Dermoscopic Features of Diaper Dermatoses in Children: A Descriptive Pilot Study

Abstract

Background: Diaper dermatoses broadly refer to skin disorders that occur in the diaper area. Dermoscopy is a non-invasive diagnostic tool that magnifies subsurface structures of the skin that are invisible to the unaided eye. Aim: To identify and describe the dermoscopic features of dermatoses in the diaper area. Materials and Methods: A cross-sectional clinical study was conducted, which included 100 children below five years of age with dermatoses in the diaper area. The lesions were initially observed clinically and then under a dermoscope (Dermlite 4, 3GEN Inc., San Juan Capistrano, CA, USA). Findings were recorded and photographed. Results: Of the 100 enrolled children, infectious dermatoses were observed in 46 cases, predominantly comprising scabies and tinea cruris, followed by intertrigo, molluscum contagiosum, and varicella. The most common dermoscopic feature of scabies was a jet wing with a contrail, whereas scaling, red-brown, and grey-brown dots and globules were observed in tinea cruris. Of the non-infectious dermatoses, contact dermatitis and vitiligo were the most common. Dermoscopy revealed irregular-dotted vessels and white structureless areas in cases of contact dermatitis. An absent pigment network and white structureless areas with leukotrichia and white glow were seen in vitiligo, which helped differentiate it from nevus depigmentosus. Limitations: Single-center study with a limited sample size for each condition and histopathological confirmation could not be performed. Conclusion: This study highlights the dermoscopic features of diaper dermatoses and demonstrates the potential of dermoscopy to enhance diagnostic accuracy and optimize patient care without invasive investigations, underscoring its unique role in pediatric dermatology.

Keywords: Background color, children, dermoscopy, diaper dermatoses, scaling, vessels

Introduction

Diaper dermatoses are skin disorders that occur in the diaper area. They are a common occurrence in children, especially before the completion of toilet training. As these diseases occur very early in childhood, they are generally diagnosed as a contact reaction due to fecal matter and urine in the diaper. This can often lead to a misdiagnosis of all cases of diaper dermatosis as being contact dermatitis.

While contact dermatitis remains the most common cause of diaper dermatoses, the differentials are myriad, including infective conditions such as scabies, tinea cruris, molluscum contagiosum, and intertrigo. Numerous non-infective conditions also affect the diaper area, including vitiligo, seborrhoeic dermatitis, lichen planus, lichen sclerosus, and psoriasis. [1]

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As the diaper area in children is somewhat fragile, invasive investigations, including histopathology, are neither practical nor justified, sometimes leading to a diagnostic dilemma. This may lead to misdiagnosis and delay in appropriate treatment, negatively impacting short-term and long-term clinical outcomes. While the clinical presentation of these dermatoses is well-documented, the incorporation of dermoscopy in elucidating their distinct features remains an area of evolving exploration. [2]

Dermoscopy, dermatoscopy, or epiluminescence microscopy is a non-invasive diagnostic tool that helps view subsurface structures of the skin that are not visible to the naked eye and acts as a link between clinical dermatology and microscopic dermatopathology; it is thus much more than just a magnifying lens.^[3]

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Dermoscopy has classically been used in the diagnosis of pigmented lesions of the skin, especially melanoma. In recent years, there has been a gradual expansion in the description of dermoscopic features in general dermatology, with data being added to the current knowledge of various features seen on dermoscopy and their histopathological correlates.^[4]

The rationale behind this study stems from the recognized limitations of conventional clinical examination in accurately discerning subtle variations among various entities in the diaper area. This study aimed to systematically investigate the dermoscopic features of diaper dermatoses in children and present their salient dermoscopic findings. This shall aid in the correct diagnosis and prompt treatment of these conditions.

Materials and Methods

A descriptive single-center cross-sectional clinical study was conducted in the department of dermatology, venerology, and leprosy of a tertiary care hospital. The study was approved by the Institutional Ethics Committee. With written informed consent from the parents, 100 patients below five years of age with skin lesions in the diaper area were enrolled in the study. Convenience sampling was used to arrive at the sample size. Clinical and demographic data were noted. The lesions were initially observed clinically, followed by dermoscopic examination using Dermlite 4 (3GEN Inc., San Juan Capistrano, CA, USA). Findings were correlated with the clinical features of that particular condition. The dermoscopic images were taken in polarized mode and captured using a high-resolution mobile camera phone attached to the dermoscope (iPhone 11 Pro).

Results and Discussion

Of the 100 patients in the study, 60 were males. The age of the patients ranged from 3 months to 5 years. Diaper usage was noted in 60 patients, with an average frequency of change of 3-4 diapers/day in the majority of these children (n = 36).

The duration of symptoms of diaper dermatoses ranged from 2 days to more than a year, with the majority of the children (n = 56) having a symptom duration of 2–3 weeks.

The most commonly affected anatomical sites were the groin and the buttocks, followed by the labia majora in females and the scrotum in males. In addition to the diaper area, non-diaper area involvement was observed in 54 patients. The most common non-diaper site involved was the abdomen, followed by the trunk.

The disease distribution of diaper dermatoses is described in Table 1. Infectious dermatoses were seen in 46 cases, predominantly comprising scabies and tinea cruris, followed by molluscum contagiosum, intertrigo, and varicella. Of the non-infectious dermatoses, contact dermatitis and vitiligo were the most common.

Table 1: Distribution of conditions in patients with diaper dermatoses (*n*=100)

Condition	Number of patients (%)
Infectious	
Scabies	18 (18)
Tinea cruris	13 (13)
Intertrigo	11 (11)
Molluscum contagiosum	3 (3)
Varicella	1 (1)
Non Infectious	
Contact dermatitis	15 (15)
Vitiligo	9 (9)
Infantile seborrheic dermatitis	8 (8)
Lichen planus	6 (6)
Lichen sclerosus et atrophicus	6 (6)
Psoriasis	4 (4)
Ichthyosis	2 (2)
Nevus depigmentosus	2 (2)
Lichen nitidus	2 (2)

The prominent dermoscopy findings of the various conditions are described below and summarized in Table 2.

Infectious conditions

Scabies

A total of 18 cases of scabies were observed. Clinically, erythema and papules were observed in all cases [Figure 1a].

Dermoscopy showed a jet wing with contrail in all the cases [Figure 1b], which consisted of a small dark brown triangular structure (corresponding to the anterior part of the mite) located at the end of a whitish linear trail that is typically curved or wavy (corresponding to the burrow). Compared to the standardized skin scraping method, dermoscopy is faster, more sensitive, and better tolerated by patients.^[5]

In a study by Walter *et al.*,^[6] the sensitivity of dermoscopy was 0.83, which was significantly higher than that of the adhesive tape method and skin scrapings. Hence, dermoscopy is a valuable tool for diagnosing scabies, especially in a resource-poor setting. Neglecting infected individuals can lead to the spread of infection to other siblings and family members with complications such as secondary infections.

Tinea cruris

Tinea cruris was observed in 13 children. All cases presented clinically with erosions and scaling [Figure 1c], with additional findings of erythematous plaques with annular borders (n=8) and pustules (n=2). The most common dermoscopy features were white scales (n=7), red-brown (n=7), and grey-brown dots and globules (n=4), pinkish hue, and brown clods [Figure 1d]. Our findings are similar to a study by Bhat *et al.*^[5] They

Table 2: Dermoscopic findings of the various conditions in the study	
Condition	Dermoscopy findings (number of cases)
Infectious	
Scabies (<i>n</i> =18)	Jet wing with contrail (18)
Tinea cruris (<i>n</i> =13)	White scales (7)
	Red-brown dots and globules (7)
	Grey-brown dots and globules (4)
Intertrigo (<i>n</i> =11)	Blurry linear vessels (9)
	Cottage cheese-like structures (11)
Molluscum contagiosum (<i>n</i> =3)	White dots and globules (3)
	Peripheral radial vessels (3)
Varicella (n=1)	Red-brown dots and globules and brown shadows (1)
Non-infectious	
Contact dermatitis (<i>n</i> =15)	Irregular-dotted vessels and white structureless areas (9)
	Irregular scaling (6)
	Regular-dotted vessels (6)
Vitiligo (n=9)	White structureless areas (9)
	Leukotrichia and white glow (9)
Nevus depigmentosus (<i>n</i> =2)	Reduced pigment network (2)
	Structureless white areas with pseudopod-like extensions. (2)
Seborrheic dermatitis (<i>n</i> =8)	Yellow background (8)
	Regular dotted and comma vessels (8)
	Structureless white areas (8)
Lichen planus (<i>n</i> =6)	Irregular-dotted vessels (4)
	Grey-brown dots and globules (4)
	Wickham striae (6)
Lichen nitidus (<i>n</i> =2)	Well-circumscribed circular white areas. Indistinct brown shadow (2)
Lichen sclerosus et atrophicus (<i>n</i> =6)	Irregular-dotted vessels and telangiectasia (3)
Psoriasis (<i>n</i> =4)	White scales with regular-dotted vessels (2)
	Dermoscopic Auspitz sign (2)
	Regular-dotted vessels (2) in flexural psoriasis
Ichthyosis (n=2)	Brown structureless areas (2)
	Thick bark-like scaling (2)

also saw morse code hair, which was not seen in our patients and could be attributed to the absence of genital hair in the pediatric population. Thus, dermoscopy can help diagnose fungal infections in the diaper area.

Intertrigo

Erythema was observed in all 11 cases of intertrigo [Figure 1e]. In addition, erosions and scaling were observed in 4 and 2 cases, respectively. Dermoscopy revealed a vascular pattern of blurry linear vessels in 9 cases and regular-dotted vessels in 2 cases. Furthermore, cottage cheese-like structures representing the yeast colonies were also observed on dermoscopy in all cases [Figure 1f]. Demonstrating yeast colonies on dermoscopy allowed us to establish the diagnosis of candidial intertrigo. Similar findings were observed by Kamat and Vinay^[7] and Lacarrubba *et al.*^[8]

Molluscum contagiosum

We identified 3 cases of genital molluscum contagiosum, all presenting clinically with dome-shaped umbilicated papules. Dermoscopy revealed a white background color, with a white discoid area (roundish structure), peripheral radial crown of vessels, white dots and globules, and structureless areas. These findings correspond histopathologically to endophytic epidermal hyperplasia, intracytoplasmic inclusion bodies, and compressed dermis presenting as fine septae. ^[9] These findings are similar to a study done by Ianhez *et al.* ^[10] While the clinical differentials of umbilicated papules in the diaper area include genital warts, Fordyce spots, and syringomas, the presence of peripheral radial crown of vessels clinches the diagnosis of molluscum contagiosum.

Varicella

A single case of varicella was seen in a preterm infant with protein-energy malnutrition. The child presented with generalized papules and vesicles involving the penis, as well as bilateral thighs. The clinical examination was non-diagnostic. On dermoscopy, yellow background color with red-brown dots and globules and brown structureless

areas were seen. These findings suggest early stages of varicella, as also described previously.^[11] Dermoscopy also helped rule out insect bite, other infectious conditions like molloscum contagiosum and other bullous disorders, which may have similar clinical findings but have distinct features on dermoscopy. Early stages of varicella may not present with the characteristic dew drop on rose petal appearance, leading to a diagnostic dilemma and delaying patient isolation and treatment. Dermoscopy can prove valuable in the prompt diagnosis of such equivocal vesiculobullous disorders.^[12]

Non-infectious conditions

Contact dermatitis

Fifteen children with contact dermatitis were seen in the study. Clinically, erythema and scaling were seen in all cases, whereas plaques were also seen in 4 cases. Dermoscopy revealed irregular-dotted vessels with white structureless areas in 9 cases and regular-dotted vessels with irregular



Figure 1: Infectious dermatoses Scabies (a, b) - (a): Erythema, erosions, and papules; (b): Jet wing with contrail (black arrow); Tinea Cruris (c, d) - (c): Erythematous plaques with mild scaling; (d): Brown clods with white scales and pinkish hue (black square); Intertrigo- (e, f) - (e): Erythema with scaling; (f): Erythema with cottage cheese-like structures (red arrow) representing the yeast colonies [b,d,f - Dermlite 4, polarized, 10x]

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scaling in 6 cases. While regular-dotted vessels are generally associated with flexural psoriasis, they can also be seen in cases of contact dermatitis.^[13] The presence of scales along with regular-dotted vessels helps in differentiating the two, as flexural psoriasis would not have the presence of scales.

Contact dermatitis, commonly referred to as diaper dermatitis, can account for almost 25% of dermatology visits to healthcare providers in the initial years of life.^[14] Contact dermatitis is generally of the irritant type, though allergic contact dermatitis to the rubber components, preservatives, adhesive materials, and fragrant substances in the diaper has also been described.

The role of dermoscopy in these cases is primarily to rule out less common conditions, including psoriasis, especially of the flexural type, and seborrheic dermatitis, which may be clinically very similar, leading to misdiagnosis and treatment delays. [1] Dermoscopy of these conditions has specific findings, as described in the relevant sections, and thus, assumes importance in accurate diagnosis.

Vitiligo and nevus depigmentosus (Pigmentary disorders)

Eleven patients presented clinically with depigmented macules/patches in the diaper area [Figure 2a and c]. On dermoscopy of 9 patients, an absent pigment network, white structureless areas with leukotrichia, and a white glow were observed [Figure 2b], suggesting the diagnosis of vitiligo.

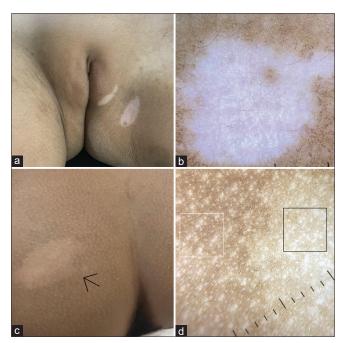


Figure 2: Pigmentary disorders. Vitiligo (a, b) - (a): Depigmented patches involving the vulva and medial thigh; (b): Dermoscopy shows an absent pigment network, white structureless areas, and a white glow, white clods, and vascular structures; Nevus Depigmentosus (c, d) (c): Depigmented patch involving the left buttock (black arrow); (d): Dermoscopy showing broken pigment pattern (black square) and areas of reticulate pigmentation and pseudopod-like extensions (white square) [b,d- Dermlite 4, polarized, 10x]

Dermoscopy of 2 patients showed white to yellow structureless areas with areas of reticulate pigmentation and pseudopod-like extensions of the central white structureless areas, clinching the diagnosis of nevus depigmentosus [Figure 2d].

Leukotrichia with a white glow is a specific dermoscopic feature of vitiligo, whereas pseudopod-like extensions are specific for nevus depigmentosus, as also reported in previous studies.^[15,16]

Thus, dermoscopy can help differentiate various pigmentary conditions which may be clinically indistinguishable.

Seborrheic dermatitis

Plaques with yellowish-greasy scales were seen in all eight cases. Dermoscopy findings of yellow background with regular-dotted vessels, comma vessels, and structureless white areas were observed in all the cases. Similar findings were also reported by Errichetti and Stinco.^[17] The presence of comma vessels and yellowish greasy scales helps to differentiate seborrheic dermatitis from psoriasis and is specific to the condition.^[18]

Lichen planus

All 6 cases presented clinically with violaceous papules and plaques [Figure 3a]. On dermoscopy, violaceous

background color, irregular-dotted vessels, pigment pattern showing grey-brown dots and globules, and Wickham's striae were seen [Figure 3b and c]. Lichen planus though generally found in adults can also occur in infants as young as three weeks of age. Clinically, Wickham's striae, seen dermoscopically as polymorphic pearly whitish structures with arboriform fern-leaf projections, are diagnostic of lichen planus. However, the diagnosis of genital lichen planus poses a challenge, as Wickham striae may be inconspicuous. Dermoscopy allows the recognition of these characteristic Wickham striae in these equivocal cases.^[19]

Furthermore, cases of lichen planus may be more challenging to identify in dark-skinned patients; dermoscopy might help clinch the diagnosis in such patients.^[20]

Lichen nitidus

The two cases of lichen nitidus presented clinically with pinpoint skin-colored to white papular lesions [Figure 3d]. A yellow background color with well-circumscribed circular white areas and indistinct brown circles was observed on dermoscopy [Figure 3e and f]. Our findings are similar to those of Malakar *et al.*^[21]

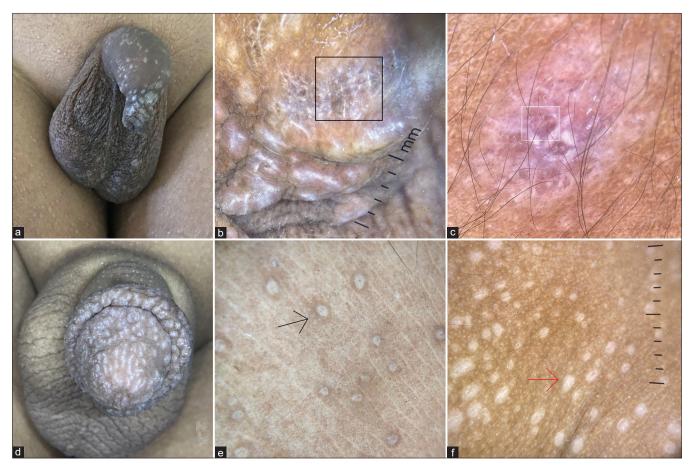


Figure 3: Lichen planus and nitidus. Lichen planus (a-c) - (a): Papules and plaques; (b): Grey-brown dots and globules, Wickham's striae (black square); (c): Another child with violaceous background with Wickham's striae (square); Lichen nitidus (d-f) - (d): Pinpoint skin-colored to white papules; (e): Circular white area surrounded by a brown circle (black arrow); (f): Yellow-brown background color with well-circumscribed circular white areas and indistinct brown shadows (red arrow) [b,c,e,f - Dermlite 4, polarized, 10x]

Clinical findings of lichen nitidus have a broad differential, including pearly penile papules, molluscum contagiosum, Fordyce spots, and lichen planus, especially when presenting as isolated genital lesions.

Dermoscopy reflects the histopathological findings, with the circular white areas representing epidermal acanthosis and focal parakeratosis, while the brown shadow inside the white circles represents the inflammatory infiltrate enveloped by acanthotic rete ridges. Hence, it may help diagnose such isolated genital lesions where histopathology is generally not feasible.

Psoriasis

Among the four children with psoriasis, two exhibited clinically observable white scales in the diaper area [Figure 4a]. On dermoscopy, white scales with regular-dotted vessels were noted [Figure 4b]; the vessels became more prominent on gentle removal of the scales without inducing bleeding, described as the "dermoscopic Auspitz sign." [22] These findings are similar to those observed by Lacarrubba *et al.* [8] Elucidation of this sign confirms the diagnosis while avoiding patient discomfort and pain by inducing bleeding in this sensitive area of the child's skin.

The other two children presented clinically with erythematous plaques in the diaper area in the absence of scales [Figure 4c]. On dermoscopy, regular-dotted vessels were noted [Figure 4d]. Clinically, genital psoriasis differs from lesions of psoriasis elsewhere due to a lack of scaling over the flexural aspects (inverse psoriasis); hence, isolated



Figure 4: Psoriasis (a): White scaly plaques on the buttock (black arrow); (b): Dermoscopy showing white scales with regular-dotted vessels representing the "dermoscopic Auspitz sign." (black square); (c): Erythematous plaques over labia majora and thighs; (d): Dermoscopy shows hemorrhagic dots (white square) and regular-dotted vessels (black square), consistent with inverse psoriasis [b,d - Dermlite 4, polarized, 10x]

genital lesions may be challenging to identify.

The characteristic vascular pattern observed on dermoscopy corresponds histopathologically with the elongated dilated capillaries in the papillary dermis, aiding the dermatologist in diagnosing genital psoriasis conclusively.

Lichen sclerosus et atrophicus

Six cases of lichen sclerosus et atrophicus were observed, clinically presenting as depigmented patches with erythema and erosions [Figure 5a]. Reduced pigment network with pink and white structureless areas, vascular network showing irregular-dotted vessels, and telangiectasia was seen in all cases [Figure 5b]. These correspond with the histopathological changes of dermal sclerosis and hyalinization. Detecting the aforementioned dermoscopic findings may help to differentiate lichen sclerosus et atrophicus from morphea and other similar dermatoses.^[17]

Ichthyosis

Two cases of lamellar ichthyosis involving the diaper area presented with scaling and xerosis [Figure 5c]. Other findings, such as eclabium and ectropion, were also observed in these children. During the detailed history taking, the mother gave a history of the baby being born in a membrane (collodion baby). Brown background color with thick irregular bark-like scaling [Figure 5d]. This was similar to the case reported by Zeng *et al.*^[23]

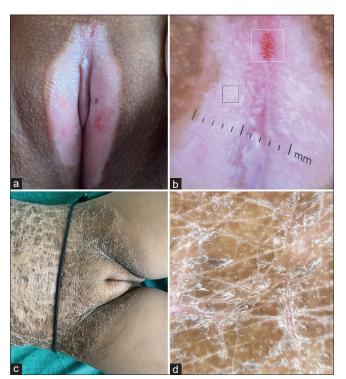


Figure 5: Lichen sclerosus et atrophicus and Ichthyosis. Lichen sclerosus et atrophicus (a, b) - (a): Depigmented patches, erythema, and erosions involving the labia; (b): Shiny white streaks (black square), and vascular network showing irregular-dotted vessels and telangiectasia (white square); Ichthyosis (c, d) (c): Scaling and xerosis involving the diaper area; (d): Brown background color with thick irregular bark-like scaling [b,d- Dermlite 4, polarized, 10x]

Limitations

This study has limitations as it is a single-center study with a limited sample size for each condition. In addition, histopathological confirmation could not be performed due to the pediatric patient population and the anatomical area of involvement. It is advisable to carry out multicentric studies with a larger sample size to validate the results.

Conclusion

Diaper dermatoses are common dermatological conditions in children under five years, often necessitating visits to a dermatologist. Arriving at a correct diagnosis is imperative for appropriate treatment, a better outcome, and alleviation of parental anxiety.

Lesions in the diaper area may often prove to be challenging to diagnose clinically. Dermoscopy of these conditions has been studied in adults and in extragenital sites, but there is lack of studies describing the same in the diaper area in the pediatric population. Specific dermoscopic features can help clinch the diagnosis in such cases, as demonstrated in our study.

Beyond its diagnostic utility, dermoscopy can be pivotal in circumventing the necessity for invasive procedures and mitigating the potential discomfort and distress experienced by pediatric subjects.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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