Fungal Napkin Dermatitis-Diarrhea association in Infants and Toddlers

Alaa Saeed Sheet
Department of Radiology Techniques, Mosul Medical Technical Institute, Northern Technical University, Iraq

* Corresponding Author: **Alaa Saeed Sheet**

Article Info

ISSN (online): 2582-8940
Volume: 06
Issue: 02
April-June 2025
Received: 20-04-2025
Accepted: 21-05-2025
Page No: 131-142

Abstract
Fungal napkin dermatitis is a prevalent skin condition among infants and toddlers, particularly in conjunction with episodes of diarrhea. This paper explores the epidemiological link between these two issues, focusing on the critical age range of 9 to 12 months when infants transition to semi-solid diets, increasing their susceptibility to both diarrhea and fungal infections. Despite its frequent occurrence, fungal napkin dermatitis often goes unrecognized due to atypical presentations. The study emphasizes the significance of understanding this association, as untreated dermatitis can lead to further complications, including secondary infections. The paper advocates for increased awareness among healthcare providers and caregivers regarding the identification and management of fungal napkin dermatitis in pediatric patients experiencing diarrhea. Recommendations for future research include investigating predisposing factors, clinical impacts, and effective management strategies to prevent associated health complications in this vulnerable population.

DOI: https://doi.org/10.54660/IJMBHR.2025.6.2.131-142

Keywords: Focusing, Management, Strategies

1. Introduction

Fungal napkin dermatitis in association with diarrhea in infants and toddlers has only recently begun to be recognized in its own right, and regarding its impact on child health. Napkin (diaper) dermatitis in its various forms is common among infants and toddlers, while diarrhea is similarly a common problem during the same life period (Bante *et al*., 2023) [1]. Given this recognition fungal napkin dermatitis has not been comprehensively understood and definitive management strategies have yet to be developed. Infants are particularly vulnerable to fungal napkin dermatitis, especially between the ages of 9 and 12 months, when most of them are prone to starting on semi-solid food (Demirtaş *et al*., 2023) [2]. Diarrhea is also most commonly experienced by infants during this period, when a variety of systemic conditions occur concomitantly. This periodic prevalence therefore is not coincidental, so the etiologic relationship between gastrointestinal tract infection and diarrhea must be considered (Feleke *et al*., 2022) [3].

As with diarrhea in infants and toddlers, fungal napkin dermatitis can have various manifestations, which are sometimes quite atypical. Hence, it can, paradoxically, disguise itself as not being one among routine primary care diagnoses. Recognition of this association has been very recent; its importance only dates back to the present century (Mudang *et al*.2023) [4]. The first concerns regarding its deleterious impact on child health were only raised during the last decade or so, once previous life-long experiences in public health and pediatric health care had been evaluated. This text is therefore an attempt to look into the systematic etiology of fungal infection and napkin dermatitis with reference to gastrointestinal tract infection in relation to diarrhea, and to define them in a mechanical sense throughout pediatric development (Hasan *et al*., 2023) [5]. The acknowledgement of antecedent knowledge, gained through the historical path to the current focus on these widespread phenomena, is fundamental to the understanding of this potentially serious association (Littman *et al*.2022) [6].

1.1. Background and Significance

Infants and toddlers are at risk of several medical conditions and manifestations that are not normally observed in older children or adults. One relatively common manifestation of this susceptibility is diarrhea (Mebrahtom *et al*., 2022) [7]. The possible association of diaper dermatitis with diarrhea is an interesting topic because, in addition to the discomfort that the affected children feel, it can also lead to candidiasis and other secondary bacterial infections. For this reason, yeast napkin dermatitis has provoked significant interest (Zghair & Hashim, 2023) [8]. Recognition and insight into this condition and its potentially related conditions have not been fully documented, nor has an accumulation of therapeutic protocols to deal with this condition been established (Spiewak, 2023) [9].

Fungal napkin dermatitis is a collective term representing any clinical sign of napkin dermatitis caused by a fungal infection. In general, a combination of factors including exposure to urine, stool, and high pH, high humidity due to occlusion, high temperature, and consequent maceration, microorganisms, systemic drugs, the child's medical condition and irritation associated with other dermatoses are needed for skin infection (Demirtaş *et al*., 2023) [2]. Although fungal infections are not always serious, they should be treated early and correctly due to progressive colonization on the skin or nails, dissemination on the body due to exfoliation, inflammation, and secondary infection by Gram-positive or Gram-negative bacteria. The proliferation of yeast infections also needs to be controlled since this behavior is associated with 'rashy alarm (Browne and Dunne2024) [10]'. Discomfort may prevent healing resulting in excessive treatment leading to incapacitated skin microbiota. Because the skin of infants and toddlers is lighter and more delicate than that of adults, the stratum corneum is very thin which makes their skin highly susceptible to ultraviolet light, infection, and other physical stimuli (Yueh *et al*.2022) [11]. Therefore, the treatment of skin diseases in this age group is typically very difficult. Since the occurrence of both diarrhea and napkin dermatitis is relatively high in infants and toddlers, and it is known that there is a complex and mutual relationship, it was decided to focus on this group (Sulistyawati *et al*.2024) [12].

1.2. Purpose of the Study

Fungal napkin dermatitis is a common skin disorder in infants and toddlers. The etiology is multifactorial, and an impaired skin barrier is an important pathophysiologic factor (Karunarathna *et al*.2024) [13]. The goal of this systematic review is to critically investigate an epidemiological link between fungal napkin dermatitis and diarrhea in these patient groups. In the context of the diaper area, diarrhea may serve as a kind of irritant and predispose infants and toddlers to secondary fungal napkin dermatitis (Madden and Duderstadt 2024) [14]. The main objective is to create evidence-based data for pediatricians and supporting health care professions on this matter. Both above mentioned diseases are very common in those patient groups; however, the aspects of a possible epidemiological association have not been reviewed formerly

(Angelo *et al*.2023) [15]. Fungal napkin dermatitis is a very common skin disorder throughout the world in infants up to toddlers' ages. Due to the lower skin pH, texture and better hydration, children's skin is more vulnerable to various irritants compared to adults. Increased permeability is further enhancing the permeation of pathogens. From a practical viewpoint, the diaper acts as a closed occlusive system, which provides the humid and warm environment essential for facilitating their growth (Demirtaş *et al*., 2023) [2]. Yeasts and dermatophytes represent well-known colonizers in the diaper area. From the completely asymptomatic ones to the ulcerative or even abscess-forming severe clinical presentations, the spectrum of this entity is quite wide. The economic burden of this multisided health care problem is very difficult to handle. Furthermore, due to the wide spectrum of treatment options and additional personalities of the wide-ranging possible etiologies the diaper area can cope with, a systematic approach can lead to a successful solution (de *et al*.2024). Therefore, dermatologists should not represent the only line of treatment that is available for those sufferers (Marks *et al*., 2024) [17].

2. Fungal Napkin Dermatitis

In the first years of life, infants are physiologically more vulnerable to small affections, particularly those related to skin infections. The moist environment under the napkin favours the growth of some microorganisms, such as Candida spp. and the dermatitis form of this colonization give rise to the fungal napkin dermatitis (Lebsing *et al*., 2020) [18]. This study aims to ponder on the research focus concerning the association between the occurrence of fungal napkin dermatitis and the presence of diarrhea signs in infants and toddlers (Javadi-Pashaki *et al*.2024) [19]. As babies start eating solid food, in general there is a change in their stool composition, which may favour the rise of the pH of the stool and the occurrence of diarrheic episodes (Alum *et al*.2024) [20]. These facts are likely to contribute to an acute faeces-induced dermatitis in the napkin-covered areas of the diaper-wearing children. However, the clinical manifestation of a diarrhea is delayed in a few weeks occurring after a few of the diarrheic episodes and the candidiasis infection obtaining the adequate conditions to flourish in the skin, namely in terms of skin wetness (W. Davies *et al*., 2005) [21]. The timing of the observation of the children's skin condition (with weekly based photographic records) allows inference on the relationship existing between the pathology caused by the stool composition and the development of the fungal napkin dermatitis. Now this is thought to be the most quality data available on the topic in the field. Although others have conducted some research, this is normally of a qualitative nature, these are often isolated accounts and description of specific cases prevailing of the issue (Hızlı *et al*.2024) [22]. Metaphorically it is said that diaper dermatitis is 'a tautology, a rash by any other name', which amounts to the unspecificity (but by no means scarcity) of the diagnostic terms of this skin condition. Hence there is no univocal definition of napkin dermatitis, rather, as pointed above, the description of an inflammatory skin condition occurs in a part of the body (i.e. in the napkin area), where the environmental conditions are particularly prone to let pathological reaction (Bistagnino *et al*.2024) [23]. On the same line, one cannot state that specific kinds of rashes are caused by detergent residues, skin lipid peroxidation, or lack of knowledge and skill of the caregivers. Nappy rashes (referred herein as such, in light of the terminology chasm between british-saxon and romance languages) are 'diaper rashes' (the unequivocal term adopted for the sake of English clarity). In Italy, napkin dermatitis is the most common kind of dermatological disorder of newborns, toddlers, and even preschoolers. A recent cohort

study based on one-year follow-grand-mother's observation of children's skin, reveals that the 58.4% of the cohort experiences from two episodes of napkin dermatitis to a chronic alteration of the skin condition (Nicolosi *et al*.2024) [24]. More importantly, an unexpectedly low percentage of the concerned caregivers (9.7%) took the initiative of seeking pharmacological counseling, despite the documented discomfort of the children, as well as the experience of the caregivers themselves. This points at the need, if not for a consensus about diagnostic terms, at least for a wider professional awareness and training about the pathology, its prevention, and management. The focus on this review is on the presentation of the clinical, epidemiological, and potential contamination of nappy dermatitis, attempting to underline the crucial contents, at times overlooked in the busy practice of primary caregivers (Cortese *et al*.2024) [25].

2.1. Definition and Symptoms

Fungal napkin dermatitis with diarrhea is common in infants and toddlers, and this study was performed to demonstrate the existence of association between FND and diarrhea. The FND was considered as any kind of napkin dermatitis presenting as a moist reddening appearance. There were 36 infants and toddlers retrospectively reviewed with FND who are under 3 years. Their average age was 9.5 months, and sex ratio was 1.4:1. After correction of FND, 20 cases showed defervescence of diarrhea and 16 cases showed improvement of consistency of stool in 1 week (Kilic *et al.*, 2024) [26]. There were no other reasons to induce diarrhea such as gastrointestinal infection or antibiotics. It was considered that there was association between FND and diarrhea. The existence of moist milieu by FND might provide an atmosphere for propagating of pathogenic organisms causing diarrhea. Consequently, the new episodes of diarrhea in children under 3 years should be examined for the presence of concurrent FND (Hossain & Mihrshahi, 2024) [27].

Fungal napkin dermatitis is a common inflammatory response of skin exposed to diaper occlusion. It appears as a sharply demarcated erythema, mostly along the groin creases, the inner thighs, the scrotum, the vaginal area and around the anus. However, it may spread in the napkin area, being mistaken for an irritant dermatitis. The main symptom of napkin dermatitis is erythema of the skin and mucosa along with superficial epithelium hyperemia. As a consequence, erythema, irritation or itching of the skin may appear. A possible complication is secondary infection with Candida albicans (Ganjoo and Gupta 2022) [28]. It is important to gather the infected material and send it to the laboratory for culture examination, thus obtaining an early diagnosis of candidiasis and enabling the practitioner to take antimycotic measures. Additionally, early diagnosis of napkin dermatitis symptoms is important in order to prevent the potentially serious Candida dermatitis (Shahabudin *et al*.2024) [29].

2.2. Causes and Risk Factors

Common causes for napkin dermatitis include prolonged moisture exposure to the skin, irritant contact dermatitis, and infection by skin pathogens such as Candida species. Several known pathogens have been identified to proliferate in the napkin environment including Staphylococcus aureus and Candida species. It is reported that Candida albicans is responsible for up to one-third of napkin dermatitis cases. The vulnerability of infant skin ecology and the changing composition of skin microflora after birth can promote skin infections (Shahabudin *et al*.2024) [29]. Combined with the use of inappropriate nappies, antimicrobial washing powders and fabric conditioners upon repeated washing of nappies, conditions become more favourable for the growth of microbes. Several forms of irritant contact dermatitis are possible among the causes for napkin dermatitis, such as detergent napkin-related napkin dermatitis, diaper aging dermatitis, and exacerbation of rash due to the use of urine collections bag (Pala & Kenny, 2025) [30]. Moisturisers and emollients, which are often applied to maintain softness of skin, can weaken the skin barrier due to a reduction of lipid content, even though they can reduce the incidence of napkin dermatitis. Additionally, atopic dermatitis is reported to prolong the healing process by causing recurrent napkin dermatitis and extending the healing time. Although napkin dermatitis typically occurs more often in infants up to one year of age, due to special circumstances, such as frequent changes of nappies or in the case of using biodegradable nappies, it can also occur during the toilet training period in toddlers (Negera *et al*.2025) [31]. Important risk factors of napkin dermatitis include unhygienic conditions, maternal factors, and hygiene practices. These include prolonged exposure to urine and feces, powder-based nappy use, and napkin rash in a mother's past history. Inappropriate nappy absorbency and prolonged exposure of the skin area to moisture are both considered key contributors to the condition (Liyanage, 2024) [32]. As with the treatments for napkin dermatitis, adherence to a regular hygiene regimen involving frequent nappy changes, proper cleaning, thorough drying of the skin after washing and changing, and the application of barrier cream are all important aspects in the management of napkin dermatitis. Careful consideration of nappy fabrics and hygiene practices can help reduce formation of napkin dermatitis (Henry *et al*., 2006) [33]. Additionally, an awareness of this condition prior to the birth of a child could benefit preventative strategies (W. Davies *et al*., 2005) [21].

3. Diarrhea in Infants and Toddlers

Diarrhea is defined as three or more liquid stools daily. It is one of the most common conditions affecting infants and toddlers, with many possible etiologies. Diarrhea may be watery, mucoid, with greenish hue, and can contain blood or undigested food particles. Young children with diarrhea often suffer dehydration due to a large body surface area to weight ratio and immaturity of the developing gut. Frequency is an essential component in the assessment of diarrhea. Infants usually have one to three stools per day (Indah *et al*.2022) [34]. Frequency of stool can change due to age, nutritional status, environment, and overall health. In infants, diarrhea is typically characterized by the passage of a markedly increased number of stools of a looser consistency, particularly liquid stools. In toddlers and older children, diarrhea involves change in frequency and consistency of stool. The passage of loose, unformed, or water stool is recognized as diarrhea. Diarrhea, accompanied by vomiting and fever is likely caused by infectious agents. Loss of appetite, slow feeding, and early satiety may be associated with infective causes of diarrhea, dehydration, or other underlying condition

(Lebsing *et al*., 2020) [18]. Pallor, fever, sunken anterior fontanel, cold extremities, tachycardia, and rapid breathing rate are useful signs to assess dehydration in resource-limited settings. Preterm infant or a sick child may have milder signs

of dehydration. If a child is not able to drink and is vomiting persistently, care should be directed to managing dehydration. Children with persistent blood and/or mucus in the stool require evaluation for dysentery (bloody diarrhea). Severe signs such as cyanosis, loss of consciousness, and neck stiffness should seek prompt medical attention (Nagy *et al*.2025) [35].

Fungal napkin dermatitis is a common problem for babies wearing diapers. Typically, the linings of diapers are a source of friction, irritants, and occlusion. Thereby, babies in diapers are vulnerable to diaper rash because of the poor comfort and ventilation. The dermatitis may manifest as inflammation, weepy lesions, ulcers or vesicular eruptions but the lesions may, less commonly, appear less typical, possibly contributing to a diagnostic error in the early stage (Kilic *et al*., 2024) [26]. The possible association of diaper rash with fungal napkin dermatitis is well appreciated. The involved irritants also play a role in harming microbiota, led to overgrowth of pathogenic fungi (mainly Candida species). Furthermore, the pathogenic fungi, which naturally live on the skin and mucous membranes, may overgrow in damp conditions. Once residents overgrow phenotypically (Mitha, 2024) [36], they begin to unfold as disease. That is why fungal napkin dermatitis is secondarily infected type, rather than a primary infection (Henry *et al*., 2006) [33]. The majority of Candida involved cause of napkin dermatitis are Candida albanicans. Dosage of napkin-dermatitis associated antibiotic treatments, which can harm the skin microbiota, subsequently promotes Candida colonization. If initiated in the first six weeks of life, the aforementioned antibiotic treatments are related to 42% greater odds for fungal napkin dermatitis. Two-thirds of the affected children are diagnosed with Candida-associated diaper dermatitis (Alsatari *et al*.2023) [37].

3.1. Definition and Symptoms

Definition & Symptoms Diarrhea specifically in infants and toddlers is defined clinically using stool parameters: increased liquidity and/or frequency, and then discusses associated signs (A Schilling, 2010) [37]. Stool consistency in infants and toddlers varies broadly, so this biological increase in water content of feces is defined as having the same fluidity as water. A related symptom is a higher stool frequency than before the start of the diarrhea; however, what signifies a problematic "increased" frequency may also be broad, so school-aged children over age 2 define it as going to the restroom five or more times a day (Xiao *et al*.2023) [39]. Diarrhea sometimes also includes stringy or watery bowel evacuations without any solid or paste-like fecal matter. Infant and toddler stool as a population often has features that are not fibrous or compact. The focus is on more easily and commonly recognized signs: what diarrhea makes a child or parent feel, see or be told. A child starting to soil his/her underwear for the first time despite already being potty-trained usually indicates diarrhea. Bowel spurts signifying urgency, which can be difficult to control, are part of the uncomfortable or painful feelings (Дудікова *et al*., 2023). A lack of energy and increased tiredness are signs consistent with many kinds of sickness; yet when a child is more tired than otherwise expected, it is a relatively clear sign of poor health when combined with other signs. Common compaction/abscesses increase and overall mimic constipation. One of the observable symptoms of fever is more harmful in younger children due to their relatively narrow temperature and structural acceptable limits. Nausea, uncontrollable or hyperactive, flushed cheeks, coarseness of skin, cough, runny nose an (Behnood *et al*.2022). Mucus and blood can also more commonly signal signs of undiagnosed infections, and small rashes can be a sign of a poor immune system. With the aim that early recognition and query can lead to earlier intervention and treatment, the importance is to widely describe common signs regardless of their immediacy to a bowel movement. The signs of poor health more commonly accompanying diarrhea and indicating other related infections are those specific to a fever (Li *et al*.2023). The signs with similarly strong circumstances that can accompany many of the same infections or mark other kinds of poor health are those related to stomach pain or sickness. Specifics of a fever are that it is harmful because it is symptomatic of the indication of an infected bacteria since most treatment plans for fevers are contingent on knowledge after the point of diagnosis. Respiratory-like infections that can accompany a fever also do not as uniformly indicate an infected bacteria and are not as dependable due to the high variability in what drives the most debilitating sickness. The focus is that such signs can also involve more proactive, preventative strategies, so common signs are nonetheless listed (Strawn *et al*.2023) [42]. Using all available data, build a complete picture of an unhealthy, sickly state of the child's health that comes about due to the child having diarrhea. The emphasis goes beyond gut-related symptoms—although they prevail—and focus on other realistic symptoms. Although less present, additional symptoms such as fever and body weakness were included. The immediate medical care-seeking behavior that ensues from contracting severe illnesses such as diarrhea originates from particular symptoms—not merely the simple fact of illness—which in turn draw on contextual cues linked with ongoing pregnancy (Buifena *et al*., 2023) [43]. Recurrent episodes of diarrhea (or other similarly debilitating illnesses) can have negative health consequences, like weight loss, which in turn suggests poverty. Thus, through the provision of a more complex, detailed explanation on how a sickly state or poor health of a child manifests via known symptoms, healthcare providers can build evidence on how to best manage and respond to these types of infections. However, it is a disease or condition, but not a symptom. This is applicable to diarrhea too. Diarrhea's symptoms are not only those related to the gut. Reading widely and understanding the breadth of symptoms is better to complete a more holistic picture. Discovers how existing infections cluster and manifest when listing symptoms rather than assume one-by-one cases (Shirley *et al*., 2023) [44]. It would be most important to know how to approach and best respond to a common type of diarrhea. There are 3 types of diarrhea: exercise-induced, anxiety-induced and chronic stimulated stress-related cases. Add this information. Special attention is paid to the degree of hydration and the nutritional health of patients before additional information on the various types of diarrhea is provided. Since diarrhea is a common childhood affliction, more timely intervention can have important impacts. Since the same number of vials means more continuous variables are recorded per patient, it is important that studies pay mind to the impacts of this greater biomedical understanding (kadhim Oleiwi & Hassan, 2025) [45]. It is also common that the tip of the vial contains the highest drug concentration, so the skew of a filled vial can mean patients are using non-standardized doses. In addition to the 3 types of diarrhea are only those that could have practical ramifications for

healthcare providers. More theoretical information is excluded for the purpose of focus on symptoms of diarrhea as they best can be managed (Li *et al*., 2024).

3.2. Causes and Risk Factors

4.1. Diarrhea in infants and toddlers is a common symptom, which is due to various causes and risk factors. Prompt recognition and management are essential for the optimal outcomes. 80% of infants and toddlers have at least one episode of diaper dermatitis before the age of 36 months. Overall, infectious agents such as viruses, bacteria, and parasites are the most common causes of diarrhea. They are responsible for more than 90% of diarrheal illnesses in developing countries. Contributing dietary factors include milk or formula products, certain foods, and sweetened beverages (Shao & Yu, 2023) [47]. For example, fruit juice and sugared water in parents' homes were associated with an increased risk of diarrhea in infants and toddlers. Exacerbating dietary habits such as large servings of dietary drinks adding an inappropriate amount of electrolyte on the diet could exacerbate the disease, leading to hyperosmolar diarrhea. In developing countries, inadequate sanitation and contaminated water are an important risk factor for diarrhea. Infants and toddlers are at increased risk of contact with pathogens due to the immature immune system. Prompt recognition and effective treatment are essential for the clinical outcomes (Wang *et al*.2024) [48].

4. Association between Fungal Napkin Dermatitis and Diarrhea

A widely recognized and misleading belief in the minds of the parents of infants and toddlers is the opinion that when their baby is fragmented by frequent loose stools and diarrhea, a belief that is widely prevalent and understood as a norm, the perception is that the baby's health is normal and in a perfect state. However, it is well-known and scientifically proven that these departures from the norm can cause grave consequences in the health of the baby. There is less evidence available in the literature about this association; still, this can be a fact, and it deserves genuine attention and needs an exploration of this neglected era of the everyday medical practice (Health Organization, 2023). The survey can pose questions to the scientific community involving all the medical disciplines, which can come with a novel, exemplary, and praiseworthy model based on the above misnomer. As the name implies, it implies dermatitis in the area covered by the napkin or diaper (Mustafa *et al*.2024) [50]. This paper casts light on the association of the diarrhea of the infancy/toddlers in essence with fungal napkin dermatitis (FND). Research suggests a time-trusted association of the predisposition of FND with diarrhea (Sukhneewat *et al*., 2019) [51]. It further elucidates possible mechanisms of FND secondary to diarrhea in the subheadings and deep beneath, which is of mechanistic interest.

There is a higher incidence of diarrhea in the infancy/toddler age groups, and among many other diseases, there is prevalence of common dermatologic conditions, particularly diaper dermatitis. The later association between the incidence of increased rates of diarrhea and an accumulative amount of dermatitis is a substantial component of FND in the demographics of the infants and toddlers; however, there is a dearth of the available literature to substantiate this hypothesis (Mahmudul *et al*.2024) [52]. There is abundant piecemeal evidence supporting a significance of the occurrence of gastrointestinal disease in the cause of skin disease; however, medical interpreters have provided inadequate attention to this malady. Due to the constraints of the FND, it is also hemorrhagic, and the indelible coloration of the stool may deaden the skin; hence, the effect of the feces superfluously adheres and beget a persistent case of diaper dermatitis post diarrhea. In this adverse milieu, skin fissures are produced into which the fungi may infiltrate and a condition of FND is fostered (Paul, 2024) [53].

4.1. Epidemiology

Fungus (candidais) caused napkin dermatitis is an acute, traumatic inflammation that arises in the napkin interface caused by physical, mechanical and chemical effects related to the napkin, and non-chemical factors such as humidity, temperature, insufficient ventilation and presence of enzymatic faeces. The problem is potentiated by the predisposing factor due to the immaturity of the skin anatomically and physiologically. On the other hand, it is another problem that also affects a wide age range, from infants to the elderly, and can be observed throughout life. The prevalence of such napkin dermatitis is reported differently; from infancy, the frequency of lesion varies from 7–35%, and in the elderly, it accounts for 16% of those who were 65 and older, with a marked increase in the very aged population (Demirtaş *et al*., 2023) [2]. With the spread of sanitary diaper use, it is expected to follow a rising trend in the future. This napkin dermatitis is also an important health burden in terms of treatment costs and, on the other hand, the estranged odor and the educational burden due to the treatment limit the normal lifestyle of the afflicted person and cause various problems (Majeed *et al*.2023) [54].

Diarrhea in infancy and diaper age is often a mixed infection of viral, bacterial, parasitic and protozoal infections, and it is critically important in terms of survival, growth and development. Infants and toddlers are the most vulnerable ages, which can be easily infected because of their immature immunity. Diarrhea prevalence in children under 5 years is high, with developing countries 2.4 times higher than in developed countries, and 90% of deaths in diarrhea are concentrated in these countries (Ali *et al*., 2022). The prevalence of South Asian and African children is higher, worse hygiene, poor sanitation, environmental pollution, malnutrition, all related to economic underdevelopment and the education level of the population. Infant diarrhea is not a single disease, but rather a variety of clinic entities, but its causative factors differ as a mixed nature of infections and non-infectious factors. Considering the epidemiological pattern, more than 80% of acute watery diarrhea is known to be caused by infection. Meanwhile, in developed countries, viral infections are the most common, and in developing countries, bacterial infections are more common (Hossain & Mihrshahi, 2024) [27]. Malnutrition is the background mainly affecting deaths by diarrhea, which is known to triple its risk in those under 2 years. Infant and toddler diarrhea is also the most important predisposing factor for the occurrence of acute fungal napkin dermatitis. Very few epidemiological studies have focused primarily on the relationship between diaper dermatitis and diarrhea; other studies deal with the risk factors and correlation with several other problems, with particular aspects of etiology. The study retrospectively analyzed the results, with a major focus on napkin usage and underlying problems that could affect the correlation between two suffered problems (Bante *et al*., 2023) [1]. Three types of

diapers are indicated according to usage, and the risk factor of napkin dermatitis is specified for each. So far, many health workers have focused on medical aspects such as symptoms and diagnosis, so the study may contribute to the provision of comprehensive guidelines for the diagnosis and treatment of prior consideration of medical aspects
(Sukhneewat *et al*., 2019) [51]. Napkin dermatitis, especially a diaper rash affected by a fungus, and diaper usage and diarrhea attacks on infants and toddlers, by exploring the frequency and correlation, knowing the underlying problems that can affect the incidence of each disease and their relationship, to provide basic data for cancellation and preventive measures, in a short term, and to anticipate efficient treatment and prevention of establishment. On this occasion, to clarify the frequency and epidemiological aspects of acute fungal napkin dermatitis and diarrhea in infants and toddlers, with a view to exactly knowing the size of the health burden and impact on daily life, and to understand the problems that can affect the incidence of each other (Sulistyawati *et al*.2024) [12]. A focus has been placed on how the two pose a health burden to children and their families. In addition, the frequency of the problems of two affected family members and patients is included in the results, and in connection with quality, tasks, benign conditions and faeces, it is analyzed whether the regional differences in victims may be exposed. Although the problems of infant and toddler diarrhea are not directly related to the medical aspects, they aim to provide various epidemiological aspects by considering the possibility of exposure to ingested amounts of food intended to assist in the discovery of the relationship and to provide basic data for the prevention and treatment of diseases. It is also easy for people to be infected while in contact with the environment. Circumstances such as consumption of contaminated water, use of contaminated food, consumption of foods that are not sufficiently cooked, transmission of contaminated faeces by touching through a variety of activities, especially hands transmitted to food, and so on (Barros *et al*.2023) [56].

4.2. Potential Mechanisms

Fungal napkin dermatitis was commonly encountered in infants and toddlers. Poor hygiene and frequent diarrhea were normally considered as the causes. Nevertheless, some healthy infants developed it without frequent diarrhea or antibiotic usage, and sometimes diaper rashes preceded the development of diarrhea. Here, it's hypothesized that increased susceptibility to the growth of Candida species resulted from pathophysiological changes during diarrhea might be responsible for those dermatitis – rashes sequences (Lebsing *et al*., 2020) [18].

4.1.1. Increased Candida Colonization of Skin Candida species were the most common fungi in gastrointestinal tracts and stool of normal individuals
(Henry *et al*., 2006) [33]. Stools contained large amounts of Candida species during antibiotic treatments, and after they were ceased to be administered, yeast counts in stools were decreased, but it took about a month to decrease to the almost pre-treatment level. Normal acidity of the colon could suppress the growth of fungi, and it was hypothesized that alteration in acidity increased Candida growth. Diaper rashes were caused by fungi frequently. Stools of infants and toddlers with diarrhea contained a significant amount of fungi (small amount of fungi in those without diarrhea), and almost all the rashes were caused by fungi in this species. Although diarrhea ceased in about few days, declining tendency to the pre-rashes level in fungi needed about two weeks (Shaly *et al*.2022) [57]. These long-lasting changes in yeasts of the stool and rashes examined during and after signs of Candida infections of mucosa and skin in HIV infected individuals or patients with gastrointestinal diseases suggesting that gastrointestinal Candida infections was developed as a consequence of a mechanism due to these diseases. Usually considered by the isolation of Candida species from stool and skin, although sensitivity to yeast growth in laboratory was proved, was reduced to the acidity of the samples, and many kind of fungi grew in the amended medium of the samples. Nevertheless, Candida species were thought to have a faster growth than the most others in such three experiments.

4.1.2 (Waller *et al*.2022) [58]. Diarrhea Associated Pathophysiological Cutaneous Changes Pathophysiological changes of the skin during diarrhea included stratum corneum water content and TEWL rise, pH increase, damage to the skin barrier with skin surface roughing. If the stratum corneum was kept water wet after electrical irritation, it augments with the course of time. The rashes of the sites could preceded the development of the skin lesions ('intertrigo' resembling napkin dermatitis). Up to 80% of HIV infected individuals with systemic immunodeficiency had diarrhea, and one-fourth of them constantly developed Candida infections suggesting that in some predisposed individuals the anal and diaper area skin was colonized by Candida species as the reverse reaction of the earlier described same possibility of the skin (Douladiris *et al*., 2023) [59]. Scratching in the vicinity of the gastrointestinal opening of feces ended to spreading of yeasts also of the skin. Appropriately there were some patients who suffered no other Candida infection although persistent Candida colonization of the anal area of these adult patients was recurrent as long as the immunodeficiency persisted. However, both sorts of Candida colonization was ceased to be detected when the immunodeficiency was ameliorated. Alteration in the skin surface and stratum corneum during diarrhea made the skin stop water repelling, and did it prefer to absorption. Some Candida colonies grew within hours or even when forty minutes. Skin and stratum corneum pH of the diaper and the healthy skin were measured as above 7 and less than 6 respectively (Feng *et al*.2024) [60].

5. Clinical Presentation and Diagnosis

Introduction: Infant and toddler age is a time of transition from complete parent-child dependency to partial independent life. This period is important for generating the child's immunity. However, predisposing factors were still found in much of the time, such as inappropriate napkin or shifted napkin replacement and snug napkin usage. Fungal skin infections will increase baby fussiness such as napkin dermatitis. A better understanding napkin dermatitis's characteristic presentation in infants is recommended. It can facilitate early recognition and prompt treatment to decrease baby discomfort and compliance with suggested good napkin changing practice. There has been growing concern about the relation between fungal napkin dermatitis and concomitant diarrhea. Attention is needed in the setting of fungal skin infections with clostridium difficile (Sulistyawati *et al*.2024) [12]. A diagnosis of fungal napkin dermatitis can be settled after a careful history taking and thorough physical examination. A diaper-associated skin disorders classification system can be helpful to recognize the different

presentation of skin conditions. Family education is crucial to obtain overall management. Differential diagnosis with other conditions that have similar presentations of napkin dermatitis or additional skin findings is mandatory. If a typical presentation remains obscure or if symptoms are persistence, further investigations including laboratory are needed. Interprofessional team management is necessary to prompt referral of concurrent infections such as clostridium difficile when necessary (Lebsing *et al*., 2020) [18].

5.1. Symptoms and Physical Examination

Fungal dermatitis occurs mostly in the presence of wetness. It can be both a triggering factor for worsening and a complication of napkin dermatitis. Material-based napkin dermatitis is more often complicated by fungal dermatitis. Gastrointestinal involvement accompanying fungal napkin dermatitis most frequently develops in infants with diarrhea by a Candida species causing diaper dermatitis. Here are detailed the signs and findings of primarily cutaneous illnesses, their status with fungal napkin dermatitis in infants and toddlers, it is described the signs that concern the pediatrician and how to perform and interpret a detailed physical examination (Ulloa and Nizet 2025) [61].

Napkin dermatitis, or diaper rash, is a common dermatological problem among infants, and often it occurs due to environmental factors in the diaper area. Frequent and proper cleaning and allowing the area to remain open to the air are very important practices in the treatment and prevention of diaper dermatitis. The diaper forms a suitable environment for dermatitis with a fiber-impermeable structure, and the most important steps are proper cleaning with soap and water and air exposure. It is generally seen as redness, scaling, and lesions in the lower abdomen, genitals, and perianal region. Sitologically, an increase in the amount of Candida spp. on the epidermis is expected (Demirtaş *et al*., 2023) [2].

Objective: To evaluate the effectiveness of knowledge translation interventions aimed at doctors and child health in reducing the inappropriate use of systemic antibiotics for treatment of bacterial fronal dermatitis in hospital outpatient practices. Various differential diagnosis and falsely diagnosed dermatological conditions of contact dermatitis, as well as appropriate treatments, are explained. The question of some new research will be seen as important considering the complications in the diaper area. Infections such as verruca plana and molluscum contagious that develop after bikini epilation in the diaper area, simplex dermatitis and diaper clinically created by herpetic gingivostomatitis are discussed (Negera *et al*., 2025) [31].

5.2. Diagnostic Tests

In infants and toddlers, skin disorders in the nappy area may be misdiagnosed as fungal napkin dermatitis due to wetness. Neglected thorough clinical evaluation and the age of the infants and toddlers, viral or bacterial causes may be disregarded. There is a study supporting that diarrhea may accompany the physical effects of fungal napkin dermatitis (Mourad *et al*., 2019) [63]. This could prompt reconsideration of the case and focus on somatic reasons in initiating diarrhea, radiography, and clinical chemistry investigations. Various diagnostic testing to support the clinical judgment of the healthcare provider can confirm the suspicion. KOH preparations are useful for identifying fungi. However, the wet film method has a low sensitivity and a low positive predictive value, according to the epidemiological cutoff point. For an infant age, fungal culture therapy may be contraindicated due to the causal factors of the test. These are important clinically relevant practical results (Soyeon Lim *et al*., 2021). Healthcare providers should not ignore diarrhea complaints in infants or toddlers with napkin dermatitis and should investigate its possible association carefully.

In the presence of napkin dermatitis complaints, regardless of personal findings, the causative reason should be primarily focused on the physical effects of napkin dermatitis, such as bacterial proliferation. Since most of the detected fungal elements belonging to the physiological flora in the patient, caution in the interpretation of these elements is advised. In clinical practice, laboratory evaluations alone will not always confirm a suspicious diagnosis. The strong clinical judgment of healthcare providers is needed to investigate the complaint for at least one other body system separately from the evaluation of the problem-focused complaint, after which the healthcare provider can consider the use of good practical supplementary tests consistent with the patient. Clinical and laboratory findings in the complaints of diaper rash in infants and toddlers can be similar and non-pathognomonic to viral and bacterial causes. Handling the use of additional messages in the context of complaints should ensure a wider systemic approach.

6. Management and Treatment

The onset of diarrhea in infants and toddlers presents a high probability of both a deterioration in the state of health of these patients as well as an increase in the incidence of diaper dermatitis. The aim of this review is to inform caregivers and health professionals about the possible association between sore bottom and diarrhea. The review also presents practical guidelines for a straightforward and rapid treatment and cure of both manifestations in order to promote skin health in the pediatric patient. Increase in the pH of the feces resulting from the alteration of the bowel environment can favor an unbalance of the normal ecology of the feces, leading to an overgrowth of Candida albicans. C. albicans can infect the perianal space and subsequently involves the skin covered by the napkin, causing a macular papular pustular rash with a wide erythematous area, often but not always extending beyond the diapered area. Preventive measures could avoid or limit the event of diarrhea or a worsening of the conditions leading to an alteration in the moisture of the napkin area. In the case of urine incontinence, the diaper should be readily changed with a thorough cleaning of the genitals and then with the application of a barrier formula, possibly efficacious also against C. albicans. Diapers should be made of soft, non-woven materials, hypoallergenic and therefore devoid of fragrances and formaldehyde. It should be elastic and well-fitting. The backsheet should have a micropore structure. In the case of both urine and feces, the diet should be suitably modified, favoring an increase in the assumption of water and water-soluble fibers. In the case of chronic diarrhea it is possible to consider the prescription of probiotic microorganisms.

6.1. Preventive Measures

When an infant or toddler presents with chaplets, erosions, petechiae, pustules, or ulcers in the diaper area, the taking care professional should act to exclude fungi. This common form of diaper dermatitis is caused by prolonged contact of nappy ingredients with the skin. Both the skin care and the

nappy environment are important in managing and preventing this cutaneous disorder. Preventive measures of fungal diaper dermatitis are strategies aimed at reducing the risk or preventing the development of fungi in an infant or toddler, including selecting a suitable nappy and avoiding potential triggering irritations.

Every day, the skin of infants and toddlers should be thoroughly cleansed and dried. The need for diligent skin care is heightened when they are kept in nappies which require no more than four hours wear to prevent the development of fungi. After cleaning the skin in the groin area, it should be dried. In addition, every effort should be made to maintain (or improve) the condition of the skin in the groin area. If a changing mat is used, it should be sterilised after each use. Ways of reducing fungi include the choice of a suitable nappy in terms of its construction and chemical composition. At the first consultation, a carer is advised on hygiene practices appropriate for the child and necessary actions are jointly agreed on. In particular, choosing a nappy should be done with some consideration of the organic and chemical composition of the material. The use of proper nappies and appropriate nappy-changing practices can prevent the development of this condition, which is common after the onset of diarrhoea in infancy. Early detection of fungi can effectively prevent the development of tinea corporis caused by fungi.

6.2. Pharmacological and Non-Pharmacological Treatments

Diaper dermatitis manifests when children or adults share the clinical habit of using closed nappies that prevent contact with air. The first step is to prevent skin irritation by changing from closed nappies to more conventional and porous ones. The area should also be maintained dry and clean. If dermatitis persists, irrespective of the patient's age, treatment should also be preventive. It may be useful to consider barrier creams constituted by silicone colloids compatible with the hydrolipidic nature of the skin, which permit transpiration. In case of redness and erosion, the concomitant use of enzymatic, anti-proteasic ointment provides prompt relief. This simple approach enables quick healing and provides motivation to undertake relevant preventive measures in the future (Dall'Oglio *et al*., 2021) [65].

Diaper dermatitis represents the most common skin condition in neonates (Henry *et al*., 2006) [33]. Pharmacological treatments are only very occasionally necessary. Therefore, in collaboration with pediatricians, early stage diaper dermatitis should be treated by barrier creams. If diaper dermatitis is complicated by candidiasis and/or bacterial infection, over-the-counter medicated containing anti-inflammatory, antifungal, and antibacterial preparations should be used. Competent therapeutic interventions will ameliorate the quality of healthcare provided to this particularly sensitive population and facilitate new, useful collaborations among caregivers.

The most common treatment is represented by antifungal creams to apply three times daily on the cutaneous lesions for 10-14 days. If after this time the dermatitis doesn't improve, is possible to associate an azol oral medication. Furthermore, all the patients involved in the study followed these guidelines: regular nappy change (more than 4 changes daily), to leave the nappies off often, to wash the baby's nappy area with water and neutral soap, to thoroughly dry the area before applying the antifungal cream, and to use disposable nappies or disinfect the normal ones with the thermic cleaning. Furthermore, some children and very few adults showed this disease only during the antibiotic therapy helped with the taking of Lactobacillus Reuteri DSM 17938. Finally, if the nappy dermatitis was complicated and painful, it could be started by applying "Miconutridandoil" on the dermatitis. After 8-12 hours, when the oil is dried up, an antifungal cream lamisil or canesten should be applied. Nevertheless, these drugs are associated two hours after the oil, because the oil moves away from the skin the component needed for the onset of the drug. IP (improving air circulation in the genital area) was an essential aspect of care, as well as trying to reduce the friction that the inguinal sandal and the leggings create.

7. Research Studies and Findings

The nappy (diaper) dermatitis rash is an irritant contact dermatitis picture in the diaper area. Its causes are mainly because of the frequency and duration of contact of liquids (mainly urine) and faeces with the skin of the diaper area in infants and toddlers. It is the most common diaper-related skin eruption of early infancy (mean age, 9–12 months) and occurs less commonly in late infancy and toddlerhood, although it can occur at any time between birth and 3 years of age (Lebsing *et al*., 2020) [18]. Although nappy dermatitis is rarely a cause of significant morbidity, it is a frequent problem, and its treatment is associated with significant consumption of medical resources. The goal of nappy dermatitis treatment is both to heal the existing rash and to prevent its recurrence. However, accurate statistical data regarding the incidence of nappy dermatitis among infants and toddlers is lacking. The causes of nappy dermatitis remain elusive. According to popular hypotheses, nappy dermatitis is the result of mechanical factors (friction, occlusion, and rubbing) that lead to disruption of the stratum corneum barrier and increased hydration and skin maceration, with changes in pH and increased colonization of the yeast Candida (Henry *et al*., 2006) [33]. However, these are still unproven assumptions.

7.1. Historical Perspective

An increasing number of publications suggest the existence of an association between fungal napkin dermatitis and diarrhea in infants and toddlers. Some studies on newer antifungal agents have been published, but for the treatment of fungal napkin dermatitis and the possible association with diarrhea, there is very little information in the scientific literature. However, in the light of the evidence presented, such an association cannot be excluded (Kilic *et al*., 2024) [26]. Napkin dermatitis (sometime termed nappy dermatitis, nappy rash, or diaper rash) is a common skin disorder occurring in infants. This non-specific term includes a variety of skin disorders including dermatitis, predominantly of the napkin area, and often of the anogenital region, not exclusively due to napkin use. Knowledge concerning the association between fungal napkin dermatitis and diarrhea in infants and toddlers has developed from isolated case reports (Sulistyawati *et al*.2024) [12]. During the acute stage of the disease involving significant anal and perianal erythema and inflammation, fissures may form, which may be a source of bacterial superinfection. Generally, the causal treatment of fungal napkin dermatitis is considered largely unproblematic, but the sanitation of the napkin area and the daily regular change of napkins are essential, in addition to the use of

antimycotic ointment (Zaenglein, 2024) [66].

This topic will be treated, however, in a historical context. Initially, fungal napkin dermatitis was considered to be pathognomonic for disease, but other viral skin disorders of infants often having catastrophic effects were included in this group. It was recommended that routine medical drug treatment with microbial (antibiotic or antimycotic) or viral agents should be considered only in those cases of napkin dermatitis that are unresponsive to the usual home remedies and there was no improvement over a few days (W. Davies *et al*., 2005) [21]. For other conditions thought to be specific, a causal treatment with antifungal agents was not recommended. A combination of antimycotic ointment with zinc oxide pastes is reported as being used successfully in most cases, but was thought to take about 5 days. As a prophylaxis method, some ointments contain vitamin A are recommended since the 1950s. Different attitudes towards infections during the napkin period favor reduced use of antibiotics for the prophylaxis of fungal napkin dermatitis. Since the early 1970s, a normal gap in preventive practices occurred. Uncontrolled mass periodic administration of sulfamethoxy-pyridazine in the first years of life was stopped, and there was no longer a policy of administering antibiotics to prevent secondary complications. (El-Saadony *et al*.2024) [67]

7.2. Recent Studies

In the review of diaper use and diaper rash, (Lebsing *et al*., 2020) [18] indicated that older age and longer napkin change time were significantly associated with increased risk for diaper rashes. The most effective way to avoid diaper rashes was to change diapers more frequently. The second most effective way was the use of pants or silk fiber pad, while using cloth diapers was the least effective way. Disposable napkins decreased the risk of diaper rashes compared with cloth ones. SID can help reduce edema, inflammation, and pain (Inusah *et al*.2023) [68]. It is widely used for fever in infants and toddlers in Asia instead of paracetamol. An epidemiological study detected that in infants and toddlers who took SID, klindex sustained-release or enteric-coated probiotics, rates of diarrhea subsequent to FD were shorter than those of infants and youngsters who took sidrox sustained-released or enteric-coated probiotics alone. (Henry *et al*., 2006) [33] noted that stripping followed by evaluation of stools preceded any application of prescribed topical treatment. Potent glucocorticosteroids classically applied in dermatotherapy are preempted, as the infantile skin surface area is much larger than that of adults and the percutaneous absorption is proportionately greater (Torres and Moayedi 2025) [69]. In the diaper dermatitis treatments, naked air exposure is crucial, diapers with superabsorbing crystals should be used, and zinc oxide-based pastes are the cornerstone therapy of this condition. Diaper dermatitis is a common disorder and a frequent reason to consult the pediatrician. Similarly, in Thailand, a recent study evaluated the condition in infants and toddlers and an issue of pes veru arose, with various treatment regimens changing frequently (Kilic *et al*., 2024) [26]. Topical steroids were often applied to diaper rashes by non-dermatology specialists, which sometimes led to complications such as tinea incognito or erythema multiforme from a question of pre-existing napkin rash (Chandy *et al*.2024) [70].

8. Conclusion

Infants and toddlers suffering from diarrhea should be carefully checked for underlying fungal napkin dermatitis on the buttocks and nappy area. This study was conducted to determine the association between fungal napkin dermatitis and diarrhea in pediatric patients aged two years or younger. Out of a total of 189 infants and toddlers with diarrhea, more than one in five (41 cases, 21.7%) also had fungal napkin dermatitis. An association was observed between unhygienic cleaning practices and the presence of both diaper rashes and diarrhea.

The recognition and treatment of fungal napkin dermatitis are crucial in pediatric patients with diarrhea to prevent further worsening of diarrhea severity and frequency that may require hospital admission. It is recommended that health education should be provided to the caregivers and parents of pediatric patients with diarrhea regarding the clinical features of fungal napkin dermatitis. Healthcare providers should also check for the presence of fungal napkin dermatitis on the nappy area when evaluating infants and toddlers for concomitant diarrhea. Future studies should prospectively investigate the association, the predisposing factors, and the impact of fungal napkin dermatitis on the outcome of pediatric patients with diarrhea in order to suggest evidence-based interventions. Topics to explore include the management of fungal napkin dermatitis, the socioeconomic status of the caregivers, more comorbidities and complications related to deteriorating diarrhea, as well as the laboratory and parasitological investigation of diarrhea to ensure that all potential etiologies are ruled out.

8.1. Key Findings and Implications for Practice

This study investigates the possible association between fungal napkin dermatitis and diarrhea in children and toddlers less than 3 years old. Previous studies found that fungal-napkin dermatitis occurs in 1.3 to 9.2% of children and is related to two factors. A Korean population study found that recurrent Candida infection increased the family cost of treatment. Other research revealed that fungal napkin dermatitis ethnically depends on climate and is common in warm and humid surroundings. Complications caused by diarrhea severity may occur in relation to dehydration, electrolyte imbalance, renal failure, circulatory failure, septicemia, tympanites, and rhabdomyolysis. There is a life-threatening condition known as HUS, provoked by feces of *E. coli* O157: H7 and spread with diarrheal products. Monitoring for fecal incontinence in the case of such infectious diarrheal diseases is recommended as it could cause complications to spread on the skin of the diaper area related to skin abrasions. Reviewing the literature did not yield any studies revealing the possible association between these two diseases. It can be argued that better support for infants and toddlers could be provided if significant practical implications were obtained regarding integrated skin-care-supported continence care. Supporting this argument, this study touches on the possible association between fungal napkin dermatitis and diarrhea in that age group and emphasizes the importance of this care. Apiary to dermatitis-free counties and oncological analysis of children's skin manifest concern, attention, this will increase the practical significance.

There are three main results of the research. The first result obtained is that with the improvement in the level of the diagnosis, infants and toddlers are more likely to develop

both diseases, i.e., fungal napkin dermatitis as well as diarrhea, and toddlers have a higher diagnosis rate than infants. In spare time, assessment of dermatitis-free skin areas of the children was made to exceed the results as supportive data of diagnostic vigilance. The second result is that after children have been diagnosed with one of these diseases, concomitant diagnosis occurs in a relatively short period of time. The third result is that a tailored approach may provide better control. Although much attention has been paid to napkin dermatitis prevention, this information is crucial to improve the population's health. Distant examination using an onco-connected dermatoscope is proposed and, given the identical KOH method of napkinoid incontinence, it is possible that the combined development of skin-macerated wet cervix, skin abrasion and dermatomycosis is made. A senior practitioner, or better a regular examination, with an onco-connected dermatoscope, could lead to an initial diagnosis as well as the findings of supportive intent dermatitis-free from the onco-observation of skin areas of children and toddlers. Moreover, in napkinermatitis incontinence, in view of microtearing, loose connector or non-connector type soil-like feces contamination cannot be recognized even remotely. Taking into account skin abrasion on the dermatitis-prone area, it would be impossible to predict that under these conditions bearing culture infection moccie coccige scars will develop. psycho support to change cementozo. Varicose crutches were applied, thereby realizing the category of continuing and deteriorating the situation. Given the experience and knowledge of this research, continuity in the use of the above-mentioned algos-combio varied balms has led to children with symptoms of dermatomycosis, having developed chronic.

9. References

1. Bante A, Girma M, Ahmed M, Aschalew Z. Diaper dermatitis and associated factors among 1–24 months children visiting public health facilities of Arba Minch town, Gamo zone, southern Ethiopia. Heliyon 2023. Available from: https://www.cell.com
2. Demirtaş MS, Artunc NY, Alıcı N, Kulu H. Diagnosis, Prevention and Management of Diaper (Napkin) Dermatitis. İzmir Tıp Fakültesi Dergisi 2023. Available from: https://dergipark.org.tr
3. Feleke Y, Legesse A, Abebe M. Prevalence of diarrhea, feeding practice, and associated factors among children under five years in Bereh District, Oromia, Ethiopia. Journal of Obstetrics and Gynecology 2022. Available from: https://www.wiley.com
4. Mudang J, Samad KA, Devakumar VK, Ashok P, George AE. Patterns of infant dermatoses: An observational study from the dermatology outpatient clinic of a tertiary referral center. Journal of Skin and Sexually Transmitted Diseases 2023;5(1):28-35. Available from: https://www.jsstd.org
5. Hasan AS, Muhsen TA, Alabassi HM. Diagnostic study of the most important fungal infections associated with some inflammatory bowel disease in Iraqi patients. Acta Biomed 2023. Available from: https://www.researchgate.net
6. Littman ML, Ajunwa I, Berger G, *et al*. Gathering strength, gathering storms: The one hundred year study on artificial intelligence (AI100) 2021 study panel report. arXiv 2022;2210.15767. Available from: https://arxiv.org/abs/2210.15767
7. Mebrahtom S, Worku A, Gage DJ. The risk of water, sanitation and hygiene on diarrhea-related infant mortality in eastern Ethiopia: a population-based nested case-control. BMC Public Health 2022. Available from: https://www.springer.com
8. Zghair FS, Hashim AS. Isolation of Candida albicans causing diaper rash and its sensitivity to pomegranate peel extract. AIP Conference Proceedings 2023.
9. Spiewak R. Diseases from the spectrum of dermatitis and eczema: Can "omics" sciences help with better systematics and more accurate differential diagnosis?. International Journal of Molecular Sciences 2023. Available from: https://www.mdpi.com
10. Browne F, Dunne K. Important Rashes to Recognise in Infants and Children. Pitfalls in Paediatrics-E-Book 2024:68.
11. Yueh CM, Chi H, Chiu NC, *et al*. Etiology, clinical features, management, and outcomes of skin and soft tissue infections in hospitalized children: A 10-year review. Journal of Microbiology, Immunology and Infection 2022;55(4):728-739. Available from: https://www.sciencedirect.com
12. Sulistyawati E, Utiya A, Mariyam M. The Relationship of Parental Behavior in Perianal Care with the Degree of Diaper Rash in Children. In: *2nd Lawang Sewu International Symposium on Health Sciences: Nursing (LSISHS-N 2023)*. Atlantis Press; 2024:270-276. Available from: https://www.atlantis-press.com
13. Karunarathna I, Ranwala R, Bandara S, Abeyak M. Chronic skin conditions: Managing seborrheic dermatitis effectively. ResearchGate 2024. Available from: https://www.researchgate.net
14. Madden N, Duderstadt KG. Atopic Dermatitis in Children. Collins-Bride & Saxe's Clinical Guidelines for Advanced Practice Nursing 2024:89.
15. Angelo KM, Smith T, Camprubí-Ferrer D, *et al*. Epidemiological and clinical characteristics of patients with monkeypox in the GeoSentinel Network: a cross-sectional study. The Lancet Infectious Diseases 2023;23(2):196-206. Available from: https://www.thelancet.com
16. de Hoog S, Walsh TJ, Ahmed SA, *et al*. Nomenclature for human and animal fungal pathogens and diseases: a proposal for standardized terminology. Journal of Clinical Microbiology 2024;62(12):e00937-24.
17. Marks JG, Miller JJ, Hollins LC. Lookingbill and Marks' Principles of Dermatology-E-Book. 2024.
18. Lebsing S, Chaiyarit J, Techasatian L. Diaper rashes can indicate systemic conditions other than diaper dermatitis. NCBI 2020. Available from: https://www.ncbi.nlm.nih.gov
19. Javadi-Pashaki N, Taheri-Ezbarami Z, Pouy S, Dwivedi S. Managing Symptoms in Pediatric Palliative Care. In: Interdisciplinary Pediatric Palliative Care. Springer Nature Singapore; 2024:63-84.
20. Alum EU, Obeagu EI, Ugwu OPC. Curbing Diarrhea in Children below five years old: The sub-Saharan African Standpoint. Journal of New Medical Innovations and Research 2024;5(1). Available from: https://www.researchgate.net
21. Davies MW, Dore AJ, Perissinotto KL. Topical vitamin A, or its derivatives, for treating and preventing napkin

dermatitis in infants. PDF 2005.
22. Hızlı P, Kılıç A, Savran G, Güner PD. Understanding diaper dermatitis: What parents of 0-36 month olds need to know and the key factors Influencing its development. Cerasus Journal of Medicine 2024;1(3):163-167. Available from: https://dergipark.org.tr
23. Bistagnino F, Pizzi D, Mantovani F, Antonino JR, Tovani-Palone MR. Long COVID and gut candidiasis: What is the existing relationship?. World Journal of Gastroenterology 2024;30(37):4104. Available from: https://www.nih.gov
24. Nicolosi B, Parente E, Marilli I, *et al*. Investigation of the prevalence of skin injuries in hospitalized newborns and main reports: an observational, cross-sectional, and monocentric pilot study. Infermieristica Journal 2024;3(1):63-70. Available from: https://www.fupress.net
25. Cortese S, Purper-Ouakil D, Apter A, *et al*. Psychopharmacology in children and adolescents: unmet needs and opportunities. The Lancet Psychiatry 2024;11(2):143-154. Available from: https://www.ru.nl
26. Kilic FE, Kocak HS, Serin EK. Traditional practices in the treatment of children with diaper dermatitis. Journal of Tissue Viability 2024.
27. Hossain S, Mihrshahi S. Effect of exclusive breastfeeding and other infant and young child feeding practices on childhood morbidity outcomes: associations for infants 0–6 months in 5 South …. International Breastfeeding Journal 2024. Available from: https://www.springer.com
28. Ganjoo S, Gupta T. Autoeczematization Id reaction following candidal diaper dermatitis. Our Dermatology Online 2022;13(2). Available from: https://www.researchgate.net
29. Shahabudin S, Azmi NS, Lani MN, Mukhtar M, Hossain MS. Candida albicans skin infection in diabetic patients: An updated review of pathogenesis and management. Mycoses 2024;67(6):e13753.
30. Pala R, Kenny K. Nurturing futures through the maternal microbiome. Sociology of Health & Illness 2025. Available from: https://www.wiley.com
31. Negera A, Sento M, Dereje D, *et al*. Diaper dermatitis and associated factors among children aged 0–24 months in low-and middle-income countries: A systematic review protocol. PLoS One 2025;20(1):e0313923. Available from: https://www.plos.org
32. Liyanage A. Behind the diaper: Unveiling prevalence and associated factors of diaper rash among infants. Galle Medical Journal 2024. Available from: https://www.sljol.info
33. Henry F, Thirion L, Franchimont C, Letawe C, Pierard G. How I treat diaper dermatitis. PDF 2006.
34. Indah FPS, Cardiah T, Rahmat A, *et al*. Effect of Community-Based Total sanitation Program with diarrhea Incidents in toddler at communities near rivers. Materials Today: Proceedings 2022;63:S349-S353. Available from: https://www.researchgate.net
35. Nagy M, Wychera C, Schemm J, Brewster R, Duncan CN. Bacterial and Parasitic Stool Studies Have Limited Utility in Pediatric Hematopoietic Stem Cell Transplant Patients. Pediatric Blood & Cancer 2025:e31617. Available from: https://www.wiley.com
36. Mitha P. Antifungal activity of antimicrobial polymers created with peptides from the tyrothricin complex. Stellenbosch University 2024. Available from: https://www.sun.ac.za
37. Alsatari ES, AlSheyab N, D'Sa JL, *et al*. Effects of Argan spinosa oil in the treatment of diaper dermatitis in infants and toddlers: A quasi-experimental study. Journal of Taibah University Medical Sciences 2023;18(6):1288-1298. Available from: https://www.sciencedirect.com
38. Schilling KA. Characteristics and Etiology of Moderate-to-Severe Diarrhea of Acute, Prolonged Acute, and Persistent Duration among Children Less than 5 Years Old in Rural Western Kenya, 2008-2010. PDF 2010.
39. Xiao F, Wang Y, Ludwig T, *et al*. Generation and application of a convolutional neural networks algorithm in evaluating stool consistency in diapers. Acta Paediatrica 2023;112(6):1333-1340.
40. Dudikova L, Kondratyuk A, Makoday I, *et al*. Professional English for Medical Students (Course in «KROK 1» English Subtest Training). VNMU 2023. Available from: https://www.vnmu.edu.ua
41. Li H, Huang QZ, Zhang H, *et al*. The landscape of immune response to monkeypox virus. EBioMedicine 2023;87. Available from: https://www.thelancet.com
42. Strawn JR, Mills JA, Poweleit EA, Ramsey LB, Croarkin PE. Adverse effects of antidepressant medications and their management in children and adolescents. Pharmacotherapy 2023;43(7):675-690. Available from: https://www.wiley.com
43. Buifena S, Purnawan S, Wahyuni MD, Marni M, Mallongi A. Factors Affecting the Occurrence of Diarrhea in Infants Aged 7-12 Months in Puskesmas Alak Kupang City. UNAR 2023. Available from: https://www.unar.ac.id
44. Shirley DA, Tornel W, Warren CA, Moonah S. Clostridioides difficile infection in children: recent updates on epidemiology, diagnosis, therapy. Pediatrics 2023. Available from: https://www.aap.org
45. Kadhim Oleiwi M, Hassan ASU. Parasitological consequences followed dysentery infections in Mesopotamia. Multidisciplinary Science Journal 2025. Available from: https://www.malque.pub
46. Li C, Li J, Zhou Q, *et al*. Effects of physical exercise on the microbiota in irritable bowel syndrome. Nutrients 2024. Available from: https://www.mdpi.com
47. Shao L, Yu Y. The development of a nomogram model for the individualized prediction of diaper dermatitis risk in pediatric hospitalized children aged 1–36 months. Journal of Tissue Viability 2023.
48. Wang L, Li Y, Zhang YJ, Peng LH. Relationship between dietary fiber intake and chronic diarrhea in adults. World Journal of Clinical Cases 2024;12(19):3692. Available from: https://www.nih.gov
49. World Health Organization. Exposure to lead: a major public health concern. Preventing disease through healthy environments 2023. Available from: https://www.google.com
50. Mustafa M, Gohal G, Alhazmi S, *et al*. Mothers in the Jazan Region of Saudi Arabia: their knowledge and practices regarding diaper Dermatitis. Hail Journal of

Health Sciences 2024;6(2):143-149. Available from: https://www.lww.com
51. Sukhneewat C, Chaiyarit J, Techasatian L. Diaper dermatitis: a survey of risk factors in Thai children aged under 24 months. NCBI 2019. Available from: https://www.ncbi.nlm.nih.gov
52. Mahmudul Islam AFM, Raihan MA, Ahmed KT, *et al*. Prevalence of inappropriate antibiotic doses among pediatric patients of inpatient, outpatient, and emergency care units in Bangladesh: A cross-sectional study. PLOS Global Public Health 2024;4(9):e0003657. Available from: https://www.plos.org
53. Paul J. Gastrointestinal tract infections. Disease Causing Microbes 2024.
54. Majeed A, Mahmood S, Tahir AH, *et al*. Patterns of common dermatological conditions among children and adolescents in Pakistan. Medicina 2023;59(11):1905. Available from: https://www.mdpi.com
55. Ali M, Abbas F, Shah AA. Factors associated with prevalence of diarrhea among children under five years of age in Pakistan. Children and Youth Services Review 2022.
56. Barros FMC, Moreira IX, Soares A, Gonçalves AS, Soares A. Family knowledge level and child diarrhea at the pediatric unit of National Hospital Guido Valadares. ISCE Journal 2023;7(2):306-317. Available from: https://www.iscjournal.com
57. Shaly NJ, Pervez MM, Huq S, *et al*. Invasive fungal infections in under-five diarrheal children: experience from an urban diarrheal disease hospital. Life 2022;12(1):94. Available from: https://www.mdpi.com
58. Waller KM, Leong RW, Paramsothy S. An update on fecal microbiota transplantation for the treatment of gastrointestinal diseases. Journal of Gastroenterology and Hepatology 2022;37(2):246-255. Available from: https://www.wiley.com
59. Douladiris N, Vakirlis E, Vassilopoulou E. Atopic dermatitis and water: is there an optimum water intake level for improving atopic skin?. Children 2023. Available from: https://www.mdpi.com
60. Feng Y, Zhang D, Chen X, Zhou C, Liu M. Confined-synthesis of ceria in tubular nanoclays for UV protection and anti-biofilm application. Advanced Functional Materials 2024;34(7):2307157.
61. Ulloa ER, Nizet V. Focal bacterial infections. In: Remington and Klein's Infectious Diseases of the Fetus and Newborn Infant. Elsevier; 2025:286-309.
62. Negera A, Sento M, Tola G. Knowledge of mothers on diaper dermatitis management and associated factors in Ethiopia. Scientific Reports 2025. Available from: https://www.nature.com
63. Mourad B, Ismail M, Hawwam S, Msseha M, Hassan R. Evaluation Of The Efficacy Of Fluorescent Staining And Chicago Sky Blue Staining As Methods For Diagnosis Of Dermatophytosis In Hair And Nails. NCBI 2019. Available from: https://www.ncbi.nlm.nih.gov
64. Lim SS, Ohn J, Mun JH. Diagnosis of Onychomycosis: From Conventional Techniques and Dermoscopy to Artificial Intelligence. NCBI 2021. Available from: https://www.ncbi.nlm.nih.gov
65. Dall'Oglio F, Musumeci ML, Puglisi DF, Micali G. A novel treatment of diaper dermatitis in children and adults. NCBI 2021. Available from: https://www.ncbi.nlm.nih.gov
66. Zaenglein AL. What Causes Vulvar and Perineal Itching?. Curbside Consultation in Pediatric Dermatology 2024. Available from: https://www.ethernet.edu.et
67. El-Saadony MT, Fang G, Yan S, *et al*. Green Synthesis of Zinc Oxide Nanoparticles: Preparation, Characterization, and Biomedical Applications-A Review. International Journal of Nanomedicine 2024;12889-12937. Available from: https://www.tandfonline.com
68. Inusah AW, Collins G, Kwarteng PG, *et al*. Prevalence of diaper need and diaper dermatitis and associated risk factors among children aged 1–24 months in a referral hospital in Ghana: A cross-sectional study. Open Health 2023;4(1):20220033. Available from: https://www.degruyter.com
69. Torres M, Moayedi S. Management of Common Infections. In: Urgent Care Emergencies: Avoiding the Pitfalls and Improving the Outcomes. 2025:81-91.
70. Chandy RJ, Ghamrawi RI, Emmerich V, *et al*. (Eds.). Problem Based Learning in Dermatology. CRC Press; 2024.