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Journal of Dermatology and Dermatitis
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Research Article

# Evaluating Knowledge of Mothers With 0–24 Month Babies on Management and Preventive Measures for Diaper Dermatitis in Makka Region, Saudi Arabia

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**Received date:** February 02, 2024; **Accepted date:** March 19, 2024; **Published date:** March 26, 2024

**Citation:** Ahmed M. ZahrAllayali, Rawan M. Almontashri, Wafa M. Sodagar, Taif N. Alhothali, Jaylan S. Malibari, Nouf A. Alturki, Maab S. AlSwealh, (2024), Evaluating Knowledge of Mothers With 0–24 Month Babies on Management and Preventive Measures for Diaper Dermatitis in Makka Region, Saudi Arabia, *Dermatology and Dermatitis*, 10(2); **DOI:10.31579/2578-8949/149**



## Abstract

Introduction: Diaper dermatitis (DD) or nappy rash is characterized by the presence of skin erosion and reddishness caused by the prolonged exposure of the diapered area to urine and feces, commonly observed in babies or infants. The incidence of DD is found to be higher among children between the ages of 0 and 12 months. DD can cause an alteration in eating and sleeping patterns, increased crying, anxiety, and emotional stress. Aim: The present study is aimed at measuring the knowledge of the mothers with infants from 0 to 24 months about the management and preventive aspects of DD in the Makka region of Saudi Arabia. Results: The results of the present study showed that 59% of mothers present in the Makka region had good knowledge about the prevalence and management of DD. The findings of the study suggested that the age of the baby, gender, frequency of changing diapers, use of disposable diapers, cleaning, and treatment are related to the prevalence of DD. The socio-economic and demographical characters (age of mother ($P<0.05$) and educational of mother ($P<0.0001$)), number of children, age of child ($P<0.05$), use of diaper ($P<0.05$), type of diaper ($P<0.05$), cleaning and drying method ($P<0.0001$), treatment aspect ($P<0.005$) and introduction to solids ($P<0.0001$) are found to influence the knowledge of mother. Conclusion: Although most mothers were educated on DD, it is important to impart knowledge to parents and caretakers about the management, hygiene practices, and preventive measures of DD.

**Keywords:** diaper dermatitis; children; mother's knowledge; saudi arabia

## Introduction

Diaper dermatitis (DD) is termed an irritation condition caused by the various cutaneous eruptions or inflammations (pustules, erythema, and papules) in diaper areas, that is, the genitals, skin folds, lower back, inner thighs, lower back, waistline, and abdomen, in neonates and infants [1]. Non-specific terms like diaper rash, napkin dermatitis, and nappy rash are commonly used in addressing DD [2]. Diaper candidiasis, chaffing dermatitis, and irritant contact dermatitis are the three types of DD. DD imparts discomfort and pain in babies; although DD is infrequently strong enough to cause a life-threatening impact, it is challenging for parents, caretakers, and healthcare workers. It is reported that in babies, the pH of the non-napped area is lower than that of the napped area [3]. The incidence of DD is more prevalent between newborns and 12 months old [4]. The clinical manifestations of DD include redness, dryness, flaky skin, shiny plaques, scaling, erosion, and papules, and rarely, raised nodules or papules. Sometimes, no symptoms are observed in infants with DD except the eruption [5,6]. Agitation, sleeping pattern alteration, change in eating, increased crying, and emotional distress [7].

DD is classified as primary (caused by irritants) or secondary (yeast, including wild candida). The primary cause of DD is urine, feces, moisture, and friction. The outer layer of the skin (stratum corneum) protects the skin from mechanical injury and environmental irritants. In DD, the barriers of the skin are disrupted by excessive hydration due to moisture and friction because of its constant contact with urine and feces [8]. The secondary causes of DD are developmental abnormalities and diarrhea (gastrointestinal factors), an imbalanced gut microflora due to infection in the respiratory tract, fragrances, preservatives, and certain chemicals causing allergic reactions, an inadequate skin care routine including reduced usage of talcum powders and soap, epidermis microorganisms, and teething, which have the ability to aggravate the DD [9] Herpes simplex, HIV infection, psoriasis, biotin and zinc deficiency, scabies, papular urticaria, congenital syphilis, enterobius infestation, Netherton syndrome, Wiskott-Aldrich syndrome, Kawasaki disease, and child abuse are very rare causes of secondary DD [10]. Streptococcus pyogenes and Staphylococcus aureus (bacterial) and mycoses and Candida albicans (fungal) are also causative agents of DD [11].

The trypsin, protease, urease, and lipase (digestive enzymes) present in fecal matter are serious skin irritants that favor the development of DD, and bile salt elevates the disruption caused by these enzymes. The presence of fecal urease can break down the urea in urine. These factors damage or break down the integrity of the epidermal layer, which results in inflammation and the initiation of a repair cascade. After a few days of the repair process, the irritation reduces and the regeneration of normal skin takes place slowly [12]. In the initial stages, a small portion of the diapered area appears to be pink or red with scattered papules and dryness. In the moderation stage, definite or intense redness is observed in a larger area with fewer pustules. In the advanced stage, extreme redness, desquamation, ulceration, eruption, and edema are found in larger areas with plenty of pustules or concurrent papules [7]. In the diagnosis of DD, the physical assessment of skin rashes is taken into consideration, along with the following: type of diaper, duration of the rash, hygiene practice, pain and itching, cleaning routine, and antibiotics used [12]. In the case of the presentation of additional symptoms or failure of basic treatment, a differential diagnosis should be considered. In differential diagnosis of DD, infectious (bacterial (folliculitis, perianal dermatitis, and impetigo), viral (varicella and herpes simplex), and yeast (candidiasis) infections), inflammatory (psoriasis, intertrigo, granuloma gluteale infantum, irritant contact, allergic contact, seborrheic, and atopic dermatitis), and nutritional deficiencies (multiple carboxylases, zinc, and biotin) should be assessed [13, 14].

The first line of treatment for DD is self-management by mothers and caretakers, such as cleaning routines, diapers and wipes, usage of skin care products (powders and creams), regular bathing, and frequency of changing diapers [15]. Corticosteroids, water repellents, barrier creams containing dimethicone, petrolatum, lanolingents, zinc oxide, cod liver oil, calcineurin inhibitors, antifungal (miconazole, tioconazole, fluconazole, nystatin, and clotrimazole), and antibacterial (mupirocin) Prevention methods such as “ABCDE” (air: increasing diaper-free time and allowing frequent aeration, Barrier: using barrier cream, Cleaning: proper cleansing of the diaper area with water and air drying, Diaper: changing the diaper is soiled or within an interval of 1 to 3 hours. Education (targeted education about good hygiene practices and diaper usage must be given to the parents) is useful in managing the DD [12]. The present study is aimed at measuring the knowledge of mothers with children between the ages of 0 and 24 months about DD and its prevention aspects.

## Methods and materials

### Study area

In the present study, mothers with infants were the target group. The study samples were obtained in the Makka region of Saudi Arabia with children aged 0 to 24 months, the age range with the most exposure to diapers and the highest prevalence of diaper dermatitis. The study was conducted from February to July 2023.

### Subject recruitment

The subjects recruited in this study were scrutinized based on the questionnaire according to the inclusion and exclusion criteria. Mothers with infants from 0 to 24 months, mothers who diaper their children, and mothers who are willing to participate in the study meet the inclusion criteria. Mothers with children above the age of 24 months, other city residents who live in Saudi Arabia, mothers who can’t read and understand Arabic, prior skin allergies, family history of skin disease, and parents not willing to participate in the study were excluded from the study. The consent form was obtained from the parents who were willing to participate in the study. The present study was conducted after acquiring proper approval, and the approval number is HAPO-02-K-012-2023-04-1573.

### Questionnaire preparation and collection

In the present descriptive cross-sectional study, responses from the mother were obtained online (electronically) using Google Forms and other social media platforms. The questionnaire was prepared in the Arabic language. The questionnaire has been validated [16]. Totally 45, questions were posted to the mothers, questionnaire is divided of several sections such as, questions to analysis sociodemographic (mothers age, educational status of both parents, religion, nationality, age and gender of child), and economical (employment status of parents, monthly income, number of children, and average money on diaper) information, information on diaper needs (introduction of solids, reason for lack of diaper, changing of diaper, episodes of DD, and use of plastic pants), knowledge of mothers on DD was assessed using 13 yes or no questions for each correct answer one point was given and for incorrect and do not know zero point was allotted, attitudes and hygiene practice on DD (cleansing and drying after defecation, type of diaper, treatment and prevention approach), and use of cortisone for DD. Questionnaires were obtained from 749 mothers with children aged between 0 and 24 months, along with a consent form. The questionnaire were validated through a pilot study.

### Study variables

In the present study, prevalence of DD and mother’s knowledge were the dependent variables, and age of the mother, educational qualification, employment status, monthly income, money spent on diapers, frequency of diaper changing, recent occurrence of DD, doctor visit, plastic pant usage, use of diapers on children, type of diaper, cleaning method, and drying of the child after bowel movement, treatment, introduction to solid foods, and preventive measures on DD were independent variables.

### Statistical Assessment

In the present study, statistical analysis was performed using IBM SPSS Statistics software (version 21). The frequency and percentage were calculated for the descriptive information (sociodemographic, economical, and diaper needs). The mothers were categorized into two groups based on the median value: respondents who scored above seven are placed in the above average category, and respondents who scored seven and below seven are placed in the below average category. A Pearson’s Chi-squared test (bivariant test) was performed to measure the prevalence of DD and the mother’s knowledge of DD. The statistical

significance was set at three different levels of P values (P<0.005, P<0.001, and P<0.0001).

## Results

A total of 749 responses were collected from mothers with infants between 0 to 24 months. The socio-economic and demographic characteristics of mothers were recorded. Among 749 mothers, 32.1% were between the ages of 31-40 years followed by 26-30 years with 29.9%. About 75% of mothers have graduated, and most of them have completed their bachelor's degree (63.9%). Almost all mothers were Muslim (99.5%) and from Saudi Arabia (89.5%). The unemployed (53.1%) were found to be more prevalent among mothers, even though they had good educational qualifications. More than half of the spouses have completed their bachelor degree (59.9%), and almost all of them are employed (91.5%). About 43.6% of families had a monthly income of more than 10,000 Saudi riyals. The prevalence of female children (54.3%) was found to be higher than that of males (45.6%). The mothers of children aged between 12-24 months (22.6%) have participated in the present study (**Table.1**).

| Variable | Criteria | Frequency | Percentage (%) |
|---|---|---|---|
| Age of mother | 18-25 | 146 | 19.49 |
| | 26-30 | 224 | 29.90 |
| | 31-40 | 241 | 32.17 |
| | 41-49 | 102 | 13.61 |
| | 50 and above | 36 | 4.80 |
| Educational qualification | High school and below | 186 | 24.83 |
| | Bachelor's degree | 479 | 63.95 |
| | Master and doctoral degrees | 84 | 11.21 |
| Religion | Muslim | 746 | 99.59 |
| | Non-Muslim | 3 | 0.40 |
| Nationality | Saudi | 671 | 89.58 |
| | Non-Saudi | 78 | 10.41 |
| Employment status of the mother | Employed | 351 | 46.86 |
| | Unemployed | 398 | 53.13 |
| Educational qualification of the spouse | High school and below | 183 | 24.43 |
| | Bachelor's degree | 449 | 59.94 |
| | Master and doctoral degrees | 117 | 15.62 |
| Employment status of the spouse | Employed | 686 | 91.58 |
| | Unemployed | 63 | 9.07 |
| Monthly household income | 5000-10000 | 295 | 39.38 |
| | >10000 | 327 | 43.65 |
| | <5000 | 127 | 16.95 |
| Child gender | Male | 342 | 45.66 |
| | Female | 407 | 54.33 |
| How old is your child? | 0-3 months | 89 | 11.88 |
| | 3-6 months | 141 | 18.82 |
| | 6-9 months | 104 | 13.88 |
| | 9-12 months | 108 | 14.41 |
| | 12-24 months | 170 | 22.69 |
| | >24 months | 137 | 18.29 |

**Table 1:** Socio-economic and demographic characteristics of mothers

The child was introduced to solid foods more likely after eight months (36.1%). The majority of mothers (76.1%) had at least one child using a diaper. The average amount of money spent on diapers was found to be 200 Saudi riyals (31.3%). In terms of the frequency of diaper changing per day, 62.6% of mothers changed diapers 4–7 times, and mothers feel that they do not have enough diapers (81.8%). About 65.8% of children didn't experience DD in the last six months, and some children about 28.4% experienced DD once, and most of them didn't visit a doctor (73.5%). Most of the mothers (89.7%) were aware that their children should not wear plastic pants. Only 29.3% of mothers attached their diapers loosely to allow the entry of air. The water and soap were used by 49.9% of mothers to clean the child after bowel movements. Gentle patting and drying with a towel (47.2%) were preferred by most of the mothers to dry the child after cleaning. Mothers preferred disposable diapers (94.2%) to cloth diapers. The mothers who participated in the present study used zinc oxide-containing barrier cream (34.5%) to prevent DD. Application of anti-fungal cream (47.3%) was mostly used by the mothers to treat the DD (Table.2).

| Variable | Criteria | Frequency | Percentage (%) |
|---|---|---|---|
| Did you introduce your baby to solid food? | Yes | 525 | 70.09 |
| | No | 224 | 29.90 |
| When did your child start eating solid food? | >8 months | 254 | 33.91 |
| | <8 months | 271 | 36.18 |
| | 1 | 570 | 76.10 |

| | | | |
|---|---|---|---|
| How many of your children are using diapers now? | 2 | 129 | 17.22 |
| | 3 | 32 | 4.27 |
| | 4 | 8 | 1.06 |
| | 5 and more | 10 | 1.33 |
| What is the average amount of money spent on diapers each month? | 100 | 59 | 7.87 |
| | 150 | 145 | 19.35 |
| | 200 | 235 | 31.37 |
| | 250 | 164 | 21.89 |
| | >250 | 146 | 19.49 |
| How many times do you change diapers per day per child? | 1-3 | 159 | 21.22 |
| | 4-7 | 469 | 62.61 |
| | 7-10 | 111 | 14.81 |
| | >10 | 10 | 1.33 |
| Do you ever feel you do not have enough? | Yes | 613 | 81.84 |
| | No | 136 | 18.55 |
| How often do you experience this? | Very often | 187 | 24.96 |
| | Not very often | 562 | 75.03 |
| Has your child been clinically diagnosed with DD in the last 6 months? | Yes | 256 | 34.17 |
| | No | 493 | 65.82 |
| If yes, how many times has this occurred in the last 6 months? | Once | 213 | 28.43 |
| | More than once | 97 | 12.95 |
| Did you visit the doctor due to this condition? | Yes | 198 | 26.43 |
| | No | 551 | 73.56 |
| Do you use plastic underpants? | Yes | 77 | 10.28 |
| | No | 672 | 89.71 |
| How do you use diapers on your child? | Attach the diaper firmly so that the feces do not leak. | 529 | 70.62 |
| | Attach it loosely to allow air to enter. | 220 | 29.37 |
| How do you clean your child after bowel movements? | Water only | 169 | 22.56 |
| | Water and soap | 374 | 49.93 |
| | Water and wet wipes | 153 | 20.42 |
| | Wet wipes | 53 | 7.07 |
| What do you use to dry after cleaning the child? | Natural air drying | 99 | 13.21 |
| | Gently patting with a dry towel + natural air drying | 224 | 29.90 |
| | Gently patting with a dry towel. | 354 | 47.26 |
| | Rubbing with a dry towel | 70 | 9.34 |
| | Drying with a hair dryer | 2 | 0.26 |
| What type of diapers do you use? | Disposable diaper only | 703 | 94.25 |
| | Cloth only | 3 | 4.05 |
| | Both disposable and cloth | 41 | 5.47 |
| What substances do you routinely put on a baby's bottom to prevent diaper dermatitis? | Baby lotion (barrier emollient) | 77 | 10.28 |
| | Baby Powder | 182 | 24.29 |
| | Zinc oxide | 259 | 34.57 |
| | Vaseline (petrolatum) | 76 | 10.14 |
| | Bepanthene moisturizer crème | 3 | 0.40 |
| | None | 152 | 20.29 |
| What do you use to treat diaper dermatitis? | Application of baby powder | 68 | 9.07 |
| | Application of native medication | 38 | 5.07 |
| | Application of medicated powder | 56 | 7.47 |
| | Application of Vaseline | 123 | 16.42 |
| | Application of anti- fungal cream | 355 | 47.39 |
| | Use of antibiotics | 32 | 4.27 |
| | Nothing | 77 | 10.28 |

**Table 2:** Investigating diaper management and mother's attitudes towards DD

The recent occurrence of DD in the babies was correlated with various factors to determine the potential risk factor. Age of mother (P=0.01), employment status (P=0.01), child gender (P=0.001), child age (P<0.005), use of plastic pants (P<0.05), use of diapers (P=0.05), cleaning method (P<0.05), and type of diaper (P=0.05) are found to be factors influencing the prevalence of DD. Apart from them, treatment method and introduction to solid foods (P<0.0001) showed strong significance with the prevalence of DD (Table.3).

| Variables | | $X^2$ Value | Df | Prevalence of DD | | *P* value |
|---|---|---|---|---|---|---|
| | | | | Yes | No | |
| Age of mother | 18-25 | 12.500 | 4 | 32 (4.3%) | 114 (15.2%) | 0.014[b] |
| | 26-30 | | | 83 (11.1%) | 141 (18.8%) | |
| | 31-40 | | | 92 (12.3%) | 149 (19.9%) | |
| | 41-49 | | | 37 (4.9%) | 65 (8.7%) | |
| | 50 and above | | | 12 (1.6%) | 24 (3.2%) | |
| Educational qualification of the mother | High school and below | 2.516 | 2 | 64 (8.5%) | 122 (16.3%) | 0.284[f] |
| | Bachelor's degree | | | 157 (21.0%) | 322 (43.0%) | |
| | Master's and doctoral degrees | | | 35 (4.7%) | 49 (6.5%) | |
| Employment status of the mother | Employed | 6.126 | 1 | 136 (18.2%) | 215 (28.7%) | 0.013[b] |
| | Unemployed | | | 120 (16.0%) | 278 (37.1%) | |
| Child gender | Male | 11.463 | 1 | 246 (32.8%) | 247 (33.0%) | 0.001[d] |
| | Female | | | 161 (21.5%) | 95 (12.7%) | |
| How old is your child? | 0-3 months | 18.387 | 5 | 15 (2.0%) | 74 (9.9%) | 0.002[c] |
| | 3-6 months | | | 42 (5.6%) | 99 (13.2%) | |
| | 6-9 months | | | 41 (5.5%) | 63 (8.4%) | |
| | 9-12 months | | | 39 (5.2%) | 69 (9.2%) | |
| | 12-24 months | | | 70 (9.3%) | 100 (13.4%) | |
| | >24 months | | | 49 (6.5%) | 88 (11.7%) | |
| Monthly household income | 5000-10000 | 3.224 | 3 | 94 (12.6%) | 201 (26.8%) | 0.358[f] |
| | >10000 | | | 43 (5.7%) | 84 (11.2%) | |
| | <5000 | | | 118 (15.8%) | 208 (27.8%) | |
| What is the average amount of money spent on diapers each month? | 100 | 2.576 | 4 | 16 (2.1%) | 43 (6.7%) | 0.631[f] |
| | 150 | | | 48 (6.4%) | 97 (13.0%) | |
| | 200 | | | 78 (10.4%) | 157 (21.0%) | |
| | 250 | | | 62 (8.3%) | 102 (13.6%) | |
| | >250 | | | 52 (6.9%) | 94 (12.6%) | |
| How many times do you change diapers per day per child? | 1-3 | 0.694 | 3 | 57 (7.6%) | 102 (13.65) | 0.875[f] |
| | 4-7 | | | 160 (21.4%) | 309 (41.3%) | |
| | 7-10 | | | 35 (4.7%) | 76 (10.1%) | |
| | >10 | | | 4 (0.5%) | 6 (0.8%) | |
| Do you use plastic underpants? | Yes | 7.342 | 1 | 37 (4.9%) | 40 (5.3%) | 0.006[a] |
| | No | | | 219 (29.2%) | 453 (60.5%) | |
| How do you use diapers on your child? | Attach the diaper firmly so that the feces do not leak. | 3.565 | 1 | 170 (22.7%) | 360 (48.1%) | 0.059[a] |
| | Attach it loosely to allow air to enter. | | | 86 (11.5%) | 133 (178%) | |
| How do you clean your child after bowel movements? | Water only | 8.186 | 3 | 72 (9.6%) | 97 (13.0%) | 0.042[a] |
| | Water and soap | | | 115 (15.4%) | 259 (34.6%) | |
| | Water and wet wipes | | | 54 (7.2%) | 99 (13.2%) | |
| | Wet wipes | | | 15 (2.0%) | 38 (5.1%) | |
| What do you use to dry after cleaning the child? | Natural air drying | 1.187 | 4 | 126 (16.8%) | 228 (30.4%) | 0.880[f] |
| | Gently patting with a dry towel + natural air drying | | | 34 (4.5%) | 65 (8.7%) | |
| | Gently patting with a dry towel. | | | 73 (9.7%) | 151 (20.2%) | |
| | Rubbing with a dry towel | | | 0 (0.0%) | 1 (0.1%) | |
| | Drying with a hair dryer | | | 23 (3.1%) | 48 (6.4%) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| What type of diapers do you use? | Disposable diaper only | 5.702 | 2 | 233 (31.1%) | 470 (62.8%) | 0.058[a] |
| | Cloth only | | | 3 (0.4%) | 2 (0.3%) | |
| | Both disposable and cloth | | | 20 (2.7%) | 21 (2.8%) | |
| What substances do you routinely put on a baby's bottom to prevent diaper dermatitis? | Baby lotion (barrier emollient) | 6.791 | 5 | 24 (3.2%) | 53 (7.1%) | 0.237[f] |
| | Baby Powder | | | 50 (6.7%) | 132 (17.6%) | |
| | Zinc oxide | | | 92 (12.3%) | 167 (22.3%) | |
| | Vaseline (petrolatum) | | | 28 (3.7%) | 48 (6.4%) | |
| | Bepanthene moisturizer crème | | | 1 (0.1%) | 2 (0.2%) | |
| | None | | | 61 (8.1%) | 91 (12.1%) | |
| What do you use to treat diaper dermatitis? | Application of baby powder | 42.632 | 6 | 21 (2.8%) | 47 (6.3%) | 0.000[e] |
| | Application of native medication | | | 14 (1.9%) | 24 (3.2%) | |
| | Application of medicated powder | | | 22 (2.9%) | 34 (4.5%) | |
| | Application of Vaseline | | | 55 (7.3%) | 68 (9.1%) | |
| | Application of anti-fungal cream | | | 129 (17.2%) | 226 (30.2%) | |
| | Use of antibiotics | | | 13 (1.7%) | 19 (2.5%) | |
| | Nothing | | | 2 (0.3%) | 75 (10.0%) | |
| Did you introduce your baby to solid foods? | Yes | 30.015 | 1 | 212 (28.3%) | 44 (5.9%) | 0.000[e] |
| | No | | | 313 (41.8%) | 180 (24.0%) | |

Sample size n=749, Significance levels at P<0.05a, P<0.01b, P<0.005c, P<0.001d, P<0.0001e, and non-significant f X2 value, Chi-squared value; df, Degrees of freedom.

**Table 3:** Analyzing the factors influencing the prevalence of DD

The majority of mothers (82.3%) knew that DD is a common skin condition in babies and young children. And 85.8% were aware that not changing the diaper of a baby frequently can lead to DD. About 86.6% of mothers knew that the alcohol content of the wipes could irritate the baby's skin. Zinc oxide-containing creams (68%) were mostly used by the mothers. Only 12.1% of mothers were mindful that a sprinkle of talcum powder on the diaper would not soak up the moisture. The false statement that disposable diapers have been shown to cause DD was identified by 18.4% of mothers. The thumb rule to visit a doctor if DD does not clear up was followed by 79% of mothers. Only 13.3% of mothers were familiar with the fact that attaching a diaper firmly will not prevent leakage. Informed knowledge about the false statement that to remove odor, wipe with a wet tissue containing perfume was observed in 72.2% of mothers. Most mothers (91.5%) were conscious of the cleaning procedure to wipe out the excreta thoroughly with water and rub the area with a towel. The mothers (32.8%) were sensible to the false statement that it is effective to apply ointment and powder together when DD occurs, and 34.8% of mothers didn't encourage the fact that if you wash the area frequently with water when a baby has DD, it will worsen. About 83.8% of mothers supported the fact that poor diapering is one of the causes of DD (Table.4). In the present study, about 55.9% of mothers had good knowledge, and 44% of mothers had below-average knowledge on the management and prevention aspects of DD.

| Questions | Criteria | Response | Percentage (%) |
|---|---|---|---|
| DD is the most common skin condition in babies and young children (yes). | Yes | 617 | 82.37 |
| | No | 38 | |
| | Do not know | 94 | |
| One of the most common causes of DD is not changing the baby diaper (yes). | Yes | 643 | 85.84 |
| | No | 48 | |
| | Do not know | 58 | |
| Some baby wipes that contain alcohol can irritate an infant's skin (yes). | Yes | 649 | 86.64 |
| | No | 35 | |
| | Do not know | 65 | |
| DD ointments that contain zinc oxide (yes). | Yes | 510 | 68.09 |
| | No | 91 | |
| | Do not know | 148 | |
| A sprinkle of talcum powder on a diaper will soak up moisture (no). | Yes | 451 | 60.21 |
| | No | 141 | |
| | Do not know | 157 | |
| | Yes | 247 | 32.97 |

| | | | |
|---|---|---|---|
| Disposable diapers have been shown to cause DD (no). | No | 138 | |
| | Do not know | 364 | |
| The general rule of thumb is to call the doctor if DD does not clear up (yes). | Yes | 592 | 79.03 |
| | No | 56 | |
| | Do not know | 101 | |
| When putting on a diaper, attach it tightly so that the excrement does not leak (no). | Yes | 611 | 81.57 |
| | No | 100 | |
| | Do not know | 38 | |
| To remove odor, wipe with a wet tissue containing perfume (no). | Yes | 136 | 18.15 |
| | No | 541 | |
| | Do not know | 72 | |
| Wipe the excreta thoroughly with water and rub the area with a towel (yes). | Yes | 686 | 91.58 |
| | No | 38 | |
| | Do not know | 25 | |
| When DD occurs, it is effective to apply ointment and powder together (no). | Yes | 298 | 39.78 |
| | No | 246 | |
| | Do not know | 205 | |
| If you wash the area frequently with water when a baby has DD, it will worsen (no). | Yes | 261 | 27.36 |
| | No | 222 | |
| | Do not know | 266 | |
| The poor type of diaper is one of the causes of diaper dermatitis (yes). | Yes | 628 | 83.84 |
| | No | 28 | |
| | Do not know | 93 | |

**Table 4:** Assessment of mother's knowledge on diaper hygiene practices and preventive measures

The association between the mother's knowledge of diaper management, hygiene practices, and preventive measures is assessed using the chi-squared test. The results showed that high significance was found between a mother's knowledge and socio-economic characteristics (educational qualification), method of cleaning and drying, and introduction to solid foods (P<0.0001). The significance was also found between mother's knowledge and age of mother (P<0.001), treatment for DD (P<0.005), age of child (P<0.05) use of diaper (P<0.05), type of diaper (P<0.05). Other parameters were found to be non-significant with the mother's knowledge (Table.5).

| **Variables** | | $X^2$ **Value** | **df** | **Knowledge of the mother** | | ***P*** **value** |
|---|---|---|---|---|---|---|
| | | | | **Above Average** | **Below Average** | |
| Age of mother | 18-25 | 14.424 | 4 | 63 (8.4%) | 83 (11.1%) | 0.006[c] |
| | 26-30 | | | 134 (17.9%) | 90 (12.0%) | |
| | 31-40 | | | 146 (19.5%) | 95 (12.7%) | |
| | 41-49 | | | 59 (7.9%) | 43 (5.7%) | |
| | 50 and above | | | 17 (2.3%) | 19 (2.5%) | |
| Educational qualification of the mother | High school and below | 19.589 | 2 | 81 (10.8%) | 105 (14.0%) | 0.000[e] |
| | Bachelor's degree | | | 279 (37.2%) | 200 (26.7%) | |
| | Master's and doctoral degrees | | | 59 (7.9%) | 25 (3.3%) | |
| Employment status of the mother | Employed | 0.878 | 1 | 190 (25.4%) | 161 (21.5%) | 0.349[f] |
| | Unemployed | | | 229 (30.6%) | 169 (22.6%) | |
| Child gender | Male | 2.491 | 1 | 202 (27.0%) | 140 (18.7%) | 0.115[f] |
| | Female | | | 217 (29%) | 190 (25.4%) | |
| How old is your child? | 0-3 months | 12.581 | 5 | 39 (5.2%) | 50 (6.7%) | 0.028[a] |
| | 3-6 months | | | 70 (9.3%) | 71 (9.5%) | |
| | 6-9 months | | | 56 (7.5%) | 48 (6.4%) | |
| | 9-12 months | | | 65 (8.7%) | 43 (5.7%) | |
| | 12-24 months | | | 106 (14.2%) | 64 (8.5%) | |
| | >24 months | | | 83 (11.1%) | 54 (7.2%) | |
| Monthly household income Saudi riyal | 5000-10000 | 3.718 | 3 | 162 (21.6%) | 133 (17.8%) | 0.294[f] |
| | >10000 | | | 192 (25.6%) | 134 (17.9%) | |
| | <5000 | | | 65 (8.7%) | 62 (8.3%) | |
| What is the average amount of money spent on diapers each month? | 100 | 3.356 | 4 | 30 (4.0%) | 29 (3.9%) | 0.500[f] |
| | 150 | | | 82 (10.9%) | 63 (8.4%) | |
| | 200 | | | 126 (16.8%) | 109 (14.6%) | |
| | 250 | | | 80 (10.7%) | 66 (8.4%) | |
| | >250 | | | 101 (13.5%) | 63 (8.4%) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| How many times do you change diapers per day per child? | 1-3 | 4.012 | 3 | 80 (10.7%) | 70 (10.5%) | 0.260[f] |
| | 4-7 | | | 269 (35.9%) | 200 (26.7%) | |
| | 7-10 | | | 66 (8.8%) | 45 (6.0%) | |
| | >10 | | | 4 (0.5%) | 330 (44.1%) | |
| Has your child clinically diagnosed diaper dermatitis (Rash) in the last 6 months? | Yes | 1.461 | 1 | 151 (20.2%) | 268 (35.8%) | 0.227[f] |
| | No | | | 151 (20.2%) | 225 (30.0%) | |
| Did you have to visit the doctor due to this? | Yes | 0.213 | 1 | 108 (14.4%) | 311 (41.5%) | 0.645[f] |
| | No | | | 90 (12.0%) | 240 (32.0%) | |
| Do you use plastic underpants? | Yes | 1.512 | 1 | 38 (5.1%) | 39 (5.2%) | 0.219[f] |
| | No | | | 381 (50.9%) | 291 (38.9%) | |
| How do you use diapers on your child? | Attach the diaper firmly so that the feces do not leak. | 1.468 | 1 | 289 (38.6%) | 130 (17.4%) | 0.020[a] |
| | Attach it loosely to allow air to enter. | | | 241 (32.2%) | 89 (11.9%) | |
| How do you clean your child after bowel movements? | Water only | 34.760 | 4 | 114 (15.2%) | 54 (7.2%) | 0.000[e] |
| | Water and soap | | | 204 (27.2%) | 170 (22.7%) | |
| | Water and wet wipes | | | 88 (11.7%) | 65 (8.7%) | |
| | Wet wipes | | | 12 (1.6%) | 41 (5.5%) | |
| What do you use to dry after cleaning the child? | Natural air drying | 28.921 | 4 | 229 (30.6%) | 125 (16.7%) | 0.000[e] |
| | Gently patting with a dry towel + natural air drying | | | 121 (16.2%) | 103 (13.8%) | |
| | Gently patting with a dry towel. | | | 229 (30.6%) | 125 (16.7%) | |
| | Rubbing with a dry towel | | | 28 (3.7%) | 43 (5.7%) | |
| | Drying with a hair dryer | | | 0 (0.0%) | 1 (0.1%) | |
| What type of diapers do you use? | Disposable diaper only | 7.821 | 2 | 402 (53.7%) | 301 (40.2%) | 0.020[a] |
| | Cloth only | | | 1 (0.1%) | 4 (2.2%) | |
| | Both disposable and cloth | | | 16 (2.1%) | 25 (3.3%) | |
| What substances do you routinely put on a baby's bottom to prevent diaper dermatitis? | Baby lotion (barrier emollient) | 8.767 | 5 | 38 (5.1%) | 39 (5.2%) | 0.119[f] |
| | Baby Powder | | | 91 (12.1%) | 91 (12.1%) | |
| | Zinc oxide | | | 157 (21.0%) | 102 (13.6%) | |
| | Vaseline (petrolatum) | | | 44 (5.9%) | 32 (4.3%) | |
| | Bepanthene moisturizer crème | | | 3 (0.4%) | 0 (0) | |
| | None | | | 86 (11.5%) | 66 (8.8%) | |
| What do you use to treat diaper dermatitis? | Application of baby powder | 21.013 | 6 | 34 (4.5%) | 34 (4.5%) | 0.002[c] |
| | Application of native medication | | | 19 (2.5%) | 19 (2.5%) | |
| | Application of medicated powder | | | 24 (3.2%) | 24 (3.2%) | |
| | Application of Vaseline | | | 63 (8.4%) | 60 (8.0%) | |
| | Application of anti-fungal cream | | | 226 (30.2%) | 129 (17.2%) | |
| | Use of antibiotics | | | 20 (2.7%) | 12 (1.6%) | |
| | Nothing | | | 33 (4.4%) | 44 (5.9%) | |
| Did you introduce your baby to solid foods? | Yes | 12.860 | 1 | 316 (42.2%) | 103 (13.8%) | 0.000[e] |
| | No | | | 209 (27.9%) | 121 (16.2%) | |

**Table 5:** Correlating the mother's knowledge on the management of diapers, hygiene practices, and preventive measures

Sample size n=749, Significance levels at P<0.05a, P<0.01b, P<0.005c, P<0.001d, P<0.0001e, and non-significant f X2 value, Chi-squared value; df, Degrees of freedom.

## Discussion

DD is defined as inflammation in the diapered area (genital, abdomen, and thighs) with varying degrees of severity on the epidermis of babies [17].

The present study is aimed at measuring the knowledge of mothers on DD with children age of 0 to 24 months in Makka region, Saudi Arabia. The outcome of the present study revealed that the age of the mother, employment status, child gender, age of the child, use of plastic pants, method of using a diaper, cleaning method, type of diaper, and treatment were found to have a statistical association with the prevalence of DD. **Kim (2019)** [18], reported that improper hygiene practices, such as cleaning and drying methods and applying talcum powder during DD, were reported to worsen the disease. In the present study, about 60% of mothers were unaware of the conscious use of talcum powder on DD. A study conducted by **Eke and Opara (2013)** [19], in Nigeria reported that

education qualification has significance for DD, and most of the mothers preferred Vaseline for the bottom and anti-fungal cream to treat DD.

**Biranjia-Hurdoyal and Pandamikum (2015)** [20], reported that the prevalence of DD is higher among babies who wear disposable diapers, and the results of the present study also showed that a higher prevalence of DD was observed in babies who used disposable diapers. Irregularity in changing diapers and usage of cloth diapers were found to have an influence on the prevalence of DD. The significant prevalence of DD was found to reduce with age [1]. The results of the present study also denoted the same: advancement in age reduced the incidence of DD and showed a higher significance between the age of the child and the prevalence of DD. **Jewaro *et al.* (2021)** [21], reported that using barrier cream, frequency of using diapers, and breast feeding are interlinked with the prevalence of DD. They also identified diarrhea as a potential risk factor for deepening the DD and suggested that educating mothers on these complications will be useful in reducing the incidence of DD. A study conducted in Saudi Arabia by **Mohamed *et al.* (2021)** [22], revealed that the age and gender (female) of infants has a strong influence on the prevalence of DD. In the present study, the prevalence of DD was found to be high among infants of age between 12-24 months. Similar results have been suggested by **Alghamdi *et al.* (2022)** [23], where infants between the ages of 19-24 months showed a higher risk of DD. **Li *et al.* (2012)** [3] demonstrated that introduction to solid foods, frequency of changing diapers, and home location were found to be risk factors for DD. In the present study, a higher significance was observed between the introduction of solid foods and the prevalence of DD. **Joseph and Mathew (2013)** [24], produced the contradicting result that the age of the mother or family type doesn't have any significance with the mother's knowledge.

The results of the present study showed that mothers had average knowledge of diaper management and hygiene practices. About 55.9% of mothers had good knowledge, and 44% of mothers had less knowledge on the management of diapers and hygiene practices. The percentage of good diaper management in the present study is higher than the recent studies conducted by **Prithiba *et al.* (2020)** [25], in Kanchipuram District, India, and **Collins *et al.* (2023)** [16], in Northern Ghana, West Africa (23.5%). The findings of the present study revealed that the association between socioeconomic factors (age of mother and educational qualification of mother), cleaning and drying method after bowel movement, type of diaper used, and treatment for DD were found to be correlated with the mother's knowledge.

A recent study conducted by **Collins *et al.* (2023)** [16], showed that employment status and cleaning and drying methods were found to have a correlation with the mother's knowledge of diaper management and hygiene practices. The results of the study conducted by **Prithiba *et al.* (2020)** [25], were found to contradict the outcome of the present study. The study showed that there is no significant correlation between the demographic factors (educational qualification, employment, diaper usage, and number of children) and the mother's knowledge of DD. But the study revealed that family type and mother's age showed significance with knowledge of DD. **Wanjiku *et al.* (2016)** [26], conducted a study to observe the relationship between sociodemographic and economic factors and DD. The results revealed the interlink between educational qualification, income of the mother, child age, and DD. In the present, maternal educational qualification was found to have a strong statistical association ($P<0.0001$) with the mother's knowledge on diaper management and hygiene practice. The present study has only included population from Makka Saudi Arabia so the study has to be extended to confirm the results.

## Conclusion

The present study highlighted that various factor like socioeconomic status (age of mother and employment status of mother), age and gender of child, plastic pant usage, use of diaper, type of diaper, cleaning method, introduction to solid foods, and treatment method are influencing the prevalence of DD, and these factors are also potentially correlated with the mother's knowledge and preventive aspects of DD. In the present study, the majority of mother respondents from the Makka region of Saudi Arabia had good knowledge of diaper usage and management and were found to be aware of diaper dermatitis, but a higher prevalence of DD was observed among the population. So, the study strongly suggests the necessity and importance of creating awareness about DD and targeting parents and caretakers about diaper-related issues that would be helpful in containing the occurrence of DD and would possibly reduce the suffering of infants.

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**DOI:10.31579/2578-8949/149**