Research Article

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Prevalence of diaper need and diaper dermatitis and associated risk factors among children aged 1–24 months in a referral hospital in Ghana: A cross-sectional study

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Abstract

Objectives: This research aimed to determine the prevalence of diaper need and diaper dermatitis (DD) and associated risk factors in children aged 1–24 months.

Methods: Data were collected through face-to-face exit interviews with 456 mothers at a Child Welfare Clinic. A chi-square, correlation, and multivariate logistic regression analyses at a significance level of $p < 0.05$ were conducted.

Results: The prevalence of diaper need was found to be 53.5%, with lower odds observed in households with monthly incomes greater than $167 and in children on breastmilk only. Diaper need was higher in parents with no formal education and use of disposable diapers. The prevalence of DD was 27.4%, with lower odds observed in households with monthly incomes greater than $167 and in children less than 6 months old and on breastmilk only. There was a moderately positive correlation between diaper need and DD.

Conclusion: The researchers recommend affordable alternative diapering methods and educating parents on the importance of frequent diaper changes to improve the prevalence of diaper need and DD. Overall, this study highlights the significant prevalence of diaper need and DD among children and identifies the important associated risk factors.

Keywords: diaper need, diaper, dermatitis, children, risk factors, Ghana

1 Introduction

Baby diapers are an essential part of the childhood care process [1]. To ensure that children do not develop contact skin irritations such as diaper dermatitis (DD), it is often recommended that children have their diapers changed every 2 h with a diaper change interval of at most 4 h [2]. The term "diaper need" refers to the disparity that exists between the number of diapers necessary to maintain a child's hygiene and the amount that a household can comfortably afford without compromising on other necessities [3].

Diapering practices, such as the choice of diaper type, differ significantly across different sociocultural contexts. Since the advent of disposable diapers, it has been noted that disposable diapers are preferred to cloth diapers among the majority of caregivers globally [4]. The high preference for disposable diapers is bound to have a significant effect on caregivers' finances if the diapering practice is to be practised at an optimum level. This significant economic demand on caregivers is very likely to result in a diaper need, not necessarily because of a lack of diapers on the market but rather due to low purchasing power. It is, therefore, to be expected that parents in

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these circumstances will try all other means to bridge the gap of the diaper need or at least try to shorten the period during which diapers are used or required for their children.

One way in which parents try to shorten the need for diapers is to rapidly toilet-train children. When toilet training is achieved early, the requirements for diapers decrease and the associated cost reduces. However, except for some variations that may be due to the local context, children on average are not ready to begin toilet training before 18 months of age [5] and the process of toilet training is generally not complete until about 3 or 4 years of age [6]. The requirement for diapers and the associated cost persist for much longer than the caregiver would have hoped. With significant budget constraints, parents may be forced to only purchase as many disposable diapers as they can afford and then modify the frequency of diaper changes according to their ability to afford them [7].

The first cross-sectional study was conducted to estimate diaper need and their impact on a child's health among 877 pregnant and parenting women, which reported that 30% endorsed diaper need [8]. A nationally representative cross-sectional study conducted in the United States among 981 mothers reported that 36% of mothers endorsed diaper need [3]. Again, a similar study conducted in 2021 among 129 caregivers of children aged 0–36 months reported that 76% endorsed diaper need [9]. Also, a survey conducted among 501 disadvantaged families (households) enrolled on the Special Supplemental Nutrition Program for Women, Infants, and Children in Vermont cited 32.5% of diaper need with a 52.3% risk of household food insecurity [10], indicating the reality of this public health problem. Interestingly, all these studies were conducted in the Western World. Judging from these relatively high figures in the developed world, it may be safe to speculate that the problem of diaper need may be worse in areas with low socioeconomic development.

DD is an inflammatory condition of the baby's skin around the diaper areas [11]. The causative factors for DD have been postulated to include overhydration of the skin and prolonged exposure of the infant's skin to urine and faecal matter [12]. Three studies conducted among 1–24 month old children in China, Thailand, and Kenya reported 43.8, 17.2, and 27.3% of DD, respectively [13–15].

To the best of researchers' knowledge, little is known about diaper need and DD in Ghana. This study sought to assess the prevalence of DD in children and uncover the magnitude of the unmet need for diapers and associated risk factors at the Tamale West Hospital, Ghana.

2 Materials and methods

2.1 Study design and setting

A facility-based cross-sectional survey was conducted among mothers with children aged 1–24 months attending the Child Welfare Clinic (CWC) at the Tamale West Hospital in the northern region of Ghana from 5 July 2021 to 27 September 2021. The hospital serves as a referral hospital for subdistrict health facilities and surrounding district hospitals (CWC is a unit in a hospital that weighs and vaccinates under 5 [5] year old children with the Ghana Health Service-approved vaccines at no cost).

2.2 Sample size, inclusion/exclusion criteria, and sampling procedures

Interviews were conducted among consented mothers after they have received CWC services for children. Sample size, sampling procedures, and inclusion and exclusion criteria can be found in our already-published paper [16].

2.3 Data collection methods

A standardized closed-ended questionnaire was adopted for this study after a careful review of similar studies [8,17,18]. The questionnaire consisted of seven questions on sociodemographic characteristics and six questions each on diaper need and DD. The last section was on coping strategies adopted by mothers experiencing diaper need. The data collection process is described in the study by Gbeti et al. [16].

3 Study variables

3.1 Dependent variables

The study had two outcome variables:

- Diaper need: Was defined as not having "enough diapers" (an average of seven diaper changes daily) to change as often as they (mothers) would like.
- DD: Was defined as the occurrence of rashes in the diaper region clinically diagnosed in the last 6 months (obtained from the patient folder).

3.2 Independent variables

This included the sociodemographic characteristics such as mother's age, educational level, religion, employment status, father's educational level, father's employment status, and the household monthly income level. The independent variables also included the age of the child, number of children in diapers, gender, type of diaper used, frequency of diaper change, the introduction of solid food, frequency of DD, and facility visitation as a result of dermatitis and diaper need coping strategies.

3.3 Data analysis

Data cleaning and data validation were carried out in excel version 2019 before being transported into SPSS version 25 for analysis. Descriptive statistics were analysed using frequency and percentages and presented in a form of tables and figures. A Pearson chi-square test (bivariate test) was used to determine the relationship between categorical variables. Only chi-square variables that were statistically significant at a p-value <0.05 were entered into a multivariate logistic regression model for inferential analysis at p-value <0.05 while simultaneously controlling for potential confounders. A multicollinearity test in a regression model was conducted, and a variance inflation factor of >10 indicated multicollinearity. Pearson's product–moment correlation was used to test the association between diaper need and DD.

Table 1: Sociodemographic characteristics of mothers

Variable	Frequency (N = 456)	Percentage
Age of mother		
18–30	348	76.3
31–40	103	22.6
41–49	5	1.1
Mother's educational level		
No education	140	30.7
Primary	52	11.4
Junior high school	64	14.0
Senior high school	104	22.8
Tertiary	96	21.1
Mother's employment status		
Fulltime homemaker	174	38.2
Engaged in economic activity	282	61.8
Mother's religious affiliation		
Christianity	88	19.3
Islam	368	80.7
Father's educational level		
No education	94	20.6
Primary	22	4.8
Junior high school	52	11.4
Senior high school	111	24.3
Tertiary	177	38.8
Father's employment status		
Unemployed	111	24.3
Employed	345	75.7
Household monthly income		
>$167 (Gh1000)	330	72.4
<$167 (Gh1000)	126	27.6

4 Results

4.1 Sociodemographic characteristics of mothers

A total of 456 mothers with children aged 1–24 months were recruited for this study. A majority of the respondents (76.3%) were between the ages of 18–30, and 30.7% of the mothers had no formal education. A majority of mothers (61.8%) were engaged in economic activities, 80.7% were Muslims, and 72.4% of mothers earned over 1,000 Ghana cedis an equivalent of $167 as their household monthly income (Table 1).

4.2 Characteristics of children (1–24 months) and prevalence of diaper need and DD

In this study, a majority of the children (61.8%) were less than 6 months, with a mean age of 5.9 ± 0.2 months. More than half (53.9%) of the children were females. Almost all (88.4%) mothers had only one child currently in diapers. On the type of diapers currently used, 69.7% reported using disposable diapers only, and about 30% reported using both cloth and disposable diapers. Regarding the frequency of daily diaper changes, the majority of children (53%) had their diapers changed 0–2 times a day. Only 35.7% of the children were introduced to solid food.

Mothers were asked whether they had ever felt like they did not have enough diapers to change as frequently as they wanted, and 53.5% responded in the affirmative, indicating diaper need. The prevalence of DD was reported as 27.4%. From this study, 23.2% of the children diagnosed with DD subsequently visited health facilities as a result of this condition (Table 2).

4.3 Association between diaper need and sociodemographic variables

This study found a statistically significant association between diaper need and mother's educational level (X^2 = 18.7, p < 0.001), father's educational level (X^2 = 10.6, p = 0.031), monthly household income (X^2 = 4.05, p = 0.040), type of diaper used (X^2 = 44.5, p < 0.001), the introduction of solid food (X^2 = 27.5, p < 0.001), and age of the child (X^2 = 21.1, p < 0.001) (Table 3).

4.4 Factors associated with diaper need

Multivariate logistic regression analysis revealed that mothers with no formal education were 2.1 times more likely to express diaper need compared to mothers with tertiary education (AOR = 2.08; 95% CI [1.003–4.315], p = 0.049). Mothers with junior high school education and those with senior high school education, respectively, were 2.3 times and 2.2 times more likely to express diaper need compared to mothers with tertiary education (AOR = 2.3; 95% CI [1.049–4.805], p = 0.037) and (AOR = 2.08; 95% CI [1.114–4.245], p = 0.023), respectively. Children whose fathers had no formal education were 2.4 times more likely to have diaper need than children whose fathers had tertiary education (AOR = 2.398; 95% CI [1.184–4.858], p = 0.015). Children from households with monthly income greater than $167 were 46% less likely to express diaper need compared to those with household monthly income less than $167 (AOR = 0.541; 95% CI [0.332–0.882], p = 0.014). Children who were not introduced to solid food (breastmilk only) were 67% less likely to have diaper need compared to children introduced to solid food (AOR = 0.333; 95% CI [0.146–0.752], p = 0.008) (Table 4).

4.5 Coping strategies adopted by mothers in dealing with diaper need

Out of the 244 mothers who reported diaper need, 51% reported borrowing diapers from friends and family members whenever they were in diaper need, and 27% of mothers said they borrow money from friends and family to purchase diapers when they run out of diapers. The use of cloth diapers was also reported as a coping strategy by 8% of mothers. Other coping strategies used by mothers in this study were stretching (delay in changing) the diaper and using money meant for household consumption to

Table 2: Characteristics of children (1–24 months) and prevalence of diaper need and DD

Variables	Frequency	Percentage
Gender of your child		
Female	246	53.9
Male	210	46.1
How many of your children are currently in diapers?		
1 child	408	88.4
>1 child	53	11.6
How many times in a day do you change diapers per child?		
0–2 times	237	53.0
3–4 times	211	46.3
5 and above times	8	1.8
Do you ever feel that you do not have enough diapers (average of seven diapers per day) to change them as often as you would like?		
Yes (**diaper need**)	244	53.5
No	212	46.5
How often do you experience not having enough diapers for your child?		
Very often	126	51.6
Not often	118	48.4
Clinically diagnosed with DD (rash) in the last 6 months (folder review)?		
Yes (**DD**)	125	27.4
No	331	72.6
How often did you experience this in the last 6 months?		
Once	81	64.8
>Once	44	35.2

Table 3: Bivariate analysis of diaper need and sociodemographic variables

Independent variables	Diaper need		X^2	df	p-value (0.05)
	No	Yes			
Mother's educational level			18.7	4	0.001**
No education	53(37.9)	87(62.1)			
Primary	30(57.7)	22(42.3)			
Junior high school	26(40.6)	38(59.4)			
Senior high school	43(41.3)	61(56.7)			
Tertiary	60(62.5)	36(37.5)			
Father's educational level			10.6	4	0.031*
No education	30(31.9)	64(68.1)			
Primary	11(50)	11(50)			
Junior high school	26(50)	26(50)			
Senior high school	53(47.7)	58(52.3)			
Tertiary	92(58)	85(48)			
Monthly household income			4.05	1	0.04*
>$167	163(49.4)	167(50.6)			
<$167	49(38.9)	77(61.1)			
Type of diaper used			44.5	2	<0.001
Cloth only	2(66.7)	1(33.3)			
Disposable only	180(56.6)	138(43.4)			
Both	30(22.2)	105(77.8)			
Have you introduced your child to solid food?			27.5	1	<0.001
No	163(55.6)	130(44.4)			
Yes	49(30.1)	114(69.9)			
Age of child			21.1	2	<0.001
<6 months old	153(54.3)	129(45.7)			
6–12 months old	53(37.1)	90(62.9)			
>12 months	6(19.4)	25(80.6)			

Chi^2 $p = 0.05$ was statistically significant. The number of asterisks $p = 0.2$*, $p < 0.001$**, shows the strength of the association. df – degree of freedom. Mother's age, religion, and parents' employment status were not associated with diaper need.

purchase diapers, while others get diapers from agencies/organizations (Figure 1).

4.6 Association between DD and sociodemographic variables

This study found only three variables associated with DD: household monthly income ($X^2 = 4.2$, $p = 0.047$), age of the child ($X^2 = 50.24$, $p < 0.001$), and introduction of solid food ($X^2 = 35.81$, $p < 0.001$) (Table 5).

4.7 Factors associated with DD

From the analysis, children from households with monthly income greater than $167 were 40% less likely to experience DD compared to those from households with monthly income less than $167 (AOR = 0.587; CI [0.363–0.942], $p = 0.029$). Children aged less than 6 months were 88% less likely to experience DD compared to children aged 12 months and older (AOR = 0.121; CI [0.040–0.362], $p < 0.001$). Also, children between 6 and 12 months were 67% less likely to experience DD compared to children above 12 months of age (AOR = 0.332; CI [0.145–0.761], $p = 0.009$). Children who were not introduced to solid food at the time of this study were 72% less likely to experience DD compared to those introduced to solid food children (AOR = 0.278; CI [0.182–0.429], $p < 0.001$) (Table 6).

4.8 Relationship between diaper need and DD

A Pearson product–moment correlation was conducted to examine the relationship between diaper need and DD. Diaper need was moderately positively correlated with DD (r (456) = 0.3, $p < 0.001$). This indicated a significant linear relationship between diaper need and DD (Table 7).

Table 4: Multivariate logistic regression analysis of factors associated with diaper need

Variable	AOR	95% CI	*p*-value
Mother's educational level			
No education	2.08	1.003–4.315	0.049*
Primary	0.946	0.392–2.285	0.902
Junior high school	2.245	1.049–4.805	0.037*
Senior high school	2.175	1.114–4.245	0.023*
Tertiary	Ref		
Father's educational level			
No education	2.398	1.184–4.858	0.015*
Primary	0.925	0.326–2.622	0.883
Junior high school	1.277	0.588–2.770	0.537
Senior high school	1.221	0.671–2.220	0.514
Tertiary	Ref		
Household monthly income			
>$167	0.542	0.332–0.882	0.014*
<$167	Ref		
Type of diaper used			
Cloth diaper only	0.019	0.001–0.271	0.004**
Disposable diaper only	0.225	0.137–0.368	<0.001
Both	Ref		
Age of child			
<6 months old	0.388	0.106–1.418	0.152
6–12 months old	0.310	0.104–0.929	0.037*
>12 months	Ref		
Have you introduced your child to solid food?			
No	0.332	0.146–0.752	0.008**
Yes	Ref		

Statistically significant at p value < 0.05, OR – odds ratio; CI – confidence interval. The number of asterisks p = 0.2*, p < 0.001** shows the strength of the association.

5 Discussion

This study aimed to examine diaper need and DD and factors associated with them among mothers with children aged 1–24 months old attending a CWC at the Tamale West Hospital. Results from this study demonstrated that 53.5% of the respondents reported diaper need. The current result is considered higher when compared with previous studies conducted in the United States, which reported 30% [8], 76% [9], 25% [19], 36% [3], and in Vermont 32.5% endorsed diaper need [10]. These disparities may be a result of the differences in the socioeconomic status of households in the United States and Ghana. There is available literature to suggest that the living conditions in the former are generally better than in the latter [20]. The justification for the possible discrepancies in the abovementioned results is further supported by previous studies [3,9,10,21], which showed that the prevalence of diaper need was associated with the socioeconomic characteristics of the respondents. Ghana is one of the West African countries with high consumption of baby diapers, consuming over 500 million units of baby diapers, second to Nigeria, which consumed over 2 billion units in 2019 [22]. The demand for diapers is increasing, leading to a rise in domestic production and more competition. Local brands are gaining market share alongside foreign brands. The market is shifting towards disposable diapers and locally manufactured brands, which are appealing to the lower- to middle-income segment [23]. The cost of a pack of diapers ranges from 5 Ghana cedis (<1$) for those that come in 5 pieces to 45 Ghana cedis (7$) for those that come in 100 pieces [24]. Due to the cost of disposable diapers, some mothers still use other forms of diaper management such as cloth diapers, while some stretch the frequency of diaper changes to ally the cost of diapers. In the context of this study, it was not surprising to see mothers reporting diaper need, and the majority of them were coming from low-income households without the capacity to secure enough diapers as they will love to have.

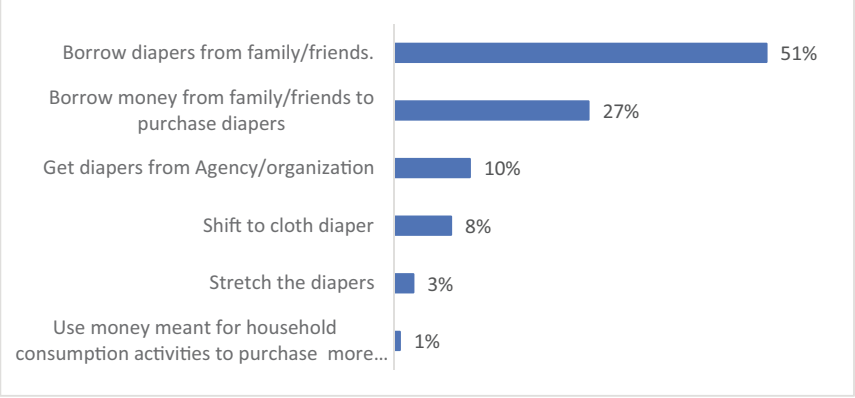

Figure 1: Coping strategies on diaper need among respondents.

Table 5: Bivariate analysis of DD and sociodemographic variables

Independent variables	DD		X^2	df	*p*-value (0.05)
	No	Yes			
Monthly household income			**4.1**	**1**	**0.047***
>$167	248(75.2)	82(24.8)			
<$167	83(65.9)	43(34.1)			
Age of child			**50.24**	**2**	**<0.001**
<6 months old	235(83.3)	47(16.7)			
6–12 months old	85(59.4)	58(40.6)			
>12 months	11(35.5)	20(64.5)			
Have you introduced your child to solid food?			35.81	1	**<0.001**
No	240(81.9)	53(18.1)			
Yes	91(55.8)	72(44.2)			

Chi^2 $p = 0.05$ was statistically significant. The number of asterisks $p = 0.2$*, $p < 0.001$** shows the strength of the association. df – degree of freedom. Mother's age, religion, parents' employment status and educational level, and type of diaper used were not associated with diaper need.

A logistic regression analysis revealed a significant association between diaper need and the mother's level of education. This finding is consistent with a study where individuals with higher educational levels were more resourceful with purchasing power compared to those with little or no education [25].

This study further revealed that mothers from households in which monthly income was more than 167$ were less likely to have diaper need compared with those with less than 167$ as monthly income. This result supports the position of the America National Diaper Bank that low-earning households or households out of work may find it difficult to afford diapers [26]. Previous studies have recommended not less than six times daily disposable diaper changes [15]. This recommendation may result in diaper needs as not all mothers will be able to afford them. This is consistent with our current study where mothers who use disposable diapers were having higher diaper need compared to those who used cloth diapers. Results from this study show that children less than 6 months of age were less likely to have diaper need compared to children aged 12 months and older. This was in sharp contrast with an earlier study, which reported less diaper need with an increase in child age [1]. The inconsistencies in the findings could be attributed to the higher levels of mothers engaged in some economic activities. From the above-mentioned findings, the current study showed that the age of the child was associated with DD. Children who were less than 12 months of age were less likely to experience DD compared with children aged 12–24 months. This was partly because as a child increases in age, parents begin to run out of income and may start to stretch the frequency of diaper changes, resulting in DD. Additionally, as the child grows, the mother may begin to engage in other economic activities to meet household demands, leading to infrequent changes in diapers. Prolonged stays in

Table 6: Multivariate logistic regression analysis of factors associated with DD

Variable	OR	95% CI	*p*-value
Household monthly income			
>$167	0.587	0.363–0.942	0.029*
<$167	Ref		
Age of child			
<6 months old	0.121	0.040–0.362	<0.001
6–12 months old	0.332	0.145–0.761	0.009*
>12 months			
Have you introduced your child to solid food?			
No	0.278	0.182–0.429	<0.001
Yes	Ref		

Statistically significant at p value < 0.05, AOR – odds ratio; CI – confidence interval. The number of asterisks $p = 0.2$*, $p < 0.001$** shows the strength of the association.

Table 7: Pearson's product–moment correlation between diaper need and DD

		DD
Diaper need	Pearson's *r*	0.3
	p-value	<0.001*
	N	456

*$p < 0.05$, $p < 0.01$, $p < 0.001$.

diapers expose the diaper region to the stresses of urine, faecal matter, friction, microbes, and chemicals that can contribute to dermatitis [27]. Again, as a child grows in age, mothers begin to introduce other complementary and supplementary foods, which may lead to frequent episodes of diarrhoea. Increased episodes of diarrhoea increase the required frequency of diaper change, and if the diapers are not changed as required, the incidence of DD is likely to increase. Similar studies found a strong correlation between diarrhoea and DD [13,28].

World Health Organization (WHO) has recommended the late introduction of solid foods to children until they attain the age of 6 months and older [15]. This was in line with this current study as children who were not on solid food at the time of the study were less likely to experience diaper need compared to children on solid food. This is partly because children on solid food may pass stools more frequently than those on breastmilk. Also, the risk of diarrhoea is likely to be higher among children on solid food as compared to the risk in children who are being breastfed [29].

This study revealed the prevalence of DD to be 27.4%. This result was higher compared with a similar study conducted in Thailand, which reported DD at 17.2% [13]. The result was, however, similar to a previous study conducted in Kenya that also reported a DD prevalence of 27.3%. The difference in prevalence between the African countries (Ghana and Kenya) and Thailand can be explained by the vast difference in the socioeconomic conditions among these countries. While Thailand is an upper middle-income country, both Ghana and Kenya are lower middle-income countries [30]. The current prevalence as reported in this study was significantly lower than in similar studies conducted in Central Ethiopia and Turkey where the prevalence of DD was 62.5 and 67.3%, respectively [7,28]. A possible reason for the high prevalence of DD in the two countries compared to the current study might be that all mothers interviewed in the two studies reported the use of only disposable diapers and the cost and accessibility of diapers could lead to diaper stretch resulting in DD. It is interesting to note that Jewaro et al. [28] in their study in Central Ethiopia indicated that one contributory factor to the high incidence of DD could be the high temperatures in the rift valley area. Though scientifically proven that high temperatures have a role in causing DD, it does not seem to have played a significant role in our current study because the geographical area of our study, Tamale, also has high average temperatures. It is, however, likely that the rates of DD in Tamale are lower because of a higher average diaper change frequency, compared to the study in Ethiopia where almost half (46.5%) of respondents changed diapers only once a day, with a further 17.3% reporting no diaper change at all. It may thus be concluded that diaper change frequency is significantly associated with DD.

A statistically significant association with DD was the introduction of solid food. Children who were only on breastmilk were less likely to experience DD compared to children who were introduced to solid food. This finding was in line with two other studies, which found that children who were only on breastmilk had a lower chance of experiencing DD because their stools have a higher pH, lower digestive enzyme activity, and less urease-producing bacteria than children who are on solid food [4,28]. This further supports the WHO recommendation for mothers to exclusively breastfeed their children until they are aged 6 months and older [15]. The study showed a moderately positive correlation between diaper need and DD ($r = 0.3$, $p < 0.001$). The correlation can be explained by the unmet need for diapers. Mothers with an inadequate supply of diapers begin to stretch the frequency of change of diapers, which will result in DD.

5.1 Limitations of this study

This study has some potential limitations. This study was a descriptive observational study; our findings were only associations and not clinically confirmed determinants. Several other factors such as the frequency of urination and defecation, hygiene practices, cleansing routine, previous therapies used for treatment (such as soaps, cleansers, wipes, boric acid, etc.), type and material of the diaper used, exposure to potential irritants and contagious diseases (like scabies or herpes simplex virus), trauma to the skin, history of past dermatologic allergic or infectious illnesses, family history of certain diseases (such as psoriasis or atopy), recent antibiotic use, and child abuse and neglect may result in DD and not necessarily the frequency of diaper change. Further research is needed to explore other potential factors in this area. Even though we tested for multicollinearity in our regression model, future models should exclude variables that are known to be correlated.

The fact that this was the first study on diaper need and DD in settings, there were challenges referencing local literature. This study was confined to only the Tamale West Hospital due to financial constraints; hence, generalization of these findings should be done with caution.

6 Conclusion

This is the first study on the prevalence of diaper need and DD in Ghana among children aged 1–24 months. The prevalence of diaper need and DD was found to be high. Parents' educational status, household income, type of diapers used, age of the child, and the introduction of solid food were associated with diaper need. Low household income, age of the child, and introduction of solid food were the factors associated with DD. Also, diaper need and DD were positively correlated. This study serves as a baseline demanding further future studies in this area to better understand the key determinants of diaper need and DD in our local context. In the meantime, mothers should be sensitized to optimize diaper change frequency. Again, alternative diapering methods at reduced prices should be made available to address diaper need. The study recommends further research that is nationally representative to determine the national prevalence of diaper need and DD.

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Informed consent: Informed consent has been obtained from all individuals included in this study. The purpose of this study and the confidentiality of the respondents' data were explained to the participants. Participation was purely voluntary, and all participants provided their consent.

Ethical approval: The research related to human use has been complied with all the relevant national regulations, institutional policies, and in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board at the University for Development Studies (UDS/RB/013/22).

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