



# Diaper (napkin) dermatitis: A fold (intertriginous) dermatosis

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**Abstract** Diaper (napkin) dermatitis is an acutely presenting inflammatory irritant contact dermatitis of the diaper region. It is one of the most common dermatologic diseases in infants and children. In the past, the disease was thought to be caused by ammonia; however, a number of factors, such as friction, wetness, inappropriate skin care, microorganisms, antibiotics, and nutritional defects, are important. Diaper dermatitis commonly affects the lower parts of the abdomen, thighs, and diaper area. Involvement of skin fold regions is typical with diaper dermatitis. At the early stages of the disease, only dryness is observed in the affected area. At later stages, erythematous maceration and edema can be seen. Secondary candidal and bacterial infections can complicate the dermatitis. In the differential diagnosis of the disease, allergic contact dermatitis, intertrigo, psoriasis, atopic and seborrheic dermatitis, and the other diseases should be considered. Causes of the disease should be determined and eliminated primarily. Families need to be informed about the importance of a clean, dry diaper area and the frequency of diaper changes. The use of superabsorbent disposable diapers has decreased the incidence of the disease. Soap and alcohol-containing products should be avoided in cleaning the area. In some cases, corticosteroids and antifungal agents can be administered. If necessary, antibacterial agents and calcineurin inhibitors can also be beneficial.

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Diaper dermatitis is an acute, inflammatory skin reaction that occurs in the diaper area. This term includes skin reactions caused by direct exposure of the skin to diapers; however, dermatologic disorders (such as bullous impetigo, acrodermatitis enteropathica, and so on) that occur particularly around the diaper region are considered as subgroups of this definition as well.<sup>1</sup>

Diaper dermatitis is the most common dermatologic disease of infancy. It is seen mostly in infants between 9 and 12 months of age but also may be seen in adults using incontinence pads and those with urinary incontinence.<sup>1,2</sup> The prevalence of this disorder has been estimated to be

between 7% and 35%. Recently, the use of superabsorbent disposable diapers had reduced this frequency.<sup>3</sup> No variability between different ethnic groups is seen.

The best clinical criterion for the diagnosis of diaper dermatitis is the location of the lesions. Affected regions include the genitals, the buttocks, thighs, and the lower part of the abdominal area.<sup>4</sup>

## Etiology

In the past, it was widely believed that ammonia was the prominent factor for diaper dermatitis. Ammonia is produced by fragmentation of urea in urine with the aid of bacterial

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enzymes. It has been determined that the amount of ammonia on the skin and the morning's first diaper of infants is the same for affected and unaffected infants. Erythema can be observed when ammonia is applied only to the damaged skin. All of these show that the main factor responsible for diaper dermatitis is not limited to ammonia. Many factors other than ammonia are involved in the etiology of diaper dermatitis. The primary cause of diaper dermatitis is prolonged and increased exposure to wetness against the skin.<sup>5</sup>

## Friction

Friction between the skin and clothes is an important trigger in diaper dermatitis but is not the sole factor.<sup>6</sup> Friction damages epidermal barrier functions, which allows easier penetration of irritants. This hypothesis is supported by the predilection of diaper dermatitis to occur in areas with the closest contact with the diaper such as the convex surfaces of the genitalia, the thighs, the buttocks, and the waistline.<sup>7</sup>

## Wetness

Increased skin hydration occurs in diaper areas, which makes skin surfaces more fragile and therefore increases the risk of friction. The skin's protective barrier function is damaged by friction, which makes the skin more susceptible to microorganisms.<sup>8</sup>

## Urine and feces

We can say that ammonia is not the primary cause of diaper dermatitis; however, it has an important role as an aggravating factor for the damaged skin. Other urinary degradation products also may play a role in diaper dermatitis etiology. In one study, a sample of urine kept below 37°C for 18 hours was applied to newborn skin, after which development of dermatitis free of pH and ammoniacal concentration, was observed.<sup>7</sup> Epidermal permeability function is more severely affected by urine than water.<sup>9</sup>

It is known that feces have an irritant effect on skin. Bacterial enzymes in feces degrade urea and release ammonia. Increased pH levels in the diaper area activate fecal proteases and lipases.<sup>10</sup> These enzymes in the diaper area are the most important irritant agents for skin. Severe erythema and deterioration in the integrity of the skin develops after contact with these enzymes. Children fed cow's milk have many urease-positive bacteria in their feces, which raises the risk of diaper dermatitis in these children.<sup>3</sup>

There is a correlation between diaper dermatitis and the volume of defecation. Intestinal passage is faster in patients

with diarrhea. As a result, the number of enzymes increases in diaper area and the frequency of diaper dermatitis rises.<sup>3</sup>

## Inappropriate skin care

The use of liquid soap and talcum powder can cause diaper dermatitis. The other important factor causing diaper dermatitis is infrequent diaper changes.<sup>3,7,11</sup>

## Microorganisms

The role of microorganisms in the pathogenesis of diaper dermatitis has been considered; however, any significant difference between the bacterial growth in infants with or without diaper dermatitis has not been demonstrated. Penetration of bacteria increases when the stratum corneum is damaged.<sup>7</sup> The role of *Candida* infection in the pathogenesis is more prominent than that of bacterial infection. Several reports indicate that the presence and level of *Candida* infection is important for the clinical demonstration of diaper dermatitis.

Atopic dermatitis can affect the diaper area. The presence of atopic dermatitis may cause or exacerbate diaper dermatitis. Patients with atopic dermatitis have increased *Staphylococcus aureus* colonization in this area. Other infectious agents such as herpes simplex virus type 1, dermatophytes, and cytomegalovirus infections can also trigger diaper dermatitis.<sup>5</sup>

## Antibiotics

The use of broad-spectrum antibiotics can play a role in the etiology of diaper dermatitis. This condition is related to colonization of *Candida* infection in the genital area.<sup>7,12</sup>

## Nutritional defects

Zinc and biotin deficiency can lead to diaper dermatitis.<sup>1</sup>

## Clinical findings

Irritant diaper dermatitis is the most common dermatologic disease of infancy.<sup>2</sup> This condition is not observed within the first 3 weeks of infancy. The disease usually starts between the third and twelfth weeks. It is characterized by erythema on the convex sides of the hips, mons pubis, scrotum, and the lower part of the abdomen, areas with the

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