

THERAPEUTIC APPROACHES FOR DIAPER DERMATITIS IN INFANTS: AN INTEGRATIVE LITERATURE REVIEW**ABORDAGENS TERAPÊUTICAS PARA DERMATITE POR FRALDAS EM LACTENTES: UMA REVISÃO INTEGRATIVA DA LITERATURA****ENFOQUES TERAPÉUTICOS PARA LA DERMATITIS DEL PAÑAL EN LACTANTES: UNA REVISIÓN INTEGRADORA DE LA LITERATURA**

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ABSTRACT

Objectives: To identify the most commonly used and effective treatments for diaper rash in children aged 0 to 2 years, highlighting protocols for protecting and caring for the skin barrier. **Method:** An integrative literature review was carried out in six stages, according to Mendes et al. (2008), including study selection and synthesis of results. The search, conducted between September and December 2023 in the MEDLINE/Pubmed, CINAHL, SCOPUS, and Web of Science databases, used descriptors such as “Diaper Rash” and “Therapeutics”. Primary studies with different designs, narrative reviews, and a practical guide in Portuguese, English, or Spanish that addressed children aged 0 to 2 years with diaper rash were included. **Results:** Of the 169 studies identified, 22 met the inclusion criteria. Skin barriers (zinc oxide, petrolatum), topical corticosteroids, and preventive practices such as adequate hygiene and friction reduction were the most effective treatments. Breast milk demonstrated high efficacy in healing. However, the indiscriminate use of corticosteroids has led to adverse effects, and gaps in randomized studies persist. **Conclusion:** Diaper rash is multifactorial and preventable. Standardized protocols focused on effective and low-cost therapies are essential to improve clinical practice, promote skin barrier recovery, and prevent complications.

Keywords: Diaper Rash; Infant; Wound Healing.

RESUMEN

Objetivos: Identificar los tratamientos más utilizados y efectivos para la dermatitis del pañal en niños de 0 a 2 años, destacando los protocolos para proteger y cuidar la barrera cutánea. **Método:** Se realizó una revisión integradora de la literatura en seis etapas, según Mendes et al. (2008), incluyendo selección de estudios y síntesis de resultados. La búsqueda, realizada entre septiembre y diciembre de 2023 en las bases de datos MEDLINE/Pubmed, CINAHL, SCOPUS y Web of Science, utilizó descriptores como “Diaper Rash” y “Therapeutics”. Se incluyeron estudios primarios con diferentes diseños, revisiones narrativas y una guía práctica, en portugués, inglés o español, que abordaran niños de 0 a 2 años con dermatitis del pañal. **Resultados:** De los 169 estudios identificados, 22 cumplieron los criterios de inclusión. Las barreras cutáneas (óxido de zinc, vaselina), los corticosteroides tópicos y las prácticas preventivas como la higiene adecuada y la reducción de la fricción fueron los tratamientos más eficaces. Se ha demostrado que la leche materna es muy eficaz en la curación. Sin embargo, el uso indiscriminado de corticosteroides ha generado efectos adversos y persisten lagunas en los estudios aleatorizados. **Conclusión:** La dermatitis del pañal es multifactorial y prevenible. Los protocolos estandarizados, centrados en terapias efectivas y de bajo costo, son esenciales para mejorar la práctica clínica, promover la recuperación de la barrera cutánea y evitar complicaciones.

Palabras clave: Dermatitis del Pañal; Lactante; Cicatrización de Heridas.

INTRODUCTION

Diaper dermatitis is one of the most common dermatologic conditions in infancy. It can cause considerable discomfort and may predispose infants to secondary infections, although irritant contact dermatitis is the most frequent underlying form, as noted by Ravanfar et al.¹ Nourbakhsh et al.² further reported that peak incidence occurs between 6 and 12 months of age.

According to Ward et al.³, diaper dermatitis accounts for more than one million medical visits each year in the United States. Benitez Ojeda and Mendez⁴ reported that, when the diagnosis is accurate and appropriate management is instituted promptly, the prognosis is excellent and the condition is generally mild and self-limiting. In a cross-sectional study of 1,153 participants using structured questionnaires, Sukhneewat et al.⁵ found a prevalence of 36.1%, which decreased significantly with age. Risk factors significantly associated with diaper dermatitis in both univariate and multivariate analyses included changing diapers fewer than three times during the night, a history of previous episodes of diaper rash, use of cloth diapers, and topical application of talcum powder to the diaper area.

Fernandes et al.⁶ observed that diaper use increases local temperature and moisture, making the skin more susceptible to irritation from prolonged contact with urine and feces and resulting in skin maceration. Secondary infection may also occur, particularly with *Candida albicans* or bacteria such as *Bacillus faecalis*,

Proteus, *Pseudomonas*, *Staphylococcus*, and *Streptococcus*.

According to Tüzün et al.⁷, friction is an important contributor to diaper dermatitis, although it is not the sole factor. Increased hydration within the diaper area weakens epidermal barrier function, produces a more fragile skin surface, increases susceptibility to microorganisms, and amplifies the effects of irritants present in urine and feces.

Hertiš Petek et al.⁸ suggested that interleukin-1 alpha (IL-1 α) is one of the main drivers of inflammation in diaper dermatitis, as infants with diaper rash and erythema show significantly higher IL-1 α levels than healthy infants.

In line with Hertiš Petek et al.⁸, preservation of the skin acid mantle is important because it creates an environment that is unfavorable to colonization by pathogenic microorganisms. An acidic skin pH of approximately 4.0-4.5 helps maintain resident bacterial flora on the skin and thereby contributes to its protective function. By contrast, an alkaline pH of approximately 8.0-9.0 promotes disruption of the cutaneous environment. Ammonia-induced alkalinization also activates fecal enzymes such as lipase and trypsin, leading to irritation and breakdown of the skin barrier.

According to Fernandes et al.⁶, primary irritant diaper dermatitis is the most prevalent form. It is characterized by confluent, shiny erythematous lesions whose intensity may vary over time. Erythematous papules may be

accompanied by edema and mild scaling and typically affect areas with the greatest diaper contact, producing the characteristic “W-shaped” distribution. The convex surfaces of the buttocks and thighs, lower abdomen, pubic region, labia majora, and scrotum are most commonly affected, while the skin folds are usually spared.

Hebert⁹ noted that modern topical agents, including corticosteroids and antimicrobials, are widely used to treat diaper dermatitis because of their potent and rapid effects. However, inappropriate, excessive, or prolonged use may cause adverse effects such as skin atrophy, pigmentary changes, hypothalamic-pituitary-adrenal axis suppression, and bacterial resistance, thereby undermining the potential benefits of treatment.

Based on this background, the research question was: What evidence has been reported in the literature regarding the most commonly used and effective treatments for diaper dermatitis in children aged 0-2 years?

OBJECTIVE

This study aimed to identify the most commonly used and effective treatments for diaper dermatitis in children aged 0-2 years and to describe their application protocols in relation to protection and care of the skin barrier.

METHODS

Study design and period

This integrative literature review followed the framework described by Mendes et al.¹⁰, which comprises six stages: (1)

identification of the topic and formulation of the hypothesis or research question; (2) establishment of inclusion and exclusion criteria and literature searching; (3) definition of the information to be extracted from the selected studies; (4) appraisal of the included studies; (5) interpretation of the results; and (6) synthesis of knowledge.

Search strategy

The search was guided by the question: “What evidence has been reported in the literature regarding the most commonly used and effective treatments for diaper dermatitis in children aged 0-2 years?” The question was structured according to the PICO mnemonic described by Munn et al.¹¹, representing Population, Interest, and Context: P - children aged 0-2 years; I - effectiveness of the most commonly used treatments for diaper dermatitis; and Co - application protocols.

The searches were conducted from September to December 2023 in MEDLINE/PubMed, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Scopus, and Web of Science. English-language descriptors were combined using advanced search forms adapted to the specifications of each database and the Boolean operators AND and OR.

Inclusion criteria

Eligible studies were published in English, Spanish, or Portuguese, available in full text, and without restriction on publication date. Primary studies of different designs, narrative

reviews, and practical guidance were included provided that they addressed children aged 0-2 years with diaper dermatitis and described preventive, management, or treatment measures.

Exclusion criteria

Incomplete articles, letters, interviews, duplicates, studies involving other age groups, studies that did not address diaper dermatitis in children or that focused on other types of

dermatitis, systematic or integrative reviews, and editorials were excluded.

RESULTS

Literature search

A literature search was conducted in MEDLINE/PubMed, CINAHL, Scopus, and Web of Science (Table 1). The search strategy was based on the terms ((“Diaper Rash”) AND (Therapeutics)) AND (Newborn).

Table 1 - Summary of the search process

Database	Search terms	Records identified	Records selected	Final sample
		N	N	N
Pubmed/Medline	Diaper Rash AND Therapeutics AND Newborn	102	32	17
Cinahl		31	12	2
Scopus		36	5	3
Web of Science		0	0	0
Total		169	49	22

Source: Research data.

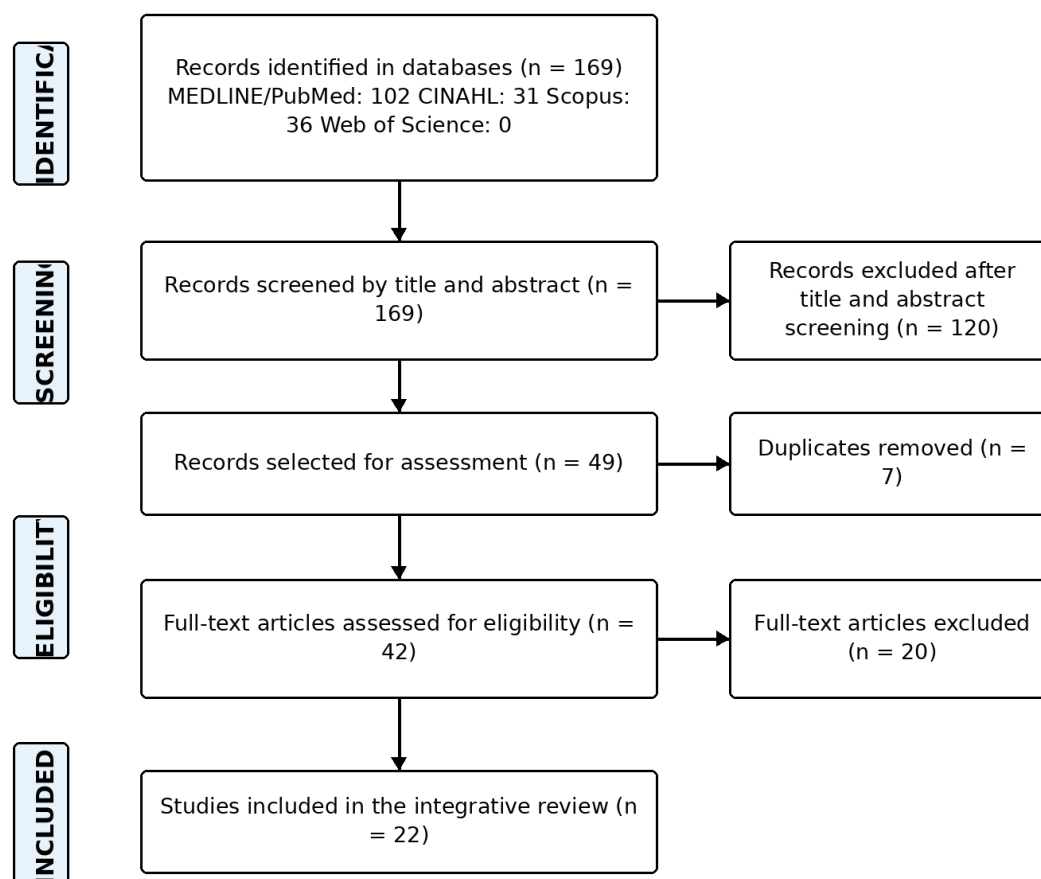
A total of 169 potentially eligible records were identified: 102 in MEDLINE/PubMed, 31 in CINAHL, 36 in Scopus, and none in Web of Science. Titles and abstracts were screened according to the inclusion criteria described above. Records addressing topics outside the scope of the review, articles unavailable in full text through the CAPES Journal Portal, and records meeting explicit exclusion criteria were

excluded at this stage. Forty-nine studies were selected for further assessment; seven duplicates were removed, leaving 42 articles for full-text review. After full-text assessment and application of the eligibility criteria, 20 studies were excluded and 22 comprised the final sample. During a subsequent check of the original search, the same strategy retrieved one Web of Science record published in 2024.

Because this record was not available during the predefined search period, which ended in December 2023, it was neither counted nor

included in the sample. The study selection process is shown in Figure 1.

Figure 1 - Flow diagram of the study selection process, adapted from PRISMA.



Source: Research data.

Characteristics of the included studies

The final sample consisted of 22 articles, all published in English between 1999 and 2021. Table 2 presents only the 22 studies that met the inclusion criteria and comprised the final sample.

The 20 full-text articles that did not meet the eligibility criteria were excluded and therefore are not shown in the table.

Table 2 - Distribution of studies addressing the most commonly used treatments for diaper dermatitis in children aged 0-2 years, according to study identification, year of publication, study design, objective, and database.

	Study identification (title and authors)	Year of publication	Study design	Objective	Database
1.	A Survey of Skin Care Practices for Premature Low Birth Weight Infants Munson et al. ¹²	1999	Descriptive study	To provide baseline information on current skin-care practices for premature very-low-birth-weight infants (<1,000 g at birth) in typical NICUs in the United States.	CINAHL
2.	A practical guide to preventing and treating nappy rash Price ¹³	2020	Practical guide	To explore the advice midwives can provide to parents to support informed choices regarding the prevention and treatment of diaper rash.	CINAHL
3.	Microbiological Aspects of Diaper Dermatitis Ferrazzini et al. ¹⁴	2003	Observational study	To investigate the relevance of <i>Candida</i> spp. and <i>Staphylococcus aureus</i> in diaper dermatitis and determine the correlation with the extent of colonization.	SCOPUS
4.	Diagnosis and Management of Diaper Dermatitis Shin ¹⁵	2014	Narrative review	To provide a comprehensive overview of the diagnosis, etiology, risk factors, and treatment of diaper dermatitis.	SCOPUS

5.	Effect of Topical Application of the Cream Containing Magnesium 2% on Treatment of Diaper Dermatitis and Diaper Rash in Children A Clinical Trial Study Nourbakhsh et al. ²	2016	Double-blind clinical trial	To investigate the effect of a cream containing 2% magnesium on the treatment of diaper dermatitis and diaper rash in children.	SCOPUS
6.	Improving newborn skin health: Effects of diaper care regimens on skin pH and erythema Gustin et al. ¹⁶	2021	Randomized, crossover, blinded study	To determine the impact of Regimen A (a diaper with an emollient and apertures in the inner liner used with an acid-buffered, pH-balanced wipe) on diaper-area erythema severity over 2 weeks.	PUBMED
7.	Use of Potassium Hydroxide (KOH) Test Reduces Antifungal Medication Prescription for Suspected Monilial Diaper Dermatitis in the Neonatal Intensive Care Unit Campbell et al. ¹⁷	2019	Quality improvement project	To determine whether KOH testing in suspected monilial diaper dermatitis would improve diagnostic accuracy and reduce antifungal prescribing and exposure.	PUBMED

8.	Prevention and treatment of diaper dermatitis Blume-Peytavi and Kanti ¹⁸	2018	Narrative review	To address common caregiver questions about diaper dermatitis and discuss effective skin-care practices and measures to minimize contributing factors and thereby prevent and control the condition.	PUBMED
9.	Perianal Dermatitis, Its Incidence, and Patterns of Topical Therapies in a Level IV Neonatal Intensive Care Unit Malik et al. ¹⁹	2018	Retrospective cohort study	To define the incidence of perianal dermatitis and determine patterns of use and cost-effectiveness of diaper-area products among neonates admitted to a level IV NICU, including those diagnosed with neonatal abstinence syndrome.	PUBMED
10	Effects of moisturizing skincare on skin barrier function and the prevention of skin problems in 3-month-old infants: A randomized controlled trial Yonezawa et al. ²⁰	2018	Randomized clinical trial	To evaluate the effectiveness of moisturizing skin care in improving skin-barrier function and preventing skin problems in Asian infants.	PUBMED

11	Neonatal skin care: what should we do? A four-week follow-up randomized controlled trial at Zagazig University Hospitals Amer et al. ²¹	2017	Randomized clinical trial	To evaluate the effectiveness of neonatal skin care in promoting normal skin development, preserving optimal skin function, and preventing neonatal skin disorders that can lead to cutaneous infection.	PUBMED
12	A real-world evidence study evaluating a treatment for nappy rash Goldman and Lodhi ²²	2016	Open-label retrospective study	To evaluate the effectiveness of a treatment for diaper rash in a real-world clinical setting.	PUBMED
13	Diaper Dermatitis: A Review of 63 Children Ersoy-Evans et al. ²³	2016	Case series	To describe the demographic and clinical characteristics of infants with diaper dermatitis.	PUBMED
14	Diaper (napkin) dermatitis: A fold (intertriginous) dermatosis Tüzün et al. ⁷	2015	Narrative review	To provide a comprehensive overview of diaper dermatitis, including its etiology, pathogenesis, predisposing factors, clinical manifestations, and therapeutic approaches.	PUBMED

15	Diaper Dermatitis in Infants Admitted to Social Pediatrics Health Center: Role of Socio-demographic Factors and Infant Care Kayaoglu et al. ²⁴	2015	Cross-sectional study	To determine the occurrence of diaper dermatitis among infants attending a pediatric health center and its relationship with sociodemographic factors and infant-care practices.	PUBMED
16	An update on diaper dermatitis Klunk et al. ²⁵	2014	Narrative review	To provide an update on current knowledge of diaper dermatitis, including etiology, diagnosis, management, and prevention strategies.	PUBMED
17	Comparison of the effect of human milk and topical hydrocortisone 1% on diaper dermatitis Farahani et al. ²⁶	2013	Randomized clinical trial	The primary objective was to compare the effectiveness of human breast milk and 1% hydrocortisone ointment based on dermatitis severity scores after 7 days of treatment. The secondary objective was to compare severity scores at baseline and after 3 and 7 days.	PUBMED
18	Efficacy of petrolatum jelly for the prevention of diaper rash: A randomized clinical trial Alonso et al. ²⁷	2013	Randomized clinical trial	To evaluate the efficacy of petrolatum jelly in preventing diaper rash and assess the relationship between diaper-rash occurrence, selected treatments, and type of nutrition.	PUBMED

19	Diaper dermatitis care of newborns human breast milk or barrier cream Gozen et al. ²⁸	2014	Prospective, randomized controlled experimental study	To determine the effectiveness of human breast milk and barrier cream for skin care in NICU newborns during healing of diaper dermatitis.	PUBMED
20	Guaiazulene: A new treatment option for recalcitrant diaper dermatitis in NICU patients Gunes et al. ²⁹	2013	Clinical trial	To evaluate the effectiveness of topical guaiazulene ointment in high-risk neonates with recalcitrant diaper dermatitis.	PUBMED
21	Diaper dermatitis-frequency and contributory factors in hospital attending children Adalat et al. ³⁰	2007	Cross-sectional study	To determine the frequency of diaper dermatitis in hospital-based pediatric practice, reassess the importance of previously identified etiologic factors, and examine current treatment practices and their effectiveness.	PUBMED
22	Treatment of Incontinence-Associated Dermatitis (Diaper Rash) in a Neonatal Unit Ratliff and Dixon ³¹	2007	Clinical analysis	To explore the clinical challenges involved in selecting skin protectants for the treatment of incontinence-associated dermatitis (diaper rash) in a neonatal unit.	PUBMED

Source: Research data.

Study designs

Although systematic and integrative reviews were excluded, narrative reviews were retained because of their broad scope and absence of the methodological delimitations characteristic of other review types. Other included designs comprised clinical trials, cross-sectional studies, retrospective studies, case series, clinical analyses, descriptive studies, and a practical guide.

Across the included designs, the studies addressed skin and stratum corneum pathophysiology, sociodemographic factors, predisposing conditions and risk factors, preventive measures, therapeutic approaches, infant care practices, treatment-related costs, and variations in clinical management among infants admitted to neonatal intensive care units (NICUs).

DISCUSSION

The findings indicate that elevated pH may result from fecal urease, which breaks down urea when urine and feces mix. This process promotes irritation of the diaper-area skin, disrupts the resident flora, and increases susceptibility to infection by opportunistic microorganisms through pH imbalance.²⁵ This mechanism helps explain colonization by *Candida albicans*, *Staphylococcus aureus*, and *Streptococcus* spp.¹⁸

In the context of cutaneous immaturity and additional aggravating factors, preterm newborns have a substantially less developed skin barrier than term newborns. The presence of only a few layers of the stratum corneum limits

protective function and contributes to overhydration, skin maceration, and increased permeability of the lipid barrier.²⁷

Because prolonged exposure and alkaline pH promote microbial colonization and disruption of the protective barrier,¹⁸ excessive use of soaps should be avoided, and cleansing should be performed without friction.²⁷

In the cross-sectional study by Adalat, Wall, and Goodyear,³⁰ factors such as the type of skin-cleansing agent and frequency of cleansing, previously considered important etiologic factors, were not significantly associated with diaper dermatitis. Oral candidiasis, however, has been described as a relevant factor, and failure to identify it may contribute to recurrence of diaper dermatitis.^{15,30} The role of routine oral mucosal examination in infants with diaper dermatitis and the strength of this association therefore remain uncertain.

With regard to predisposing factors and therapeutic products, petrolatum was evaluated in the randomized clinical trial by Alonso et al.²⁷ Its use was not associated with a statistically demonstrable protective effect. Likewise, differences in the development of diaper dermatitis according to sex or gestational age were not demonstrated; therefore, these factors could not be associated with incidence in that study.²⁷

Conversely, antibiotic therapy was significantly associated with an increased risk of diaper dermatitis. The use of 50% oral glucose, which acts as an osmotic agent by drawing water into the intestinal lumen, may also produce more irritating stools because of a greater enzymatic

load. Stool frequency itself was also identified as a risk factor.²⁷

The included studies addressed risk factors as well as preventive and therapeutic measures. Phototherapy was also reported as a potentially protective factor.²⁷ This finding may appear counterintuitive because infants undergoing phototherapy may experience frequent episodes of diarrhea. One possible explanation is that, during phototherapy, the skin may remain less occluded and therefore less exposed to maceration. Further studies are needed to clarify this association and to evaluate treatment response in relation to hospitalization-related factors.

Among the interventions evaluated, human breast milk was reported as a highly effective treatment and was recommended for infants with clinical manifestations of diaper dermatitis.²⁶ In the randomized clinical trial by Farahani, Ghobadzadeh, and Yousefi,²⁶ no significant differences were observed in lesion size, inflammation, or severe erythema when the breast-milk intervention was compared with the topical comparator.

Evidence suggesting that human breast milk may be as effective as topical 1% hydrocortisone for healing diaper dermatitis²⁶ supports its potential use as a low-cost therapeutic option. Nevertheless, this approach is not equally available to all infants, particularly in the care of preterm newborns, and feasibility must therefore be considered when developing clinical protocols.

Given the need for well-defined therapeutic approaches, one study evaluated potassium

hydroxide (KOH) preparation testing to differentiate *C. albicans* and dermatophytes from other skin disorders.¹⁷ The findings highlighted persistent challenges in clinical assessment and diagnosis.

Following assessment and diagnosis, commonly used topical antifungal agents include nystatin, miconazole, and clotrimazole.¹⁷ Although diagnostic testing may help reduce unnecessary treatment and associated costs, accurate measurement and control of the amount of antifungal medication used and the treatment regimen remain difficult. This finding further supports the need for evidence-based protocols adapted to current hospital practice.

In routine practice, topical corticosteroids such as 0.5% or 2.5% hydrocortisone acetate may be applied to affected areas twice daily. However, topical corticosteroids should not be used for more than 2 weeks unless under dermatologic supervision.¹⁵ Occlusion and other characteristics of the diaper area can increase drug absorption and potency, and cases of Cushing syndrome have been reported in infants after excessive use of clobetasol, a class I superpotent topical corticosteroid.¹⁵

Because the appropriate use of these agents depends on the clinical presentation and comprehensive assessment, particularly when opportunistic infection is suspected, barrier preparations and their constituent components have also been investigated as preventive measures.

Among skin barrier products, zinc oxide and petrolatum are used both to prevent and to treat diaper dermatitis by forming a lipid film that

protects the skin surface and supports the stratum corneum.¹⁵ Skin preparation and protection should be considered at every diaper change, with particular attention to friction reduction and moisture management.

With respect to diaper changing and moisture control, friction becomes an aggravating factor when cleansing is excessive or when alcohol-containing products are used.¹⁵

The results show that several treatment options are available for diaper dermatitis, but studies comprehensively evaluating prevention and treatment remain limited. Indiscriminate corticosteroid use may lead to systemic absorption of potent steroids, which is enhanced in skin folds,¹⁸ and may contribute to growth suppression in infants.

Further evidence is therefore needed on low-cost therapies that are feasible for healthcare institutions and are not constrained by substantial product-related risks. For example, the effectiveness of topical vitamin A cannot be established because of the lack of randomized clinical trials.¹⁸ In addition, no evidence was identified regarding the use of low-level laser therapy for the treatment of diaper dermatitis.

Although prevention is emphasized in several studies, preventive practices are not yet consistently implemented. This finding suggests the need to standardize and implement institutional protocols that provide effective, feasible prevention and treatment strategies for nursing practice.

FINAL CONSIDERATIONS

Based on the evidence identified, diaper dermatitis is a common dermatologic condition with a multifactorial etiology involving the interaction of moisture, changes in pH, friction, prolonged contact with urine and feces, and potential colonization by opportunistic microorganisms. The findings reinforce that prevention should be an integral component of management, with particular attention to skin barrier protection, gentle cleansing without excessive friction, moisture control, and appropriate care during diaper changes.

Among the therapeutic approaches identified, barrier preparations-particularly formulations containing zinc oxide and petrolatum-were prominent, as were human breast milk, topical corticosteroids, and antifungal agents in selected clinical situations. Although several strategies have shown benefits, heterogeneity among the studies and the risks associated with indiscriminate use of certain medications, especially corticosteroids, underscore the need for individualized care and evidence-based protocols.

The findings of this review therefore support the importance of nursing practice in identifying risk factors, implementing prevention, monitoring skin integrity, and providing therapeutic measures appropriate to the infant's clinical condition. Standardization of institutional practices may contribute to safer, more accessible, and more consistent care. However, important gaps remain in the literature, particularly the limited availability of randomized clinical trials that comprehensively evaluate intervention effectiveness, safety, time

to response, and cost. Further studies are needed to strengthen evidence-based decision-making in clinical practice.

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Conflict of interest statement

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Authorship criteria (author contributions)

Maryanna de Andrade Ferrari (Lead Author): Responsible for study conception, methodology, manuscript drafting, and critical review.

Weverson Ferrari Junior (Author): Contributed to data collection and analysis, as well as methodological review.

Tarcisio Vitor Augusto Lordani (Advisor): Responsible for supervision, critical review, and final editing of the manuscript.

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