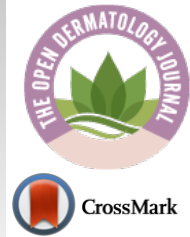




# The Open Dermatology Journal

Content list available at: <https://opendermatologyjournal.com>



## RESEARCH ARTICLE

### Correlation between Duration of Diarrhea and Severity of Diaper Dermatitis in Children Aged 0 – 24 Months

Ananda Ayu Paramita<sup>1</sup> and Deryne Anggia Paramita<sup>2,\*</sup>

<sup>1</sup>Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

<sup>2</sup>Departement of Dermatology and Venereology, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

#### Abstract:

##### Introduction:

Diaper dermatitis is a skin disease that commonly occurs in babies, especially whose diapers are always wet and rarely changed. It is a condition in which inflammation occurs in diaper areas, such as the perianal region, buttocks, genitals, inner thighs, and waistline. This study aims to analyze the correlation between duration of diarrhea and severity of diaper dermatitis in children aged 0 – 24 months.

##### Methods:

The design of this study was analytic observational using a cross sectional study. Data was collected through an interview with parents using structured questionnaire. Spearman correlation was used to analyze the correlation between duration of diarrhea and severity of diaper dermatitis. This study included 58 babies with diarrhea and diaper dermatitis. This study included 58 infants with a history of diarrhea.

##### Results:

The results showed that 37 babies (63.8%) had very mild diaper dermatitis, 18 babies (31.0%) had mild diaper dermatitis, and 3 babies (5.2%) had mild to moderate diaper dermatitis. There was a correlation between duration of diarrhea and severity of diaper dermatitis in children aged 0 – 24 months ( $p=0.0001$ ).

##### Conclusion:

It was concluded that the longer the duration of diarrhea, more severe is the diaper dermatitis.

**Keywords:** Diaper dermatitis, Duration of diarrhea, Severity, Diaper rash, Inflammatory skin, Erythema.

#### Article History

Received: January 03, 2023

Revised: July 14, 2023

Accepted: July 17, 2023

## 1. INTRODUCTION

Diaper dermatitis, known as diaper rash, is an acute inflammatory skin eruption that occurs in the diaper area, such as perianal, buttocks, genitals, inner thighs, and waistline [1]. Diaper dermatitis appears with mild erythema, but if left untreated, the erythema can be more extensive with lesions in the form of papules. In severe cases, erythema is found over a larger area with severe desquamation, swelling, erosion and ulceration [2].

World Health Organization (WHO) reported in 2012 that the incidence of diaper dermatitis in infants is quite high, which is 25% of the 6,840,507,000 babies born in the world

\* Address correspondence to this author at the Departement of Dermatology and Venereology, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia; E-mail: [deryne.anggia@usu.ac.id](mailto:deryne.anggia@usu.ac.id)

[3]. Diaper dermatitis is rarely a serious disease, but this condition causes itching and burning, which can make babies become fussy. This certainly causes the babies discomfort and anxiety for the caregivers [4].

Diaper dermatitis is caused by a combination of diaper environments such as overhydration of the stratum corneum and epidermis, irritants in urine and feces, friction against the skin, and high skin pH [5]. Many factors contribute to the occurrence of diaper dermatitis and one of the main risk factors for diaper dermatitis is diarrhea [6].

WHO (2019) reported that approximately 1.7 billion cases of diarrhea occur in children under 5 years of age each year. Riskesdas (2018), a study from Indonesia reported that diarrhea was most common in the age 1 – 4 years (11.5%) and in infants under 1 year (9%) [7]. The high incidence of diarrhea and

diaper dermatitis in infants encouraged researchers to analyze the correlation between the duration of diarrhea and the severity of diaper dermatitis in children aged 0 – 24 months.

## 2. MATERIALS AND METHODS

This was an analytic observational study with cross-sectional design. The study population in this study were all infants who visited Binjai City Health Center, Kebun Lada Health Center, and Tanah Tinggi Health Center in August – September 2022. This study used a consecutive sampling technique. The inclusion criteria included infants aged 0 – 24 months, were having or had a history of diarrhea and diaper dermatitis in the last 6 weeks, and parents willing to be respondents by signing the informed consent. Infants with active skin disease affecting  $\geq 50\%$  of the body surface area could not be sampled in this study.

## 3. RESULTS

The frequency distribution of subject characteristics based on age, gender, diaper type, frequency of diaper changing, duration of diarrhea, and severity of diaper dermatitis is given in Table 1.

A total of 58 patients were included in this study. Of these, infants aged 0-12 months were the most prevalent of all age groups (n=32, 55.2%) and the male was found to be more common (n=39, 67.2%). It was observed that most of the babies used disposable diapers (n=54, 93.1%). The frequency of diaper changing was mostly < 6 times a day (n=51, 87.9%). Duration of diarrhea was mostly < 2 weeks (n=55, 94.8%). The severity of diaper dermatitis was mostly very mild diaper dermatitis (n=37 infants, 63.8%). The following is an example of a diaper rash feature in this study, shown in Fig. (1A and B).

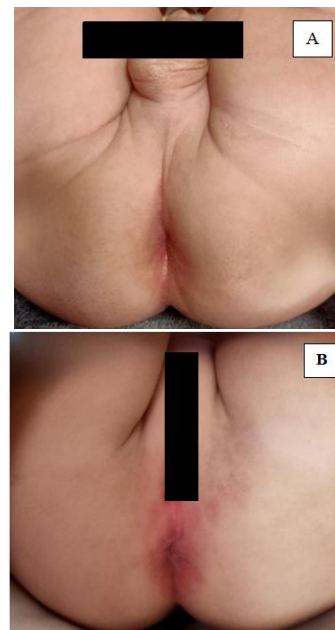


Fig. (1). (A, B) Diaper rash appearance.

Bivariate analysis was performed to examine the correlation between the duration of diarrhea and severity of diaper dermatitis using the Spearman analysis test as shown in Table 2.

Based on Table 1, the value of  $p = 0.0001$  was obtained with  $r$  (correlation) = 0.536 for duration of diarrhea and severity of diaper dermatitis. It was concluded that there was a correlation between the duration of diarrhea and the severity of diaper dermatitis. This was a positive correlation, meaning that the longer the duration of diarrhea, the more severe the diaper dermatitis.

Table 1. Frequency distribution of subject characteristics.

Variable	Frequency(n)	Percentage
<b>Age</b>	-	-
0 – 12 months	32	55,2%
13 – 24 months	26	44,8%
<b>Gender</b>	-	-
Male	39	67,2%
Female	19	32,8%
<b>Type of nappy worn</b>	-	-
Disposable only	54	93,1%
Cloth only	4	6,9%
<b>Frequency of nappy changing</b>	-	-
< 6 times/day	51	87,9%
$\geq 6$ times/day	7	12,1%
<b>Duration of diarrhea</b>	-	-
< 2 weeks	55	94,8%
2 - 4 weeks	3	5,2%
> 4 weeks	0	0
<b>Severity of Diaper Dermatitis</b>	-	-
Very Mild	0	0
Mild	0	0

(Table 1) contd.....

Variable	Frequency(n)	Percentage
Mild – Moderate	-	-
Very Mild	0	0
Moderate	-	-
Moderate – Severe	-	-
Severe	-	-
<b>Total</b>	58	100%

**Table 2. Correlation between duration of diarrhea and severity of diaper dermatitis.**

Severity of Diaper Dermatitis	Duration of Diarrhea			Total	p	r
	< 2 weeks	2 - 4 weeks	> 4 weeks			
Very Mild	37	-	-	37	0,0001	0,536
Mild	17	1	-	18	-	-
Mild – Moderate	-	3	-	3	-	-
Moderate	-	-	-	-	-	-
Moderate – Severe	-	-	-	-	-	-
Severe	-	-	-	-	-	-

**4. DISCUSSION**

This study showed that there was a correlation between the duration of diarrhea and the severity of diaper dermatitis in infants who visited Binjai City Health Center, Kebun Lada Health Center, and Tanah Tinggi Health Center. The same results were obtained in a study conducted in China, which reported the negative effects of diarrhea on diaper rash. Diarrhea was identified as statistically significantly associated with diaper rash (P=0.032). Children who did not suffer from diarrhea were about 0.4 times less likely to develop diaper rash compared to children who suffered from diarrhea [6].

Based on a study conducted in Indonesia by Oliv and Jusuf, infants with diarrhea had higher probability of diaper dermatitis [8]. Similar results were obtained in a study conducted by Liu et. al where maternal reports of diarrhea experienced by infants in the last 7 days were positively associated with a higher probability of perianal diaper dermatitis [9]. Researchers have identified that the epidermal layer in newborns will undergo rapid evolution after 28 days of birth, so diaper dermatitis is one of the most common dermatologic problems in infants [10].

When babies have diarrhea, the increased frequency of diarrhea can damage the integrity of skin tissue due to prolonged exposure to urine and feces [11]. Urine and feces are the main contaminants in the diaper area. The combination of these two factors causes an increased pH of the diaper area to be more alkaline. The increased pH causes an increased activity of protease, lipase and urease which are highly irritating to the skin. The increased activity of lipase and protease in feces also occurs due to accelerated gastrointestinal transit, and therefore higher prevalence rates of diaper dermatitis were observed in infants who had diarrhea within the previous 48 hours [12].

Bacteria in feces cause worsening diaper dermatitis by aggravating the inflammation that already occurs, causing more severe diaper dermatitis. In addition, many factors can affect the susceptibility of infants to irritant diaper dermatitis or can

worsen the condition of diaper dermatitis, such as infrequent diaper changes, using broad-spectrum antibiotics in infants, insufficient diaper area skin care, using liquid soap to clean the skin, and using talcum powder [12].

**CONCLUSION AND SUGGESTION**

The results showed a positive correlation between the duration of diarrhea and the severity of diaper dermatitis, meaning that the longer duration of diarrhea experienced by infants, the more severe the diaper dermatitis.

It is recommended that parents who have babies take care of their babies' skin health, especially in genitalia to prevent diaper dermatitis; it is hoped that health workers will participate in preventing diaper dermatitis by increasing information and providing education to parents who visit the health center regarding problems related to diaper dermatitis and its prevention; this study can be continued by finding other factors related to the severity of diaper dermatitis when babies have diarrhea.

**ABBREVIATION**

**WHO** = World Health Organization

**ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

The study was approved by the Institute review board under clearance approval number 786/KEPK/USU/2022.

**HUMAN AND ANIMAL RIGHTS**

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

**CONSENT FOR PUBLICATION**

A written informed consent was taken from the patients or their guardians.

**STANDARDS OF REPORTING**

STROBE guidelines were followed.

**AVAILABILITY OF DATA AND MATERIALS**

The data that support the findings of this study are available within the article.

**FUNDING**

None.

**CONFLICT OF INTEREST**

The authors declare no conflict of interest, financial or otherwise

**ACKNOWLEDGEMENTS**

Declared none.

**REFERENCES**

- [1] Dall'Oglio F, Musumeci ML, Puglisi DF, Micali G. A novel treatment of diaper dermatitis in children and adults. *J Cosmet Dermatol* 2021; 20(S1): 1-4. [http://dx.doi.org/10.1111/jocd.14091] [PMID: 33934478]
- [2] Stamatias GN, Tierney NK. Diaper dermatitis: Etiology, manifestations, prevention, and management. *Pediatr Dermatol* 2014; 31(1): 1-7. [http://dx.doi.org/10.1111/pde.12245] [PMID: 24224482]
- [3] Ramba HL. Incidence of skin irritation (*Diaper Rash*) in infants aged 0-12 months. *J Pediatr Nurs* 2015; 1(2): 87-912.
- [4] Carr AN, DeWitt T, Cork MJ, *et al*. Diaper dermatitis prevalence and severity: Global perspective on the impact of caregiver behavior. *Pediatr Dermatol* 2020; 37(1): 130-6. [http://dx.doi.org/10.1111/pde.14047] [PMID: 31793090]
- [5] Odio M, Thaman L. Diapering, diaper technology, and diaper area skin health. *Pediatr Dermatol* 2014; 31(1): 9-14. [http://dx.doi.org/10.1111/pde.12501] [PMID: 25403933]
- [6] Li CH, Zhu ZH, Dai YH. Diaper dermatitis: A survey of risk factors for children aged 1-24 months in China. *J Int Med Res* 2012; 40(5): 1752-60. [http://dx.doi.org/10.1177/030006051204000514] [PMID: 23206457]
- [7] Departemen Kesehatan Republik Indonesia. Basic Health Research. Jakarta: Kementerian Kesehatan RI 2018.
- [8] Khairina FO, Jusuf NK. Analysis of risk factors for infant diaper dermatitis. *Sumatera Med J* 2020; 3(2): 1-9.
- [9] Liu N, Wang X, Odio M. Frequency and severity of diaper dermatitis with use of traditional Chinese cloth diapers: Observations in 3- to 9-month-old children. *Pediatr Dermatol* 2011; 28(4): 380-6. [http://dx.doi.org/10.1111/j.1525-1470.2011.01494.x] [PMID: 21793880]
- [10] Dunk AM, Broom M, Fourie A, Beeckman D. Clinical signs and symptoms of diaper dermatitis in newborns, infants, and young children: A scoping review. *J Tissue Viability* 2022; 31(3): 404-15. [http://dx.doi.org/10.1016/j.jtv.2022.03.003] [PMID: 35562302]
- [11] Suebsarakam P, Chaiyarit J, Techasatian L. Diaper dermatitis: Prevalence and associated factors in 2 university daycare centers. *J Prim Care Community Health* 2020; 11: 2150132719898924. [http://dx.doi.org/10.1177/2150132719898924] [PMID: 31920146]
- [12] Šikić Pogačar M, Maver U, Marčun Varda N, Mičetić-Turk D. Diagnosis and management of diaper dermatitis in infants with emphasis on skin microbiota in the diaper area. *Int J Dermatol* 2018; 57(3): 265-75. [http://dx.doi.org/10.1111/ijd.13748] [PMID: 28986935]

