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Original Research Article

Socio-Demographic and Economic Determinants of Diaper Dermatitis among Children Aged 0-24 Months at Mbaghati District Hospital, Kenya: A Cross Sectional Study

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ABSTRACT

Background: Diaper dermatitis (DD) is a highly prevalent condition that causes discomfort for the child and stress for parents as well as significant distress for healthcare staff, despite the recent evolved diaper technology. It is considered to be high in young children in Kenya where the socio-demographic and economic determinants have not been studied.
Objectives: To establish the relation of socio-demographic and economic factors to diaper dermatitis among children aged 0-24 months at Mbagathi District Hospital.
Methods: A descriptive cross-sectional study was conducted among 384 children aged 0-24 months selected by systematic sampling approach. Data on mother's socio demographic and socio-economic characteristics as well as infant's information was collected using pre-tested semi-structured questionnaire. Chi-square test was used to establish the association between DD and socio-demographic and socio-economic characteristics at p-value < 0.05. Multivariate logistic regression using adjusted odds ratio with corresponding 95% confidence interval was also estimated.
Results: The prevalence of diaper dermatitis was found to be 27.3%. Multiple logistic regression revealed the following factors as independent factors associated with diaper dermatitis, low levels of maternal education [AOR=3.77; 95%CI=1.36-10.46; P=0.011], mother's engagement in any activity that earns income [AOR=8.70; 95%CI=2.68-28.17; P<0.001], nature of floor (soiled floor) [AOR=3.33; 95%CI: 1.19-9.30; P=0.022], age of child (7-12 months) [AOR=3.63; 95%CI: 1.85-7.12; P=0.022]
Conclusion: This study shows that there is still a high prevalence of DD. Special focus including campaigning and sensitization should be given on the contributing factors during ANC and immunization visits so as to avoid DD.

Key words: Diaper dermatitis, prevalence, socio-demographic, socio-economic, Infant.

INTRODUCTION

Diaper dermatitis is a highly prevalent condition in infancy. The prevalence of diaper dermatitis in infants has been estimated to be 7% to 35%, with a peak in incidence between ages 9 and 12 months. [1] The reported prevalence of diaper dermatitis varies greatly from various studies. For example, one large UK population study showed that 25% of children had experienced nappy rash during the first 4 weeks of life. [2] In the United States, it is the most common skin disease affecting the infants accounting for greater than 1 million hospital visits per year. [3] Less than 10% of those affected suffer from

severe diaper dermatitis. [3] It is shown that pediatricians treat approximately three-quarters of all children who see a physician for diaper dermatitis and it is considered the most common dermatologic disorder of infancy. [1] It was estimated that greater than 50% of infants will have at least one episode of irritant diaper dermatitis during the diaper-wearing phase. [4]

The prevalence of skin diseases among children decreased with upgrading of social class. Low level of parent education, unemployment and low social class were significant factors associated with skin diseases. [5,6] In addition, the emerging research suggests that indicators of material hardship are increasingly important to child health. [7] There is robust evidence that financial hardship is consistently associated with negative outcomes in the domains of health and academic achievement for children, with more pernicious and persistent effects demonstrated among younger children. [8,9] Sustained poverty in the form of income and material hardship has significant negative effects on children's developmental outcomes, with extant research articulating the role parenting quality plays in mediating the effects of poverty on child outcomes, particularly at early ages. [9] Economic models of child development [8] view families with higher economic resources as being better able to purchase or produce important "inputs" into their young children's development (e.g., nutritious meals; enriched home learning environments and childcare settings outside the home; safe and stimulating neighborhood environments) [8] Among other things, low-income during early childhood may limit parents' ability to purchase high-quality health care or education during children's formative years. [10]

Despite our awareness that cultural and social traditions related to infant care and economic factors related to commercial diapers, can indirectly influence the occurrence or the presence of diaper dermatitis, [2] not much research has been conducted on this in Kenya. There is no data or information regarding the socioeconomic factors influencing DD in Kenya. Therefore, this study aimed to determine DD among children aged 0-24 months in relation to socio-demographic and socio-economic factors. Knowledge of the socio-demographic and socio-economic determinant factors associated with DD in young children would help to formulate strategies to tackle this important public health problem.

MATERIALS AND METHODS

Study design and setting

A descriptive cross sectional study design using quantitative approach was conducted. The study was carried out at Mbagathi District Hospital in Nairobi. The facility is the only established district hospital within Nairobi county with a large catchment area of about 1 million people because of its accessibility and affordable healthcare. It offers full range of comprehensive health services such as pediatrics, theatres, and X-ray services, Maternal and Child Health, HIV care and other medical services.

Sample size and sampling procedures

The study included children aged 0 to 24 months. The sample size was calculated using single population formula (Fischer *et al.*, 1998; $n= Z^2_{\alpha/2}\, p\,(1-p)/\, d^2$) as the study was estimating the proportion in a single population. The following assumptions were considered: 95% confidence interval, 5% margin of error, since the proportion (p) of diaper dermatitis was not known, p was taken to be 50%.

Systematic sampling method was used to select study participants. The sampling frame was estimated from the hospital by calculating the average number of children seen in one day. The first child to be included in the sample was chosen randomly by blindly picking one of two pieces of paper one with "Yes" and another one "No" for the first two clients in each day. The one that picked the "Yes" paper then became the first participant of the day.

After that, based on the sampling interval every 5th child coming to the hospital of the outpatient paediatric department was included in the sample until the desired sample size was attained.

Data collection method

Participants were recruited at the pediatric department of the hospital, with permission granted. Children aged 0-24 months wearing diapers and whose mothers' had consented, were recruited into the study. Children with any other known dermatological disease or who had been hospitalized at the time of the study were excluded.

A pre-tested structured questionnaire developed based on literatures was used for data collection. The structured questionnaire was translated into Swahili and pre-tested during a pilot study with 20 respondents who were not included in the main study. Parental informed consent was obtained prior to completion of the questionnaire and examination of the child. The data was collected by trained nurses working in the pediatric department of the hospital who were trained on the general approach of the questionnaire and diagnosis of diaper dermatitis through physical examination. The study participants were interviewed in a private room next to the pediatric outpatient department, after their hospital visit. On completion of the survey all children had a full general examination conducted and any characteristics of diaper dermatitis present at the time of the survey noted by trained nurses who were familiar with signs and symptoms of diaper dermatitis as well as the hospital referral system. The evaluation of the rash on the children was done according to a 4 Point Global Impression scale. [9,10] The 4-Point Global Impression Scale evaluated the severity of DD, and was modified from a similar grading scale used effectively in previous dermatological studies. [10] This evaluation looked at; (0 = none, 1 = slight erythema, 2 = erythema over a large area and 3 = erythema over a deeper and larger area). In this study, scales 1-3 were considered as DD. The dependent variable was diaper/nappy rash and the independent variables included socio-demographic and socio-economic characteristics of the mothers and children.

Data analysis method

Data captured in questionnaire was entered into a computer database designed using MS Excel application. Data cleaning and validation was performed in order to achieve a clean dataset that was exported into a Statistical Package format (SPSS Version 20.0) ready for analysis. Descriptive analysis was done using frequencies and proportions. Pearson's Chi-square test was used to establish the association between the dependent variable (diaper rash) and independent variables in order to determine which ones had significant association. Odds ratio (OR) with corresponding 95% confidence interval (95%CI) were estimated. The level of statistical significance was set at p-value <0.05. Multivariate logistic regression analysis (with a backward elimination model) was used to examine the independent association of the factors with diaper dermatitis.

Ethical consideration

Approval to carry out the study was sought and obtained from, Kenyatta National Hospital/University of Nairobi Ethics and Research Committee. Written consent was obtained from all study participants after a detailed explanation of the purpose of the study.

RESULTS

Characteristics of children and prevalence of diaper dermatitis

The distribution of socio-demographic characteristics among the children participated in this study is shown in Table 1. The findings show that the highest percentages (46.1%) were less than 7 months followed by 7-12 months (26.8%). Half of the children (50.0%) were males. Most of the children (98.4%) were living with their mothers. The prevalence of diaper dermatitis was found to be 27.3% with 95% confidence interval of 23.1% to 32.0%.

Table 1: Characteristics of children and prevalence of diaper dermatitis.

Variables	n=384	%
Age of child in months		
< 7 months	177	46.1
7-12 months	103	26.8
13-18 months	68	17.7
19-24 months	36	9.4
Gender of the child		
Male	192	50
Female	192	50
Whether the child is currently living at home		
Yes	378	98.4
No	6	1.6
Diaper dermatitis		
Yes	105	27.3
No	279	72.7

Socio-demographic characteristics of the mothers

A total of 384 mothers with a mean age of 26.7(SD $\pm$ 4.5) years participated in the study. The respondents were grouped into four age categories of 22-26 years (46.1%), 27 to 31 years (31.3%), 17 to 21 years (9.4%) and 32 years and above (13.3%). Most (96.6%) of the mothers were Christians while the remaining 3.4% were Muslims. Majority (82.3%) of the mothers was married and almost all (99.4%) were staying with their partners/spouses. About half (51.8%) were primipara mothers. With respect to level of education, about half of mothers (47.1%) had attended secondary school and about one third (32.0%) attended primary school. Similarly, 44.9% of their spouses attended secondary and 21.2% attended primary. Majority (57.0%) and (61.5%) of the mothers indicated that they involve with most of the decisions in the household related to regular expenditures/bills and purchasing assets / property respectively (Table 2).

Table 2: Socio-demographic characteristics of the respondents

Socio-demographic characteristics	n=384	%
Mean age (±SD) of mother =26.7(±4.5)		
Age in years		
17-21	36	9.4
22-26	177	46.1
27-31	120	31.3
32 and above	51	13.3
Religion		
Christian	371	96.6
Muslim	13	3.4
Marital status		
Single	63	16.4
Married	316	82.3
Widowed/separated	5	1.3
Parity		
Primiparous	199	51.8
Multiparous	185	48.2
Level of education		
None	4	1.0
Primary	123	32.0
O level	181	47.1
College/Polytechnic	52	13.5
Undergraduate	19	4.9
Postgraduate	5	1.3
Spouse's level of education		
Primary	67	21.2
O level	142	44.9
College/Polytechnic	62	19.6
Undergraduate	40	12.7
Postgraduate	5	1.6
Not applicable	68	
Whether the mother is the head of the household		
Yes	26	6.8
No	358	93.2
Mother's extent of involving with the decisions in the household related to regular expenditures and bills		
Most	219	57.0
Some	114	29.7
None	51	13.3
Mother's extent of involving with the decisions in the household related to purchasing assets and property		
Most	236	61.5
Some	82	21.4
None	66	17.2

Socio-economic characteristics of the mothers

Table 3 presents the distribution of socio-economic characteristics among the mothers. More mothers were not engaged in any activity that earns money (53.1%) than those who earned income (46.9%). In regard to the mothers' spouse/partners occupation, 45.6% were salaried employee and 27.9% were self-employed while 9.1%% were casual workers. The mothers were requested to indicate the total household monthly income and the highest percentage (28.8%) and (21.4%) had Ksh 6,000- Ksh 10,000 and Ksh 11,000 - Ksh 20,000 respectively. Most (95.6%) of the mothers were staying in a rental house. Majority (70.8%) of the mothers reported that the roof of their houses were constructed using either metal or wood. Moreover, cement was the main material used to construct the walls (62.0%) and the floor (70.8%).

Table 3: Socio-economic characteristics of the mothers.

Variables	n=384	%
Engaging in any activity that earns income		
Yes	180	46.9
No	204	53.1
Employment status of spouse/partner		
Salaried employee	175	45.6
Self-employed	107	27.9
Casual wage	35	9.1
The main income earner in the household		
Self	23	6.0
Spouse/partner	307	79.9
Others (parents/relatives and equal partners)	54	14.1
Monthly household income		
< 5000 Ksh	30	7.8
6000-10,000 Ksh	109	28.4
11,000 - 20,000 Ksh	82	21.4
21,000 - 30,000 Ksh	63	16.4
31,000 - 40,000 Ksh	59	15.4
>40,000 Ksh	41	10.7
Ownership of the house residing in		
Owned or being bought by you	17	4.4
Rented	367	95.6
Materials used to construct the roof		
Metal/wood	250	65.1
Cement	70	18.2
Dirt bricks	43	11.2
Wood +sheet	21	5.5
Material used to construct the walls		
Mud bricks (unfired)	32	8.3
Metal/wood	114	29.7
Cement	238	62.0
Nature of the floor		
Soiled	48	12.5
Cement/	272	70.8
Tiles/Marble	64	16.7

Table 4: Socio-demographic and economic factors associated with diaper dermatitis using unadjusted and adjusted logistic regression.

Variables	Diaper dermatitis		Bivariate analysis	Multivariate analysis
	Yes, n (%)	No, n (%)	COR(95%CI)	AOR(95%CI)
Age of child in months				
< 7 months	34(19.2%)	143(80.8%)	1	1
7-12 months	43(41.7%)	60(58.3%)	3.01(1.75-5.18)	3.63(1.85-7.12)***
13-18 months	19(27.9%)	49(72.1%)	1.63(0.85-3.12)	2.06(0.95-4.45)
19-24 months	9(25.0%)	27(75.0%)	1.4(0.60-3.25)	2.53(0.90-7.09)
Gender of the child				
Male	51(26.6%)	141(73.4%)	0.92(0.59-1.45)	-
Female	54(28.1%)	138(71.9%)	1	
Mother's age in years				
17-21	7(19.4%)	29(80.6%)	0.71(0.25-1.99)	
22-26	53(29.9%)	124(70.1%)	1.25(0.62-2.53)	
27-31	32(26.7%)	88(73.3%)	1.06(0.50-2.25)	-
32 and above	13(25.5%)	38(74.5%)	1	
Mother's religion				
Christian	103(27.8%)	268(72.2%)	2.11(0.46-9.70)	-
Muslim	2(15.4%)	11(84.6%)	1	
Mother's marital status				
Single/widowed/separated	14(20.6%)	54(79.4%)	0.64(0.34-1.21)	-
Married	91(28.8%)	225(71.2%)	1	
Mother's level of education				
Primary	50(40.7%)	73(59.3%)	4.52(2.12-9.63)	4.22(1.71-10.41)**
Secondary	41(22.7%)	140(77.3%)	1.93(0.91-4.10)	1.79(0.76-4.22)
Tertiary	10(13.2%)	66(86.8%)	1	1
Father's level of education				
Primary	34(50.7%)	33(49.3%)	6.84(3.27-14.32)	1.48(0.43-5.05)
Secondary	43(30.3%)	99(69.7%)	2.89(1.48-5.62)	1.09(0.43-2.82)
Tertiary	14(13.1%)	93(86.9%)	1	1
Whether the mother is the head of household				
Yes	7(26.9%)	19(73.1%)	0.98(0.40-2.40)	-
No	98(27.4%)	260(72.6%)	1	

Continued table no 4				
Parity				
Primiparous	52(26.1%)	147(73.9%)	0.88(0.56-1.38)	-
Multiparous	53(28.6%)	132(71.4%)	1	
Mother's extent of involving with the decisions in the household related to regular expenditures and bills				
Most	52(23.7%)	167(76.3%)	0.75(0.38-1.47)	-
Some	38(33.3%)	76(66.7%)	1.2(0.59-2.46)	
None	15(29.4%)	36(70.6%)	1	
Mother's extent of involving with the decisions in the household related to purchasing assets and property				
Most	57(24.2%)	179(75.8%)	0.79(0.43-1.45)	-
Some	29(35.4%)	53(64.6%)	1.35(0.67-2.72)	
None	19(28.8%)	47(71.2%)	1	
Mother's engagement in any activity that earns income				
Yes	40(22.2%)	140(77.8%)	1	1
No	65(31.9%)	139(68.1%)	1.64(1.04-2.59)	1.82(1.03-3.22)*
Employment status of spouse/partner				
Salaried employee	38(21.7%)	137(78.3%)	1	1
Self-employed	33(30.8%)	74(69.2%)	1.61(0.93-2.77)	1.00(0.51-1.95)
Casual wage	20(57.1%)	15(42.9%)	4.81(2.25-10.28)	1.73(0.62-4.81)
The main income earner in the household				
Self (mother)	7(30.4%)	16(69.6%)	2.19(0.70-6.84)	-
Spouse/partner	89(29.0%)	218(71.0%)	2.04(0.96-4.35)	
Others(parents/relatives and equal partners)	9(16.7%)	45(83.3%)	1	
The total household income for all members in the household per month				
< 5000 Ksh	15(50.0%)	15(50.0%)	9.00(3.42-23.72)	1.32(0.48-3.66)
6000-10,000 Ksh	43(39.4%)	66(60.6%)	5.86(2.75-12.51)	0.85(0.28-2.57)
11,000 - 20,000 Ksh	22(26.8%)	60(73.2%)	3.3(1.46-7.46)	1.14(0.34-3.85)
21,000 - 30,000 Ksh	15(23.8%)	48(76.2%)	2.81(1.17-674)	0.54(0.15-1.99)
> 30.000 Ksh	10(10.0%)	90(90.0%)	1	1
Ownership of the house residing in				
Self-owned	5(29.4%)	12(70.6%)	1.11(0.38-3.24)	-
Rental	100(27.2%)	267(72.8%)	1	
Materials used to construct the roof				
Dirt bricks	10(23.3%)	33(76.7%)	1.29(0.35-4.72)	-
Metal/wood sheet	74(29.6%)	176(70.4%)	1.79(0.58-5.49)	
Cement/Concrete	17(24.3%)	53(75.7%)	1.36(0.40-4.61)	
Wood + sheet	4(19.0%)	17(81.0%)	1	
Material used to construct the walls				
Mud bricks (unfired)	17(53.1%)	15(46.9%)	4.86(2.26-10.46)	1.70(0.45-6.46)
Metal/woo sheet	43(37.7%)	71(62.3%)	2.6(1.58-4.28)	1.16(0.56-2.40)
Cement/concrete	45(18.9%)	193(81.1%)	1	1
Nature of the floor				
Soil	24(50.0%)	24(50.0%)	3.15(1.70-5.84)	2.99(1.18-7.54)*
Cement/Tiles/Marble	81(24.1%)	255(75.9%)	1	1
Abbreviations: COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, CI= Confidence Interval,				
*** p<0.05, ** p<0.01, *** p<0.001**				

Socio-demographic and economic factors associated with diaper dermatitis

In the bivariate analysis, age of child, mother's level of education, father's level of education, mother's engagement in any activity that earns income, father's employment status, monthly household income, material used to construct the walls and nature of the floor were associated ($p \leq 0.05$) with diaper dermatitis. However, upon fitting these factors using multiple logistic regression and by specifying *'backward conditional'* method with removal at P<0.05, four (4) factors including age of child, mother's level of education, mother's engagement in any activity that earns income and nature of the floor remained independently associated with diaper dermatitis (Table 4).

Children aged 7 to 12 months were about 3.6 times more likely to develop diaper dermatitis [AOR=3.63; 95%CI=1.85-7.12; *P<0.001*] compared to those children aged less than 6 months and below. Children whose mothers attained primary school were 4.2 times more likely to develop diaper dermatitis [AOR=4.22; 95%CI=1.71-10.41; *P<0.01*] compared to those children whose mothers had attained tertiary education. Mothers who were not engaged in any activity that earns income had 1.8 times more children with diaper

dermatitis [AOR=1.82; 95%CI: 1.03-3.22*; P<0.05*] than to those who engaged in any activity that earns income. Children living in houses with soiled floor were 3 times more likely to develop diaper dermatitis [AOR=2.99; 95%CI: 1.18-5.7.54; *P<0.05*] compared to those living in a cement/tiles/marble floor.

DISCUSSION

The findings of the study showed that the prevalence of diaper dermatitis was high (27.3%) This finding was consistent with a British study which reported diaper rash in 25% of children aged 1 month. [12] However, it was higher than to a study conducted in Italy which showed a prevalence of 15.2% and a peak incidence of 19.4% in those aged 3-6 months. [12] A Nigerian study conducted in 1995-1996 identified diaper dermatitis in 7% of children. [13] Another study in Kuwait noted that DD occurs in 4% of pediatric dermatology cases. [14] These studies do not distinguish between common or generic diaper dermatitis and secondary diaper dermatitis. The differences may be attributed to the varying number of study participants used in the different studies and the varying age group of the study participants.

This study identified some factors independently associated with the development of diaper dermatitis after multivariate analysis. These factors are: maternal education, age of the baby, home setting (nature of the floor) and mothers' engagement in any activity earning income.

There was a statistically significant association between maternal education and diaper dermatitis (P=0.000). Children whose mothers attended primary school were 4.2 times more likely to develop diaper dermatitis compared to those children whose mothers attended tertiary education. This finding is consistent with a large UK study which reported that the prevalence of DD decreased with increased maternal education level. [15] In the index study conducted in Mauritius, parents who had no formal school education had the highest prevalence of diaper dermatitis. [16] A Nigerian study conducted by Oyedeji *et al.* found a correlation between education level and prevalence of DD which showed there is a statistically significant difference between the two variables with a very weak positive relationship between education level of parents and occurrence of DD. [13] This could be attributed to the fact that educated mothers know the protective genital care practices and provide good genital care to their infants as opposed to mothers with no formal education. However, a study done in Turkey by Parlak *et al.* found no statistical association between maternal education and DD. [17] This variation maybe attributed to the family medicine health law in Turkey that requires routine check-ups and follow up of infants up to 60 months.

Mothers who were not engaged in any income generating activity had significantly more children with DD (P<0.05). This finding corroborates with other studies where the majority of skin problems were observed in families with low occupation group. [11] In these studies it was reported that there was 43% skin problem among low socioeconomic status as compared to 22.5% among high social class. [13] Ete-Rasch in his study stated that socioeconomic factors for example unemployment and low income are risk factors that have a negative impact on children's health. [19] In Iraq, a high prevalence of diaper rash was reported in regions of low socioeconomic status. [20] One major explanation for the association between income, occupation and child health is that families with a high income are able to provide better health care for their children as they have access to better medical resources and are more informed about their child's health care. As such they are more vigilant in preventing DD as compared to parents from a low economic status.

The study showed that children living in soil/mud floor houses had a higher

chance of diaper dermatitis (P<0.05) compared to those living in a cement/tiles/marble floor. Although more research is needed on this topic to help elucidate how mud floor housing is associated with diaper dermatitis, we are aware that Candida *albicans* that are causative agents for candida diaper dermatitis grow as molds in soil that is moist. [18] Also to note is that home setting is an indicator of socio-economic status where mud floor housing would reflect low socio-economic status. This finding is consistent with a study conducted in China [2] which demonstrated that children living in urban houses had a significantly lower prevalence of DD than those living in rural houses. The difference in prevalence based on the residential setting may reflect variations in the socio economic status. [2]

The proportion of diaper dermatitis increased with increasing infant age across the different age groups, with the highest frequency (41.7%) observed in children aged 7-12 months. DD was significantly higher in children aged 7-12 months compared to 0-6 months. These findings were consistent with a study conducted in the United States, where the prevalence of DD was also associated with maturity of the child. [15] This shows there is a likelihood that a time-exposure effect exists in the development of DD.

CONCLUSION AND RECOMMENDATION

In this study the prevalence of diaper dermatitis is still high. There is need for awareness and enlightenment campaigns about diaper dermatitis targeted at parents, especially mothers during outreaches and hospital visits. Special focus should be given to children aged 7-12 months and mothers with low level of education, and on improving the socio economic status of mothers.

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