Health Center, Jambi City, working area, from July to September 2023. The sample was selected using purposive sampling, involving children aged 1–24 months with a habit of wearing diapers and experiencing diaper dermatitis who met the inclusion and exclusion criteria. A minimum of 40 samples was obtained.

Descriptive data were presented in frequency tables. The Spearman rank correlation test was used to analyze the relationship between diaper usage duration and the severity of diaper dermatitis. A p-value of 0.05 or lower was considered statistically significant. Data analysis was performed using SPSS software.

RESULT

The demographic characteristics of the respondents in this study are presented in **Table 1**. Among the 40 respondents, the majority were female, accounting for 22 individuals (55%). The age group most affected by diaper dermatitis was the 1–6 months range, with 22 individuals (55%). Most respondents were born at term (full-term), totaling 39 individuals (97.5%). Additionally, 36 respondents (90%) were born with a normal birth weight.

Most respondents with diaper dermatitis had good nutritional status, totaling 29 individuals (72.5%). Half of the respondents exclusively breastfed, accounting for 20 individuals (50%). More respondents did not consume complementary feeding (MPASI), totaling 21 individuals (52.5%). All respondents used disposable diapers, totaling 40 individuals (100%).

The most commonly used material for cleaning the diaper area was alcohol-free wet wipes, used by 17 respondents (42.5%).

Table 1. Demographic Characteristics of Respondents (n=40)

Variable	Frequency (n)	Percentage (%)
Gender		
Boy	18	45
Girl	22	55
Age		
1-6 months	22	55
7-12 months	9	22,5
13-18 months	6	15
19-24 months	3	7.5

Variable	Frequency (n)	Percentage (%)
Birth History	1	2.5
Preterm		
Aterm	39	97.5
Birth weight		
Normal	36	90
Low birth weight	4	10
Nutritional status		
Severe malnutrition	0	0
Underweight	4	10
Good nutrition	29	72.5
At risk of overnutrition	6	15
Overnutrition	1	2.5
Obesity	0	0
Breastfeeding		
Exclusive breastfeeding	20	50
Breastfeeding + formula milk	6	15
Formula milk	14	35
Complementary feeding		
Complementary feeding (MPASI)	19	47.5
No complementary feeding (Non-MPASI)	21	52.5
Type of diaper		
Disposable diapers	40	100
Cloth diapers	0	0
Material for cleaning the diaper area		
Alcohol-based wet wipes	0	0
Alcohol-free wet wipes	17	42.5
Wet cloth with water	13	32.5
Wet cloth with soap	9	22.5
Just water	1	2.5

Based on the results presented in **Table 2**, the age category of the respondents' parents is predominantly in the 26-35 years range, with 28 individuals (70%). Most of the respondents' parents were non-working (housewives), accounting for 25 individuals (62.5%). The

most common level of education among the parents was high school or its equivalent, with 15 individuals (37.5%). Respondents were predominantly from parents with no history of allergic diseases, totaling 24 individuals (60%).

Table 2. Demographic Characteristics of Respondents' Parents (n=40)

Variable	Frequency (n)	Percentage (%)
Age		
15-25 years old	9	22,5
26-35 years old	28	70
36-45 years old	3	7.5
46-55 years old	0	0
Occupation		
Employed	15	37.5
Not employed/housewife	25	62.5

Variable	Frequency (n)	Percentage (%)
Educational background		
No school/elementary school/equivalent	5	12.5
Junior high school/equivalent	11	27.5
Senior high school/equivalent	15	37.5
Higher education	9	22.5
History of Allergic Diseases		
None	24	60
Present	16	40

Based on the results presented in **Table 3**, the most common diaper usage duration among the respondents was ≤ 3

hours, with 26 individuals (65%), while diaper usage > 3 hours was reported by 14 individuals (35%).

Table 3. Diaper Usage Duration (n=40)

Variable	Frequency (n)	Percentage (%)
Diaper usage duration		
≤ 3 hours	26	65
> 3 hours	14	35

Based on the results presented in **Table 4**, the most common severity of diaper dermatitis experienced by the respondents in this study was very mild,

with 15 individuals (37.5%), while the least common severity was severe, with only two individuals (5%).

Table 4. Severity of Diaper Dermatitis (n=40)

Variable	Frequency (n)	Percentage (%)
Severity of Dermatitis		
Very mild	15	37.5
Mild	10	35
Moderate	8	20
Moderate-severe	5	12.5
Severe	2	5

The clinical presentation of each severity grade of diaper dermatitis

experienced by the respondents in this study can be seen in **Figure 1**.



Figure 1. The severity of Diaper Dermatitis: (A) very mild, (B) mild, (C) moderate, (D) moderate-severe, (E) severe

Based on the results of the Spearman rank statistical test in **Table 5**, the p-value obtained was 0.000, indicating a significant relationship as the p-value is < 0.05. The correlation coefficient (ρ) in this study was +0.610, which signifies a strong correlation (>0.5) and a positive direction.

This result means that an increase follows an increase in one variable in the other variable.

The results of this study show that diaper usage for ≤ 3 hours and > 3 hours has a positive correlation with the severity of diaper dermatitis.

Table 5. Relationship Between Diaper Usage Duration and Severity of Diaper Dermatitis

Diaper Usage Duration	Severity of Diaper Dermatitis												Rho (ρ)	P
	Very mild		Mild		Moderate		Moderate-severe		Severe		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
≤ 3 hours	14	53.8	8	30.8	3	11.5	0	0	1	3.8	26	100	0.610**	0.00*
> 3 hours	1	7.1	2	14.3	5	35.7	5	35.7	1	7.1	14	100		
Total	15	37.5	10	25	8	20	5	12.5	2	5	40	100		

DISCUSSION

Based on this study, the majority of respondents were female. This finding is consistent with Khairroh's research.¹⁰ According to the Austin Journal of Dermatology, there is no significant relationship between gender and the incidence of diaper dermatitis.¹¹

The respondents' age was predominantly in the 1–6-month range. This result aligns with Astuti's research.¹² This is related to immature skin that has not fully developed its protective function, making it more prone to irritation.¹³

Most respondents had a history of being born at term. This finding is in line with Alghamdi's research.¹⁴ Premature infants are more prone to diaper dermatitis because their skin takes several weeks to develop the proper pH and mature skin barrier function.⁸

The majority of respondents had a normal birth weight. This finding is similar to the research by Mohamed.¹⁵ The stratum corneum undergoes complete keratinization at 32–34 weeks. Preterm infants experience significant transepidermal water loss (TEWL), approximately 30 mL/kg/day, which affects the skin barrier, making it more vulnerable and sensitive.¹⁶

Most respondents had good nutritional status. Nutritional deficiencies, such as biotin and zinc, can affect skin integrity, as these nutrients play a crucial role in maintaining skin health and serve as the initial barrier against pathogens.¹⁷

Fifty per cent of respondents received exclusive breastfeeding. This finding is consistent with Jewaro's research.¹⁸ Breastfed children have a lower stool pH, making it less irritating.⁸

Additionally, the components in breast milk pose no risk of allergies.¹⁹

The majority of respondents had not started complementary feeding (MPASI). This result aligns with the research by Hurdoyal.¹¹ Most respondents were in the 1–6 month age range, which explains why many had not yet started complementary feeding, as it is introduced after six months.

All respondents used disposable diapers. Disposable diapers can be irritating if the material quality is unsuitable for a child's skin.² Most respondents used alcohol-free wet wipes to clean the diaper area. Cleaning with wet wipes or water alone does not significantly impact diaper dermatitis.²⁰ However, specific compositions, such as the preservative methylisothiazolinone (MI), may trigger allergic reactions.²¹

Regarding the respondents' parents, the age range was predominantly 26–35 years. Age is a factor that influences knowledge acquisition.²² Most parents were housewives. This result may be associated with daily activities that make it challenging for them to change diapers as frequently as recommended.²³ The majority of parents were high school graduates. Education level reflects good knowledge about diaper dermatitis risk factors, enabling preventive measures.²³ Most parents did not have a history of atopic conditions. No genetic link or preference for specific races or genes has been identified in diaper dermatitis.²⁴

The majority of respondents wore diapers for ≤ 3 hours. This finding is consistent with Sujatni's research.²⁵ However, Ertiana reported different results.²⁶ Diaper dermatitis occurs due to excessive skin moisture caused by the accumulation of urine and faeces, friction between irritants and the skin, and increased skin pH, which damages the stratum corneum and affects the skin barrier function. Prolonged faeces accumulation leads to urease breaking down urea into ammonia, increasing skin pH and activating faecal enzymes, such as protease, urease, and lipase, which irritate the skin.⁴ This aligns with IDAI's recommendation to change diapers at least every three hours to reduce the risk of diaper dermatitis.⁹

The most common severity of diaper dermatitis among respondents was very mild. Rustyaningsih's research²⁷ also found that most respondents experienced mild diaper dermatitis. However, Firmansyah's study reported different findings.²⁸ Severity variations may result from multiple factors affecting the clinical manifestations. Parents' ability to recognize early signs of skin disorders in children also impacts the severity, as early intervention can prevent the condition from worsening.²⁹

This study found a significant relationship between diaper-wearing duration and the severity of diaper dermatitis, with a P-value of 0.000, indicating a strong correlation. The

correlation coefficient (+0.610) signifies a strong positive relationship between the two variables. The findings demonstrate that wearing diapers for >3 hours increases the risk of severe diaper dermatitis, whereas wearing diapers for ≤3 Hours are associated with milder cases. This finding aligns with Jordan's research,³⁰ which found that more frequent diaper changes resulted in lower severity, with a P-value of 0.03.

Diaper dermatitis is an inflammatory skin reaction caused by prolonged contact with irritants, such as faeces, urine, and moisture from diaper use.³¹ Clinical manifestations, such as erythema, papules, pustules, and scaling, vary depending on the severity.⁷ Various risk factors contribute to diaper dermatitis, making it a multifactorial condition. Among these factors, diaper-wearing duration plays a significant role.²⁵ The longer the friction between the skin and irritants, the more severe the damage to the skin barrier becomes.

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CONCLUSION

The demographic characteristics of the respondents revealed that the majority were female children aged 1–6 months. Nearly all respondents were born at term, had a normal birth weight, and had good nutritional status. Fifty per cent were exclusively breastfed but had not started complementary feeding (MPASI). All respondents used disposable diapers; alcohol-free wet wipes were the most commonly used cleaning material. Parents were predominantly aged 26–35 years, unemployed, had a high school education, and had no history of allergies. Most respondents wore diapers for ≤3 Hours and the most common severity of diaper dermatitis was very mild.

There was a significant relationship between diaper-wearing duration and the severity of diaper dermatitis, with a P-value of 0.000 and a correlation coefficient of +0.610. This study demonstrated that wearing diapers for >3 hours increases the risk of severe diaper dermatitis while wearing diapers for ≤3 Hours are associated with milder cases.

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