ORIGINAL ARTICLE

SIERRA LEONE JOURNAL OF MEDICINE

The Official Journal of the University of Sierra Leone Teaching Hospitals

Journal Homepage: www.sljm.org

Prevalence and associated factors of diaper rash among infants and toddlers aged 2 to 24 months in Ola During Children's Hospital, University of Sierra Leone Teaching Hospital Complex, Freetown, Sierra Leone

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ARTICLE INFO

Article History

Received: May 2023

Accepted: November 2023

Published: March 2024

Corresponding Author: Prof Ofovwe G.E

Technical Information

How to Cite: How to Cite: Ofovwe G. E., Bell N. T. & Ikhurionan P. E. Prevalence and associated factors of diaper rash among infants and toddlers in Ola During Children's Hospital, University of Sierra Leone Teaching Hospital Complex, Freetown, Sierra Leone: SLJM 2024;Vol 1(1) pp 1-4 .

Editor-in-Chief: Prof. Kehinde S. Oluwadiya, University of Sierra Leone Teaching Hospitals Complex, Freetown, Sierra Leone.

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Funding: No funding was received for this study.

Ethical Consideration

Conflict of interest: The authors declare they have no conflicts of interest that are directly or indirectly related to the research.

ABSTRACT

Background: Diaper rash is a common dermatological condition in infant and toddlers. This condition is also commonly seen particularly among children with malnutrition in Ola During Children's Hospital (ODCH), Freetown, Sierra Leone. However, the prevalence of this condition in Sierra Leone is not known. This study therefore was conducted to determine the prevalence of prevalence diaper rash and associated factors in infants and toddlers admitted to ODCH.

Methods: This was a descriptive cross-sectional of 269 children aged 2 to 24 months. A convenience sampling technique was used to select the subjects after verbal informed consent was obtained. A structured questionnaire was used to collect data and all children were examined as well as description of the perineum at the time of recruitment. Analysis was done with the IBM SPSS version 26.0.

Results: The prevalence of diaper rash was 52%. The proportion of males with diaper rash compared to females was not statistically different. Artificial milk, cereal, malnutrition and im-mediate caregivers other than fathers were the factors significantly associated with diaper rash.

Conclusion: The prevalence of diaper rash is high among infants and toddlers seen at the ODCH, Freetown, Sierra Leone. Factors associated with diaper rash include type of diet, nutritional status and immediate caregiver.

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Key Words: Prevalence, associated factors, diaper rash, Freetown.

1. INTRODUCTION

Diaper rash is a common skin condition in children below 24 months globally.[1] It results from prolong contact between the area of the skin covered by diaper and the diaper soiled with urine and faeces.[2] The production of ammonia from urinary urea by faecal bacteria increases skin pH and thus promotes skin susceptibility to mechanical damage and the activity of faecal enzymes such as proteases and lipases.[2] These acting together result in irritant contact dermatitis often characterized by erythematous and scaly skin, papulovesicular or bullous lesions, fissures, and erosions. The prevalence of diaper rash varies from country to country and from region to region even within the same country.[3] In Italy, 15% was reported whereas in Japan the prevalence is as high as 87%.[3] Similarly, studies from Africa have reported varying prevalence ranging from 2.7% in Ibadan, Nigeria[4] to 18.4% in Yaounde, Cameroon[5] and 62.5% in Adama, Ethiopia.[6]

Certain factors have been reported to be associated with or contribute to the development of diaper rash. These factors vary according to setting, hygiene practices, and age group of the child.[1] Commonly identified factors include the non-use of disposable diapers, low socioeconomic status, lack of breastfeeding, diaper care practices such as infrequent changes and use of barrier creams.[7,8] Environmental factors such as humidity and temperature have also been suggested to play a role in the development of diaper rash.[3] Whereas, diaper rash was observed to be common in infants particularly malnourished children admitted to Ola During Children's Hospital, Freetown, very little is known

about the prevalence and factors associated with the condition in Sierra Leone. These children might have specific risk factors for diaper dermatitis due to differences in skin sensitivities. This study was therefore undertaken to determine the prevalence and factors associated with the condition in this locale.

2. METHODS

This was a descriptive cross-sectional study conducted over a 14 weeks period, 1st December 2021 to 15th March 2022 at Ola During Children's Hospital (ODCH), University of Sierra Leone Teaching Hospital Complex, Fourah Bay Road, Freetown, Sierra Leone. ODCH is located in the densely populated eastern part of Freetown, Sierra Leone. It is the only tertiary hospital for sick children and part of the University of Sierra Leone Teaching Hospital Complex, which comprises of six hospitals. It receives referrals from across the country. It has a bed capacity of 197. It comprises of an emergency ward (for resuscitation and stabilization of patients), high dependency ward, intensive care unit (ICU) 3 main wards, special care baby unit, general and specialist outpatient clinics. Admission into the hospital is usually through the emergency unit. The general out-patient clinic attends to children whose conditions do not meet admission criteria (such as common cold, uncomplicated malaria, diarrhea diseases with no dehydration etc.) and hence managed on out-patient bases. The general out-patient clinic is run by the resident doctor and house officer taking rotations in the emergency unit and is in turn supervised by the consultant. An average of 20 to 40 children is attended to in the out-patient clinic daily.

2.1 Subjects and Procedure

The subjects comprised of children aged two months to twenty-four months, who were seen as outpatients in the emergency ward and those admitted for various conditions in the hospital. A convenience sampling technique was used to select the subjects. A 32-item questionnaire was drawn up and administered to parents of children wearing diaper who were either admitted in the hospital or seen in the outpatient clinic. The questionnaire consists of different variables such as socioeconomic, demographic data and factors associated with diaper rash. The questionnaire was structured with simple to complete questions. Diaper dermatitis was defined as a rash in the diaper region thought to be caused by the child wearing diapers. Demographic data (age, location, primary care giver and parents' marital status); history of allergic conditions (and family history), number of diarrhea episodes in the preceding six months, diet and nappy use were documented. Frequency of diaper change was considered good if it was at least eight times a day and poor if less than eight times a day. Nutrition status was considered to be well-nourished if the weight-for-age was greater than -2 Z-scores while weight-for age less than -2 Z-score was judged as malnourished. All children had a full examination including anthropometric measurements (weight and length) as well as description of the perineum at the time of recruitment. The questionnaires were completed by the researchers and trained research assistants.

2.2 Statistical Analysis

The collected data were organized, tabulated, and statistically analyzed using the International Business Machines Corporation (IBM) SPSS version 26.0 (SPSS for Window Inc; Chicago, LL, USA) Statistical Software. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to describe independent variables. Chi-square test was used to establish the association between dependent and independent variables. Multivariate regression analysis was used to identify factors that were independently associated with diaper rash. A p-value of less than 0.05 was accepted as the level of statistical significance.

2.3 Ethics and Consent

Informed verbal consent to participate in the study was obtained from primary care giver of all subjects after explanation of the study objectives, relevance, risks, and benefits. Permission for the study was obtained from the hospital's authority. Participation in the study was entirely voluntary and participants were advised that they could withdraw from the study at any point.

3. RESULTS

3.1 Socio-Demographic Characteristics

A total of two hundred and sixty-nine subjects were recruited comprising of 155 (57.6%) males and 114 (42.4%) females. The mean ± SEM age of the subjects was 8.1 ± 0.4 months. Majority, 208 (77.3%) of the subjects were infants while 61 22.7% were aged 13 – 24 months. Majority of the mothers 165 (61.3%) were not married while 68.4% were aged between 20 to 30 years. The distribution of other sociodemographic factors such as educational level, immediate caregivers and level of income of the family are as shown in Table 1.

Variables	n	%
Child's Age Group		
Infants (2 – 12 months)	208	77.3
Older child (13 – 24 months)	61	22.7
Sex	155	57.6
Male	114	42.4
Female		
Mothers' Age Group	29	10.8
Teenagers (≤19 yrs)	184	68.4
20 – 30 yrs	56	20.8
≥30 yrs		
Immediate Caregiver	170	63.2
Mother	33	12.3
Father	17	6.3
Grandmother	43	16.0
Both parents	6	2.2
Others (sibling, aunty)		
Mothers' Educational Level	145	53.9
Primary/none	106	39.4
Secondary	18	6.7
Tertiary		
Mothers' Marital Status	104	38.7
Married	165	61.3
Not Married		
Family Monthly Income	215	79.9
< $50	46	17.1
$50 - $100	8	3.0
> $ 100		

Table 1: Distribution of sociodemographic characteristics of the mothers and subjects.

3.2 Prevalence of Diaper Rash

More than half of the study population (140/269, 52.8%) had diaper rash at the time of data; Sixty-eight (25.3%) had erythema in

Factors	Diaper Rash		Chi-Square	P - Value
	Present n (%)	Absent n (%)		
Child's Age Group (Months)				
2 – 6	57 (47.9)	62 (52.1)		
7 – 12	49 (56.9)	37 (43.1)	2.119	0.548
13 – 18	22 (56.4)	17 (43.6)		
> 18	12 (48.0)	13 (52.0)		
Sex				
Male	81 (52.3)	74 (47.7)		
Female	59 (51.8)	55 (48.2)	0.007	0.935
Mother's Age Group				
≤19 yrs.	18 (60.1)	11 (39.9)		
20 – 30 yrs.	97 (52.7)	87 (47.3)	2.430	0.297
≥30 yrs.	25 (44.6)	31 (55.4)		
Mother's Educational Level				
None/Primary	75 (51.7)	70 (48.3)		
Secondary	55 (51.9)	51 (48.1)	0.096	0.953
Tertiary	10 (55.6)	8 (44.4)		
Immediate Caregiver				
Mother	112 (54.9)	92 (45.1)	7.114	0.028*
Father	10 (30.3)	23 (69.7)		
+Others	18 (56.3)	14 (43.7)		
Child's Diet				
Breast milk only	14 (33.3)	28 (66.7)		
Breast & artificial milk	48 (53.3)	42 (46.7)		
Cereal	40 (64.5)	22 (35.5)	9.889	0.04*
Mixed diet	17 (51.5)	16 (48.5)		
Family diet	21 (50.0)	21 (50.0)		
Frequent Diaper Changes				
Good	8 (40.0)	12 (60.0)		
Poor	132 (53.0)	117 (47.0)	1.256	0.262
Type of Diaper				
Disposable only	75 (46.9)	85 (53.1)		
Re-usable towel only	12 (60.0)	8 (40.0)	4.229	0.121
Both	53 (59.6)	36 (40.4)		
Child's Nutritional Status				
Well nourished	66 (45.2)	80 (54.8)	5.984	0.01*
Malnourished	74 (60.2)	49 (39.8)		
Number of Diarrhea Episodes				
0	103 (50.7)	100 (49.3)		
1	18 (58.1)	13 (41.9)	0.659	0.719
≥ 2	19 (54.3)	16 (45.7)		

* - Statistically significant; + - Grandmother, aunty, siblings

Table 2: Age specific prevalence and factors associated with diaper rash among infants and toddlers in ODCH

diaper area, 46 (17.1%) with hypo-pigmented lesions, 14 (5.2%) with papules/pustules, while 12 (4.5%) had excoriations/ulcerated lesions.

3.3 Factors Associated With Diaper Rash

About equal proportion of males 81/155 (52.3%) compared to females 59/114 (51.8%) had diaper rash, $\chi 2$= 0.007; P > 0.05. Similarly, there was no difference between the proportion of infants with diaper rash 107/208 51.4% and those aged between 13 and 24 months 33/61, 54.1%, $\chi 2$= 0.133; P > 0.05. Table 2 shows the relationship between the prevalence of diaper rash and other factors.

3.4 Multivariable Regression of Factors Associated With Diaper Rash

In a multivariate regression analysis showed that only nutritional status was independently associated with diaper rash in children (Table 3).

DISCUSSION

This study sought to determine the prevalence and associated factors of diaper rash in children two months to 24 months. We found diaper rash in over half (52%) of the children recruited. The presence of diaper rash was associated with childhood malnutrition, consumption of formula feeds and cereal-based food. Surprisingly, children whose primary caregivers were the fathers were less likely to have diaper rash compared to those cared for by mothers or other relatives. The prevalence of diaper rash seen in the present study was higher than that reported in Thailand (36.1%),[2] Saudi Arabia (39.3%),[9] Port Harcourt, Nigeria (34%)[10] and Yaoundé, Cameroon (18.4%).[5] Our finding is however lower than the prevalence described in Ethiopia (62.5%)[6] and Mauritius (79.7%).[3] The difference in prevalence observed in our study may be due to climatic difference and hygiene practices in the study population.

Nutritional status was associated with diaper rash as the proportion of children with malnutrition who had diaper rash was significantly higher than the proportion in well-nourished children. The association between nutritional status and diaper rash may be due to the fact that malnourished children are commonly deficient in some nutrients including zinc which plays an important role in maintaining the integrity of the skin and immunity. Deficiency of zinc may thus predispose to diaper dermatitis in the presence of minimum friction and irritation. Furthermore, the impaired immunity associated with severe malnutrition predisposes to infections with bacteria such as Staphylococcus aureus and fungi such as Candida albicans, two organisms reported to be associated with diaper rash.[7] It is not surprising therefore that diaper rash was

Variables	B	Wald	OR	95% CI	P
Child's Diet	-0.064	-7.791	0.938	0.773-1.138	0.517
Immediate Care Giver	-0.476	3.347	0.067	0.373-1.035	0.067
Nutritional Status	-0.525	4.216	0.591	0.358-0.976	0.040*

*significant at p < 0.05; OR – odds ratio; CI – confidence interval;

Table 3: Multivariable Regression of factors associated with diaper rash

more prevalent in children with malnutrition. Previous studies had not considered the impact of nutritional status on the prevalence of diaper rash. Also, children who are malnourished are more likely to be from the low socioeconomic strata and thus may not afford disposable diapers or change them frequently

Type of diet also plays a significant role in development of diaper rash as cereal-based diet was significantly associated diaper rash. The consumption of artificial milk in addition to breast milk or as mixed diet also contributes to development of diaper rash as more children exposed to these types of diet developed diaper rash than those who did not. Previous studies have reported the effect of diet on diaper rash and suggested that babies who were breast-fed exclusively have stools of lower pH and fewer urease producing bacteria and lower incidence of diaper rash.[3,11] The practice of exclusive breastfeeding in Freetown has previously been reported to be poor particularly among young and unmarried mothers.[12] Majority of mothers in this study were unmarried. The increase in stool pH with introduction of cereals (either alone or in combination with breast milk) increases the predisposition to nappy rash. It is therefore necessary to pay more attention to diaper hygiene and change which prevent diaper rash especially when transitioning babies from exclusive breast milt to cereal-based meals.

Immediate caregiver is also significantly associated with development of diaper rash as care given by mothers, grandmothers, aunties, siblings and others is significantly associated with development of diaper rash. Surprisingly, care given by fathers is less likely to result in diaper rash. It is likely that children who were cared for primarily by their fathers were less likely to use re-usable towels than those catered for by mothers and other relatives. The association between use of cloth diapers and development of diaper rash has been shown by previous studies. Although our study did not show significant association between diaper rash and type of diaper used, subjects who were diapered with re-usable towel alone or in combination with disposable diapers had the higher proportion of diaper rash compared to disposable alone (60% and 59.6% respectively compared to 46.9). It is possible that since the re-useable towel are not disposable; they are not frequently changed thereby staying longer periods on the children than disposable diapers. The study also showed that teenage mothers and frequency of diaper change less than 8 times per day predisposing factors to the development of diaper rash though not significantly associated. Poor diaper practice has been previously reported to be associated with diaper rash.[11] The reasons are not farfetched as infrequent diaper changes will lead to prolonged contact of soiled diaper with the skin and increase irritation whereas, teenage mothers are more likely to lack the skills required for are of their babies. It is to be noted that teenage pregnancy and unmarried mothers are common in Sierra Leone.

5.0 CONCLUSION

Prevalence of diaper rash among children two months to 24 months in Freetown is high. While malnutrition is significantly associated with its occurrence, other predisposing factors include diet type particularly cereal and artificial milk and immediate care giver are shown to also be associated. Poverty and lack of knowledge appear to be underlying causes of these factors. It is recommended that basic health education on personal hygiene and diaper care as well as strengthening of breastfeeding practices should be provided for mothers during antenatal and immunization visits.

6.0 LIMITATION OF STUDY

Since this is a hospital-based study, it may not adequately represent what is happening in the community. Furthermore, the study may also be affected by social-desirability bias being a questionnaire based study. Also, the use of convenient (non-probability) method for sampling might have inadvertently excluded or over-represented children with diaper dermatitis.

ACKNOWLEDGEMENT

We acknowledge and thank the mothers who participated in the study and the research assistants for their help in administering the questionnaire.

CONFLICT OF INTEREST

All authors declare that we do not have any financial or per-sonal relationship which may have inappropriately influenced us in writing this article.

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