

# The Clinical and Microbial Spectrum of Diaper Dermatitis in Kuwait

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## Abstract:

Diaper dermatitis (DD) is a common problem in infants both by the pediatricians and dermatologists. The present study was aimed to determine the spectrum of DD in Kuwait. A total of 100 infants with DD were studied for the clinical features, the role of superadded candida, microbial flora, and the carriage of candida species in the stools. There were 47% male and 53% female infants. Fifty percent of the cases had the onset below the age of 6 months. Most of the patients (74%) had a moderate severity of the disease. Thirty percent of the cases were associated with atopic dermatitis. Seventy-three percent of the infants were either formula-fed or were on normal diet. *Candida albicans* was isolated from skin of diaper area in 71% and *Staphylococcus aureus* in 32% of the cases. The carriage rate of *Candida albicans* in stools of DD patients (52%) was comparable to the controls (47%).

**Key Words :** Diaper dermatitis, Infants, *Candida albicans*.

## Introduction:

Diaper Dermatitis (DD) is one of the most common dermatoses in infants in around 15% of the cases<sup>(1)</sup>. Diapering promotes adverse changes in

skin condition through increase in skin hydration and pH<sup>(2,3,4,5)</sup>, which in turn compromise the physical integrity of the skin. The compromised skin is susceptible to mechanical chafing damage, chemical and enzymatic irritants and microbial attack<sup>(2,3,4,5)</sup>. Other contributing factors that can increase the possibility of diaper rash development include the age of the child, frequency of episodes of diarrhea, infectious diseases, antibiotic therapy, diet and atopic dermatitis<sup>(6,7)</sup>. The role of superadded microorganisms including *Candida albicans* and *Staphylococcus aureus* has been elucidated in several studies<sup>(8,9,10)</sup>.

In a prospective survey of 10,000 pediatric dermatology clinic outpatients in Kuwait, the DD was observed to constitute 4% of the total number of cases and 13% of the infant population<sup>(11)</sup>. The present study was aimed to determine the clinical and microbial spectrum of DD in Kuwait.

## Materials and Methods:

A total of 100 infants presenting with a primary diagnosis of DD were randomly selected. Patients receiving treatment for other dermatoses like psoriasis, acrodermatitis enteropathica and tinea cruris were not included. A detailed clinical record of their age at presentation, age at onset, duration of disease, severity of disease, feeding habits, drug intake and associated diseases like atopic dermatitis, seborrheic dermatitis, diarrhea, pyrexia and upper respiratory tract infection was maintained for all the patients. The severity of disease was defined as: mild - when there was mild to moderate erythema and/or scaling with few papules and edema (Fig.1);



Fig.1 Mild DD with localized erythema, few papules and edema.

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moderate - when there was moderate to severe erythema and/or scaling with mild to moderate erosions or oozing (Fig.2); and severe when there was moderate to severe erythema, and or scaling with severe erosions/ulcerations, papules, oedema and massive oozing (Fig.3).



Fig. 2 Moderate DD with moderate erythema, scaling, edema, scattered papules and mild erosions.

A skin smear and culture for candida was performed in all the 100 cases with DD and 20 controls. Before attaining the material the skin was cleaned with sterile saline solution. Skin scrapings for a direct KOH smear and candida culture were taken from the affected area of the patients and healthy skin of napkin area of the controls. Stool culture for candida albicans was performed in 25 affected infants and 15 healthy controls and the material was achieved from stool soiled napkins by using sterile cotton swabs. The samples for candida culture were immediately inoculated on Sabourauds dextrose medium, blood agar and EMB plates by the single colony method.

Skin swabs for microbial cultures of aerobes and anaerobes were collected from the affected skin of 50 infants with DD and healthy skin of the napkin area of 15 controls, after cleaning the area with normal saline.

The control included the age and sex matched infants who had presented with various dermatoses like impetigo, molluscum contagiosum, alopecia areata, nevi etc., of distant sites and had a healthy skin of the napkins area.

### Results:

One hundred cases of DD included, 47 male (47%) and 53 female infants (53%) with a male: female ration of 1:1.1. Age at presentation ranged between 2 weeks old infant to 2 years with a mean of 9 months ( $0.76 \pm 0.51$  years). Age at onset of rash



Fig. 3 Severe DD with intense erythema, edema, multiple erosions and oozing.

between one week to 20 months with a mean of 8 months ( $0.66 \pm 0.49$  years). Table 1 shows the age at onset of rash and sex distribution in 100 cases. A peak age at onset was seen below the age of months (50%). Thereafter a steady decline in the number of cases was seen (table 1). The duration of disease before coming to us ranged between 3 days to 10 months with a mean of one and a half month.

A mild severity of the disease was observed in 14 patients (14%), moderate in 74(74%) and severe in 12 infants (12%). Fifty-four patients (54%) had the DD alone. Among the various associated diseases, atopic dermatitis was seen in 30 patients (30%), seborrheic dermatitis in 13 (13%) and candidiasis affecting other sites (two patients had oral thrush and one had candidial intertrigo of the axillae & neck) in 3 patients. None of the patients in the present series had history of diarrhea, drug intake prior to onset of the rash or any other significant medical problem.

At the time of presentation, 17 infants (17%) were breast-fed and 73(73%) were either formula-fed or were on normal diet. Table 2 shows the relationship of various associated diseases to the severity

of the rash. Associated diseases were observed to carry no relationship to the severity of rash ( $P>0.05$ ). Similarly, the age at onset and feeding habits of the infants were also observed to have no relationship to the severity of DD ( $P>0.05$ ).

A KOH smear and/or culture for candida albicans was positive in 71 infants (71%) with DD whereas none of the controls had a positive KOH smear or culture for Candida albicans from the healthy skin of napkin area. A carriage of Candida albicans in stools was seen in 13 infants (52%) with DD and 7 controls (47%) and the difference was statistically not significant.

Eighty-four percent ( $N=42$ ) of the 50 patients were observed to have positive microbial skin cultures as compared to 73% ( $N=11$ ) of the normal controls. Table 3 shows various microbial flora isolated from the affected skin of the napkin area in 50 patients compared to normal healthy skin of 15 controls. The overall isolation of microbial flora from the skin of napkin area of the patients (84%) was not significantly different from that of controls (73%). However, the isolation of Staph. aureus was significantly higher in the patients (32%) than controls (7%). Vice-versa isolation of Staph. coagulase negative was higher in controls (33%) than the patients (6%) (Table 3).

### Discussion:

Diaper Dermatitis (DD) in its common form represents an irritant contact dermatitis. It results after repeated or prolonged contact of skin with urine and feces. Elevated skin wetness has several roles in compromising the integrity of the skin, including increasing its permeability to irritants, increasing its frictional coefficient, and promoting microbial growth<sup>(2)</sup>. An important function of urine in the etiology of DD is to increase the pH of the diaper environment by breaking down urea to ammonia in the presence of fecal urease which is produced by number of intestinal bacteria<sup>(3)</sup>. Elevated pH increases the activity of fecal enzymes that can further attack the skin<sup>(4)</sup>.

In the present report, we observed DD to affect the infants of all the ages (range 2 weeks to 2 years). A peak age at onset was seen below 6 months of age, thereafter a steady decline in the prevalence rate was observed (Table 1).

A higher incidence in younger infants has been

noticed earlier as well. The decrease in frequency with the advancing age has been related to decrease in the bowel movements and urinary frequency with the maturity of the infants<sup>(6,12)</sup>. Thus with aging the skin of the diaper region is subjected to fewer insults from contact with feces and urine<sup>(11)</sup>. The sex of the patients was not observed to bear any relationship to frequency and severity of rash.

An increase in frequency of DD with atopic dermatitis has been reported<sup>(1,7)</sup>. Thirty percent of the DD infants, in the present survey, were associated with atopic dermatitis. However, the severity of the diaper rash was not observed to be related to the associated diseases (Table 2).

It is commonly believed that the breast-fed infants are less likely than formula-fed infants to experience DD. The feces of breast-fed infants are known to have a lower pH than those of formula-fed and they may be less irritating to the surrounding skin<sup>(12,13)</sup>. It has also been observed that breast-fed infants are less likely to excrete significant amount of urease, that reflects the nature of fecal flora of breast-fed infants. Formula-fed infants are more heavily colonized with urease producing organisms such as enterobacteria and bacteroides<sup>(14)</sup>. Most of the infants (73%) in the present report were also formula-fed or were on normal diet. There is no question that Candida albicans can be frequently recovered from the patients with DD and isolation of Candida albicans in different studies has ranged from 33 to 80%<sup>(9,15,16)</sup>. We observed the presence of Candida albicans in the skin of diaper area in 71% of the cases, whereas none of the controls showed the presence of Candida on smear or culture. In many reports<sup>(6,17,18,19)</sup>, severity of the diaper rash has been correlated with the carriage of Candida albicans in the stools. In our experience carriage rate of Candida albicans in stools of the affected infants was not observed to differ from that of controls. However, a quantitative estimation of Candida carriage was not performed.

The role of the bacterial flora in diaper rash is controversial. In some studies<sup>(9,10)</sup>, a higher carriage of Staph. aureus was observed. We also observed a higher isolation (32%) of Staph. aureus from the diaper skin of affected infants as compared to controls (7%). A definite inference can not be drawn from our findings, as many of our patients had an associated atopic dermatitis and skin of atopic chil-

dren is well known to have a higher carriage of *Staph. aureus* (20). A comparative study of bacterial flora of the diaper skin of the DD infants with and without atopic dermatitis is required to settle the issue.

In conclusion, diaper dermatitis is prevalent in Kuwait, and was observed to affect around 13% of

the infants in a pediatric dermatology clinic (12). It was seen more often in younger infants and most of the cases were formula-fed. Seventy-one percent patients were secondarily infected with *Candida albicans* and a considerable number (32%) grew *Staph. aureus*. Understanding of these factors is important in treatment and prevention of these cases.

**Table 1. Age at onset and sex distribution in 100 infants with diaper dermatitis (DD):**

Age at onset (months)	Males	Females	Total	
			N	(%)
0- 6	27	23	50	(50)
7-12	9	20	29	(29)
13-18	8	3	11	(11)
> 18	3	7	10	(10)

**Table 2. Relationship of associated diseases to severity of the disease:**

Severity of disease	DD alone (N=54)		DD + AD (N=30)		DD + SD (N=13)	
	N	(%)	N	(%)	N	(%)
Mild	10	(19)	4	(23)	0	(0)
Moderate	39	(72)	23	(77)	10	(77)
Severe	5	(9)	3	(10)	3	(23)

DD = Diaper dermatitis

AD = Atopic dermatitis

SD = Seborrheic dermatitis

**Table 3. Microbial flora isolated from the skin of napkin area in DD patients (N=50) and controls (N=15)**

Microbial Flora	DD (N=50)		Controls (N=15)	
	N	%	N	%
Staph. aureus	16	(32)	1	(7)
Staph. coagulase negative	3	(6)	5	(33)
Staph. epidermidis	1	(2)	0	(0)
MRSA	1	(2)	0	(0)
Streptococcus group D	1	(2)	0	(0)
Klebsiella species	16	(32)	4	(27)
Pseudomonas	10	(20)	1	(7)
Enterobacter species	7	(14)	1	(7)
E. * coli	10	(20)	6	(40)
Acinetobacter species	2	(4)	0	(0)
Citrobacter species	1	(2)	0	(0)
Proteus	2	(4)	1	(7)

\* *Staphylococcus*\*\* *Methicillin resistant Staph. aureus*\*\*\* *Escherichia***Reference:**

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