A Comprehensive Study on Erythroderma: Etiologies, Clinical Features, and Histopathological Insights

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Background
Erythroderma is a rare but potentially life-threatening dermatological condition characterized by widespread redness and scaling of the skin. This study aims to investigate the clinical, etiological, and histopathological characteristics of erythroderma in patients attending the outpatient department (OPD) between August 2013 and December 2015.
Methods
A total of 60 patients with erythroderma were studied. Clinical data were collected, and patients underwent thorough dermatological examination, including histopathological evaluation. The etiology, age, gender, and duration of erythroderma were recorded, alongside associated symptoms and clinical features.
Results
The majority of patients were male (82%), with the highest incidence observed in the age group of 40–69 years. Psoriasis was identified as the leading cause of erythroderma (35%), followed by idiopathic erythroderma (13.33%), and non-bullous ichthyosiform erythroderma (8.33%). Chronic erythroderma accounted for 78.33% of cases, with psoriasis contributing most to this subgroup. Drug-induced erythroderma was most common in cases with acute onset. Itching (86.66%) and systemic symptoms (60%) were the most frequently reported clinical features. Nail changes were observed in 31.66% of cases, with ebonization being the most common alteration. Histopathological findings supported the clinical diagnosis in most cases, though some etiologies, including psoriasis and photodermatitis, presented with nonspecific dermatitis.
Conclusions
This study provides valuable insights into the diverse etiologies and clinical presentations of erythroderma. Psoriasis was the most common cause, while drug-induced erythroderma predominantly caused acute onset. Early

diagnosis, careful monitoring, and appropriate treatment strategies are essential for managing this challenging condition.

Introduction

Erythroderma, also known as generalized exfoliative dermatitis, is a severe inflammatory dermatological condition characterized by generalized erythema and desquamation involving more than 90% of the body surface area (1, 2). This potentially life-threatening condition is often associated with significant systemic complications, including metabolic disturbances and secondary infections. Despite its rarity, erythroderma remains a diagnostic and therapeutic challenge for dermatologists worldwide (3).

The term "erythroderma" was first introduced by Ferdinand von Hebra in 1868 in his seminal work *On Diseases of the Skin*. Hebra used the term to describe widespread redness and scaling of the skin, thereby laying the foundation for understanding this complex syndrome (4). Over time, the term has been refined to encompass a broad spectrum of etiologies, including both primary dermatoses such as psoriasis and secondary causes like drug reactions or malignancies (5). Erythroderma is uncommon, with its exact incidence varying across populations due to differences in genetic, geographic, and social factors. A retrospective study in China reported erythroderma in 13 out of every 100,000 dermatology patients, while a Portuguese study estimated an annual incidence of 9.4 cases (6, 7). The condition predominantly affects adults, with an average age of onset between 41 and 61 years, though it is more frequent in individuals over 45 years of age (6). Studies consistently indicate a male predominance, with male-to-female ratios ranging from 2:1 to 4:1 (8).

Erythroderma represents the ultimate clinical manifestation of several dermatological conditions. Its incidence varies significantly across populations due to genetic, geographic, and social differences (9). Most cases are attributed to exacerbations of pre-existing dermatoses, making patient history pivotal for diagnosis (9, 10). Psoriasis stands out as the most common underlying cause, accounting for 25–50% of cases in various studies (10, 11, 12). Psoriatic erythroderma often arises from triggers like abrupt withdrawal of corticosteroids or methotrexate, phototoxicity, or systemic infections (13). Other potential causes include eczematous conditions, drug reactions, malignancies, and infections, each contributing unique challenges to the diagnostic process (14).

The pathogenesis of erythroderma is complex, involving inflammatory cytokines and cellular adhesion molecules. Key players include IL-1, IL-2, IL-8, tumor necrosis factor, interferon-gamma, and intercellular adhesion molecule 1 (ICAM-1) (15, 16). These mediators accelerate epidermal cell turnover, reducing the transit time of keratinocytes and causing cutaneous exfoliation. This process leads to significant protein loss, with scaling contributing to a 25–30% increase in protein depletion in psoriatic erythroderma (16). The extensive shedding of amino acids, proteins, and nucleic acids further exacerbates metabolic disturbances, complicating the management of this condition (17).

Erythroderma typically begins as patches of erythema, which coalesce to involve most of the skin surface. Scaling appears within 2–6 days of onset, with the skin becoming bright red, warm, and indurated (18, 19). Acute phases often present large, crusted scales, whereas chronic cases feature finer, drier scaling (18, 20). The scale type may indicate the underlying etiology, such as fine scales in eczematous conditions or crusted scales in immunobullous diseases (21).

Nail changes, including discoloration, ridging, and pitting, occur in about 40% of patients, with paronychia and shiny nails less commonly observed (22). Palmoplantar keratoderma, seen in 30% of cases, is particularly indicative of conditions like pityriasis rubra pilaris (23). Chronic scratching may result in secondary lichenification and pigmentary changes.

These manifestations, combined with systemic symptoms like lymphadenopathy and hepatosplenomegaly, underscore the severity of erythroderma and its potential complications (24). Histopathological examination plays a critical role in the diagnosis of erythroderma, yet achieving diagnostic specificity can be particularly challenging due to overlapping histological features across various underlying conditions. A key study by Zip et al. highlighted the limitations of histopathology in diagnosing erythroderma, emphasizing its relatively low specificity and the need for integration with clinical and laboratory data to improve diagnostic accuracy (25). Similarly, Walsh et al. reviewed a series of erythroderma cases and reported significant interobserver variability among pathologists, further complicating the diagnostic process (26). Psoriatic erythroderma, a frequent underlying cause, is characterized histologically by features such as acanthosis, diffuse parakeratosis, and hypogranulosis. Tomasini et al. conducted a comprehensive study on 45 patients with psoriatic erythroderma, revealing these features as common markers but also noting their presence in other inflammatory dermatoses, thereby limiting their diagnostic exclusivity (27). In a more recent study, Megna et al. analyzed the histological presentation of erythroderma, reporting that while biopsies significantly contribute to identifying specific etiologies such as psoriasis or cutaneous T-cell lymphoma, approximately 39% of cases remained inconclusive even after extensive histological evaluation. This underscores the challenges of relying solely on histopathological findings for a definitive diagnosis (28). Histopathology remains an indispensable component of the diagnostic process in erythroderma.

Management of erythroderma involves addressing the underlying cause, providing supportive care, and minimizing complications. Prompt hospitalization is often required for severe cases to stabilize the patient and identify potential triggers. General measures include maintaining skin hydration with emollients, controlling pruritus with antihistamines, and preventing secondary infections through proper wound care and, if needed, antibiotics. Systemic corticosteroids may be employed in cases of drug-induced or idiopathic erythroderma, while immunosuppressive agents, such as methotrexate or cyclosporine, can be considered for psoriatic or autoimmune-related erythroderma. Nutritional support is critical to counter protein loss from excessive scaling, and fluid-electrolyte balance must be carefully monitored. (29) The aim of the study is to investigate the etiology, age and gender-specific clinical features, histopathological changes, and treatment responses in cases of erythroderma.

Materials and Methods

The study was conducted in the Outpatient Department (OPD) of Dermatology, Venereology, and Leprology at B.J Medical College and Civil Hopsital, Ahmedabad. Ethical approval for the study was obtained from the Ethics Committee, with reference number EC/certi/113/15. Informed written consent was taken from all patients prior to their inclusion in the study. A total of 60 patients were enrolled based on the inclusion criteria, and the study was conducted over a period of August 2013 to December 2015.

Patient Selection

The study included patients aged 18 years and above, diagnosed with erythroderma (generalized red skin) based on clinical and histopathological examination. Both male and female patients were included. Patients with a history of other chronic dermatological

conditions that could mimic erythroderma, those with contraindications to skin biopsy, pregnant or breastfeeding women, individuals with ongoing malignancy treatment, and those who refused consent were excluded from the study.

Data Collection

A detailed medical history was obtained from all patients after obtaining informed consent. The history included demographic details (age, gender), chief complaints, birth history, family history, history of seasonal variation in symptoms, personal medical history, and prior treatment for any dermatological conditions. A complete general and systemic examination was performed on each patient.

Dermatological Assessment

A thorough dermatological assessment was conducted, which included evaluating the distribution and morphology of the skin lesions. The involvement of other structures, such as hair, nails, teeth, and mucous membranes, was also carefully documented. The severity of skin involvement was recorded to assess the progression of the disease.

Investigations

Skin biopsy was performed on all patients to confirm the diagnosis of erythroderma and rule out other possible causes. Baseline laboratory investigations, including a complete hemogram, liver function tests (LFT), renal function tests (RFT), lipid profile, and other relevant blood investigations, were done to assess the overall health status of the patients. Specific investigations, such as Fine Needle Aspiration Cytology (FNAC), serum LDH (Lactate Dehydrogenase), lymph node biopsy, immunohistochemistry, bone marrow examination, CT scan, ECG, ultrasonography of the abdomen, and stool examination for occult blood, were carried out in selected patients to exclude malignancies and other underlying conditions.

Treatment and Management

Patients were managed based on the underlying etiology of erythroderma. Treatment regimens were individualized according to the clinical diagnosis and response to initial therapies. Regular monitoring of treatment efficacy, adverse effects, and disease progression was conducted throughout the study.

Follow-Up

Patients were followed up for at least 6 months to monitor the response to treatment and detect any relapses or complications. Follow-up assessments included repeated dermatological examinations and relevant laboratory tests. The effectiveness of the treatment was evaluated based on clinical improvement and the resolution of skin lesions.

Sample Size Calculation

The sample size of 60 patients was calculated based on an expected prevalence of erythroderma and the desired confidence level, with the aim of achieving statistical significance. The power of the study was set at 80%, with a significance level of 0.05. This sample size was deemed adequate to ensure reliable results and represent the general patient population in the OPD.

Results:

The present study comprises of 60 patients presenting to our OPD with clinical features of erythroderma from August 2013 to December 2015. The age distribution of erythroderma cases is presented in Table 1. The majority of cases were observed in the middle to older age groups. The highest prevalence was noted in the 50–59 years age group, accounting for 14 cases

(23.33%), followed by the 40–49 years and 60–69 years age groups, with 12 cases (20%) and 10 cases (16.66%), respectively. The 70–79 years and 10–19 years age groups each contributed 7 cases (11.66%) and 6 cases (10%), respectively, with the latter sharing its count with the 20–29 years age group, also reporting 6 cases (10%). Fewer cases were seen in the 30–39 years age group, with 3 cases (5%), and the lowest number was noted in the 0–9 years age group, comprising 2 cases (3.33%). Gender distribution among the patients revealed a significant male predominance. Out of the total 60 cases, 49 (82%) were male, while only 11 (18%) were female.

Table 1: Age distribution of erythroderma Cases

Age of Patients (Years)	No. of Cases (%)
0-9	2 (3.33)
10-19	6 (10)
20-29	6 (10)
30-39	3 (5)
40-49	12 (20)
50-59	14 (23.33)
60-69	10 (16.66)
70-79	7 (11.66)
Gender distribution among patients	
Male	49 (82%)
Female	11 (18%)
Total	60 (100)

The etiological distribution of erythroderma cases across different age groups is detailed in Table 2. Psoriasis was the most common cause, accounting for 21 cases (35%), with cases distributed across all age groups except 0–9 years. The majority of psoriasis cases were observed in the 60–69 years age group (6 cases, 10%), followed by 40–49 years (5 cases, 8.33%). Idiopathic erythroderma was the second most frequent etiology, with 8 cases (13.33%), predominantly seen in older patients aged 50 years and above. Non-bullous ichthyosiform erythroderma (NBIE) accounted for 5 cases (8.33%), primarily affecting children and young adults in the 0–29 years age range. Photodermatitis was identified in 6 cases (10%), with the majority distributed in the 50–59 years and 60–69 years age groups (3 and 2 cases, respectively). Malignancy-associated erythroderma was observed in 5 cases (8.33%), mostly in older age groups (50–59 years and 70–79 years). Drug-induced erythroderma accounted for 3 cases (5%), seen sporadically across various age groups. Other less common etiologies included atopic dermatitis, seborrheic dermatitis, CBIE, Netherton's syndrome, dermatophytosis, papuloerythroderma of Ofuji (POF), HIV, pityriasis rubra pilaris (PRP), pemphigus foliaceus (PF), and graft-versus-host disease (GVHD), each contributing 1–2 cases (1.66–3.33%).

Table 2: Age distribution according to etiology of erythroderma

Etiology	Age of Patients in years N (%)								Total patients N (%)
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	
Psoriasis	-	1 (1.66)	3 (5)	2 (3.33)	5 (8.33)	2 (3.33)	6 (10)	2 (3.33)	21 (35)
Idiopathic	-	-	-	-	-	4	2	2	8 (13.33)

							(3.33)	(3.33)	
NBIE	1 (1.66)	2 (3.33)	2 (3.33)	-	-	-	-	-	5 (8.33)
Photo dermatitis	-	-	-	-	1 (1.66)	3 (5)	2 (3.33)	-	6 (10)
Malignancy	-	-	-	-	-	3 (5)	-	2 (3.33)	5 (8.33)
Drug-induced	-	-	-	-	1 (1.66)	1 (1.66)	-	1 (1.66)	3 (5)
Atopic dermatitis	-	1 (1.66)	-	-	1 (1.66)	-	-	-	2 (3.33)
Seborrheic dermatitis	-	1 (1.66)	-	-	1 (1.66)	-	-	-	2 (3.33)
CBIE	-	-	1 (1.66)	-	-	-	-	-	1 (1.66)
Netherton's syndrome	1 (1.66)	-	-	-	-	-	-	-	1 (1.66)
Dermatophytosis	-	-	-	-	-	1 (1.66)	-	-	1 (1.66)
Papuloerythroderma of ofuzi (POF)	-	-	-	-	1 (1.66)	-	-	-	1 (1.66)
HIV	-	-	-	-	1 (1.66)	-	-	-	1 (1.66)
Pityriasis rubra Pillaris (PRP)	-	1 (1.66)	-	-	-	-	-	-	1 (1.66)
Pemphigus Foliaceus (PF)	-	-	-	1 (1.66)	-	-	-	-	1 (1.66)
GVHD	-	-	-	-	1 (1.66)	-	-	-	1 (1.66)
	3 (5)	6 (10)	5 (8.33)	3 (5)	12 (20)	14 (23.33)	10 (16.66)	7 (11.66)	60

The gender distribution of erythroderma cases according to etiology is summarized in Table 3. Psoriasis emerged as the most common cause, affecting 21 patients (35%), with a male predominance (15 males, 25%; 6 females, 10%). Idiopathic erythroderma accounted for 8 cases (13%), all of whom were male. Photodermatitis and malignancy-associated erythroderma each contributed to 6 (10%) and 5 (8.33%) cases, respectively, exclusively in males. Non-bullous ichthyosiform erythroderma (NBIE) accounted for 5 cases (8.33%), all in males. Drug-induced erythroderma involved 3 patients (5%), including 2 males (3.33%) and 1 female (1.66%). Atopic dermatitis and seborrheic dermatitis each accounted for 2 cases (3.33%). Atopic dermatitis was observed only in males, while seborrheic dermatitis affected both genders equally (1 male and 1 female). Other less common etiologies included CBIE, Netherton's syndrome, papuloerythroderma of Ofuji (POF), HIV, graft-versus-host disease (GVHD), dermatophytosis, pemphigus foliaceus (PF), and pityriasis rubra pilaris (PRP), each with 1 case (1.66%). Among these, dermatophytosis, pemphigus foliaceus, and PRP were observed only in females, while the remaining etiologies were seen in males.

Table 3: Gender Distribution according etiology of erythroderma

Etiology	Male	Female	No. of Patients N (%)

Psoriasis	15 (25)	6 (10)	21 (35)
Idiopathic	8 (13)	-	8 (13)
Photo Dermatitis	6 (10)	-	6 (10)
NBIE	5 (8.33)	-	5 (8.33)
Malignancy	5 (8.33)	-	5 (8.33)
Drug Induced	2 (3.33)	1 (1.66)	3 (5)
Atopic dermatitis	2 (3.33)	-	2 (3.33)
Seborrheic dermatitis	1 (1.66)	1 (1.66)	2 (3.33)
CBIE	1 (1.66)	-	1 (1.66)
Netherton's syndrome	1 (1.66)	-	1 (1.66)
Dermatophytosis	-	1 (1.66)	1 (1.66)
Papuloerythroderma of ofuzi (POF)	1 (1.66)	-	1 (1.66)
HIV	1 (1.66)	-	1 (1.66)
Pemphigus Foliaceus (PF)	-	1 (1.66)	1 (1.66)
PRP	-	1 (1.66)	1 (1.66)
GVHD	1 (1.66)	-	1 (1.66)
	49 (82)	11 (18)	60 (100)

The onset of erythroderma cases, categorized as acute (<6 weeks) or chronic, and their respective etiologies are presented in Table 4. Chronic erythroderma constituted the majority of cases (47 cases, 78.33%), with psoriasis being the most common chronic etiology, affecting 21 patients (35%). Other chronic causes included non-bullous ichthyosiform erythroderma (NBIE) in 7 cases (11.66%), photodermatitis in 4 cases (6.66%), idiopathic erythroderma in 4 cases (6.66%), and malignancy-associated erythroderma in 5 cases (8.33%). Less frequent chronic etiologies included atopic dermatitis, seborrheic dermatitis, dermatophytosis, pemphigus foliaceus, and Netherton's syndrome, each accounting for 1–2 cases (1.66–3.33%). In contrast, acute erythroderma accounted for 13 cases (22.67%), with drug-induced erythroderma being the most common cause, reported in 3 cases (5%). Other etiologies associated with acute onset included photodermatitis (2 cases, 3.33%), graft-versus-host disease (GVHD) (1 case, 1.66%), papuloerythroderma of Ofuji (POF) (1 case, 1.66%), HIV (1 case, 1.66%), pityriasis rubra pilaris (PRP) (1 case, 1.66%), and Netherton's syndrome (1 case, 1.66%).

Table 4: Onset of Erythroderma cases with its etiology

ETIOLOGY	No. of Patients N (%)	
	Acute onset (<6 week)	Chronic
Psoriasis	-	21 (35)
Idiopathic	4 (6.66)	4 (6.66)
NBIE	-	7 (11.66)
Photo dermatitis	2 (3.33)	4 (6.66)
Malignancy	-	5 (8.33)
Drug induced	3 (5)	-
Atopic dermatitis	-	2 (3.33)
Seborrheic dermatitis	-	2 (3.33)

NBIE	-	1 (1.66)
Netherton's syndrome	-	1 (1.66)
dermatophytes	-	1 (1.66)
Papuloerythroderma of ofuzi (POF)	1 (1.66)	-
HIV	1 (1.66)	-
Pemphigus foliaceus	-	1 (1.66)
PRP	1 (1.66)	-
GVHD	1 (1.66)	-
	13 (22.67)	47 (78.33)

The correlation of clinical features with the etiologies of erythroderma cases is presented in Table 5. Among the 60 patients, the most commonly reported symptom was itching, observed in 52 cases (86.66%), primarily in those with psoriasis (15 cases, 25%) and photodermatitis (6 cases, 10%). Other significant symptoms included nail changes, present in 19 cases (31.66%), and systemic features such as fever, joint pain, and pedal edema, observed in 36 cases (60%). Psoriasis, the most common etiology (21 cases, 35%), was frequently associated with systemic features (13 cases, 21.66%) and nail changes (8 cases, 13.33%). Idiopathic erythroderma was reported in 7 cases (11.66%), with 3 cases (5%) each showing itching and palpable lymph nodes. Non-bullous ichthyosiform erythroderma (NBIE) accounted for 4 cases (6.66%) of collodion baby presentation. Photodermatitis was reported in 6 cases (10%), all of which were associated with photosensitivity, while 4 cases (6.66%) presented systemic features. Malignancy-related erythroderma accounted for 5 cases (8.33%) and was associated with systemic symptoms (5 cases, 8.33%), weight loss (4 cases, 6.66%), and nail changes (5 cases, 8.33%). Drug-induced erythroderma (3 cases, 5%) showed a history of recent drug intake in all cases, while 1–2 cases of less common etiologies, such as atopic dermatitis, seborrheic dermatitis, dermatophytosis, graft-versus-host disease (GVHD), papuloerythroderma of Ofuji (POF), HIV, and pityriasis rubra pilaris (PRP), exhibited a limited range of symptoms.

Table 5: Co-relation of clinical features with clinical etiologies in cases of erythroderma

Etiology	No. of Patients N (%)								
	H/o itching	H/o Scalp Scaling	H/o Weight loss	H/o photo sensitivity	H/o Drug intake	H/o Collodion baby	H/o nail changes	Palpable lymph nodes	H/o Other Systemic Features (fever, joint pain, pedal oedema)

Psoriasis	21 (35)	15 (25)	-	-	-	-	8 (13.33)	-	13 (21.66)
Idiopathic	7 (11.66)	3 (5)	2 (3.33)	2 (3.33)	-	-	5 (8.33)	3 (5)	5 (8.33)
NBIE	-	-	-	-	-	4 (6.66)	-	-	2 (3.33)
Photo dermatitis	6 (10)	2 (3.33)	-	6 (10)	-	-	-	1 (1.66)	4 (6.66)
Malignancy	5 (8.33)	-	4 (6.66)	2 (3.33)	-	-	5 (8.33)	3 (5)	5 (8.33)
Drug induced	3 (5)	-	2 (3.33)	-	3 (5)	-	-	1 (1.66)	3 (5)
Atopic dermatitis	2 (3.33)	-	-	-	-	-	-	-	-
Seborrheic dermatitis	2 (3.33)	2 (3.33)	-	-	-	-	-	-	-
CBIE	1 (1.66)	-	-	-	-	-	-	-	1 (1.66)
Netherton's syndrome	-	-	-	--	-	-	-	-	1 (1.66)
dermatophytes	1 (1.66)	-	-	-	-	-	1	-	-
PRP	1 (1.66)	-	-	-	-	-	-	-	-
Papuloerythrod erma of ofuzi (POF)	1 (1.66)	-	-	-	-	-	-	-	1 (1.66)
GVHD	1 (1.66)	-	-	-	-	-	-	1 (1.66)	1 (1.66)
HIV	1 (1.66)	-	-	-	-	-	-	1 (1.66)	1 (1.66)
PF	1 (1.66)	1 (1.66)	1 (1.66)	-	-	-	-	-	1 (1.66)
Total patients	52 (86.66)	23 (38.33)	9 (15)	10 (16.66)	3 (5)	4 (6.66)	19 (31.66)	10 (16.66)	36 (60)

Nail changes were observed in 19 out of 60 patients (31.66%) with erythroderma, as detailed in Table 6. Ebonization was the most commonly reported nail change, present in 10 cases (16.66%). Other notable findings included ridging of nails in 3 cases (5%) and subungual hyperkeratosis in 2 cases (3.33%). Less common nail changes, each observed in a single patient (1.66%), included pitting, Beau's lines, onychomycosis, and onychomadesis. The diversity in

nail changes underscores the involvement of nail pathology as a frequent but varied clinical feature in erythroderma. Ebonization, being the most prevalent, may serve as a notable diagnostic clue in specific etiologies such as psoriasis.

Table 6: Nail Changes in erythroderma cases

Nail changes	No of patients
Ebonisation	10 (16.66)
Ridging of nail	3 (5)
Subungual Hyperkeratosis	2 (3.33)
Pitting	1 (1.66)
Beau's lines	1 (1.66)
Onychomycosis	1 (1.66)
Onychomedesis	1 (1.66)
Total	19 (31.66)

The comparison between clinical and histopathological diagnoses for erythroderma cases reveals varying degrees of concordance across different etiologies. Among the 21 cases clinically diagnosed as psoriasis, 14 cases (70%) were confirmed histopathologically as psoriasis, while 7 cases (30%) were categorized as nonspecific dermatitis. In 8 idiopathic cases, histopathological analysis revealed acute spongiotic dermatitis in 1 case (12.5%), chronic spongiotic dermatitis in 2 cases (25%), and nonspecific dermatitis in 5 cases (62.5%). Of the 6 cases clinically diagnosed as photodermatitis, histopathological confirmation was achieved in 3 cases (50%), while the remaining 3 (50%) were classified as nonspecific dermatitis. Similarly, for the 5 cases of nonbullous ichthyosiform erythroderma (NBIE), histopathology confirmed the diagnosis in 3 cases (60%) and classified 2 cases (40%) as nonspecific dermatitis. In malignancy-related erythroderma (5 cases), histopathological diagnoses included Sezary syndrome in 1 case (20%) and mycosis fungoides in 2 cases (40%), while 2 cases (40%) were nonspecific. All 3 cases of drug-induced erythroderma were confirmed histopathologically as lichenoid interface dermatitis (100%). Seborrheic dermatitis was clinically diagnosed in 2 cases, of which 1 case (50%) was confirmed histopathologically, and the other (50%) was nonspecific dermatitis. Similarly, of the 2 atopic dermatitis cases, 1 case (50%) was confirmed histopathologically, and 1 (50%) was nonspecific dermatitis. Single cases of dermatophytosis, congenital bullous ichthyosiform erythroderma (CBIE), Netherton's syndrome, pityriasis rubra pilaris (PRP), graft-versus-host disease (GVHD), papuloerythroderma of Ofuji, pemphigus foliaceus (PF), and HIV-related erythroderma were all histopathologically confirmed to match their clinical diagnoses, except for CBIE, Netherton's syndrome, and HIV-related erythroderma, which were classified as nonspecific dermatitis.

Table 7: Comparison between clinical diagnosis and histopathological diagnosis

Etiology	Number of cases	Histological diagnosis	Number of cases
Psoriasis	21 (35)	Psoriasis Nonspecific dermatitis	14 (70) 7 (30)
Idiopathic	8 (13.33)	Acute spongiotic dermatitis Chronic spongiotic dermatitis Nonspecific dermatitis	1 (12.5) 2 (25) 5 (62.5)
Photo dermatitis	6 (10)	Photo dermatitis Nonspecific dermatitis	3 (50) 3 (50)
NBIE	5 (8.33)	NBIE Nonspecific dermatitis	3 (60) 2 (40)
Malignancy	5 (8.33)	Sezary syndrome Mycosis fungoides Nonspecific dermatitis	1 (20) 2 (40) 2 (40)
Drug induced	3 (5)	Lichenoid interface dermatitis	3 (100)
Seborrheic dermatitis	2 (3.33)	Seborrheic dermatitis Nonspecific dermatitis	1 (50) 1 (50)
Atopic dermatitis	2 (3.33)	Atopic dermatitis Nonspecific dermatitis	1 (50) 1 (50)
Dermatophytosis	1 (1.66)	Dermatophytosis	1 (100)
CBIE	1 (1.66)	Nonspecific dermatitis	1 (100)
Netherton's syndrome	1 (1.66)	Nonspecific dermatitis	1 (100)
PRP	1 (1.66)	PRP	1 (100)
GVHD	1 (1.66)	GVHD	1 (100)
Papuloerythroderma of ofuzi	1 (1.66)	Papuloerythroderma of ofuzi	1 (100)

PF	1 (1.66)	PF	1 (100)
HIV	1 (1.66)	Nonspecific dermatitis	1 (100)

The laboratory findings in erythroderma cases, presented in Table 8, reveal several abnormalities commonly observed in these patients. Hypoproteinemia was the most frequent finding, affecting 37 patients (61.6%), followed by raised erythrocyte sedimentation rate (ESR) in 32 patients (53.3%) and eosinophilia in 31 patients (52.6%). Anemia was present in 24 cases (40%), while low blood sodium levels were found in 30 patients (50%). Low potassium levels were noted in 10 cases (16.6%). Additionally, peripheral smears (PS) revealed atypical cells in 12 cases (20%), with eosinophils being the most common atypical cell type. Lymphocytes were identified in 6 cases (10%). These laboratory abnormalities highlight the systemic involvement often seen in erythroderma and may aid in distinguishing underlying causes.

Table 8: Laboratory findings in erythroderma cases

Laboratory findings	No of Patients N (%)
Anemia	24 (40)
Eosinophilia	31 (52.6)
Raised erythrocyte sedimentation rate (ESR)	32 (53.3)
Hypoproteinemia	37 (61.6)
Low blood sodium level	30 (50)
Low potassium	10 (16.6)
PS for atypical cell showing eosinophil	12 (20)
PS for atypical cell showing lymphocytes	6 (10)

The remission outcomes for cases of erythroderma based on clinical etiologies reveal varied patterns. Among the 21 cases of psoriasis, 2 patients achieved remission within 1 month, 4 between 1–3 months, and 6 within 6 months, resulting in a total remission rate of 12 patients (20%). For idiopathic erythroderma, 4 out of 8 cases (6.66%) experienced remission, with 1 patient achieving it within 1 month, another within 1–3 months, and 2 within 6 months. In photodermatitis, remission was observed in 4 out of 6 cases (6.66%), with 1 patient each achieving it within 1 month and 1–3 months, and 2 within 6 months. Notably, there were no cases of remission in 5 patients with nonbullous ichthyosiform erythroderma (NBIE) or malignancy-related erythroderma. All 3 cases of drug-induced erythroderma achieved remission within 1 month, accounting for 5% of the total cases. Among the 2 cases of seborrheic dermatitis, remission was achieved by 1 patient within 1 month and another within 1–3 months, accounting for 3.33%. The single case of dermatophytosis showed remission within 1 month, contributing 1.66% to the total. However, there were no cases of remission in congenital bullous ichthyosiform erythroderma (CBIE) or Netherton's syndrome. Other conditions showed limited remission rates. In papuloerythroderma of Ofuji, the single case achieved remission within 1–3 months (1.66%). Similarly, the single cases of HIV-related erythroderma and pemphigus foliaceus achieved remission within 6 months and 1–3 months, respectively, each accounting for 1.66%. Pityriasis rubra pilaris (PRP) also saw remission in 1 patient within 1–3 months (1.66%), and graft-versus-host disease (GVHD) achieved remission in its single case within 1 month (1.66%). Overall, out of 60 cases of erythroderma, remission was observed in 10 patients within 1 month, 10 patients between 1–3 months, and 11 patients

within 6 months. This brought the total number of remissions to 31 cases, accounting for 51.66% of the total study population.

Table 9: Remission of cases of erythroderma with clinical etiologies

No	Etiology of patients.	No of pts.	Remission with in 1 month (patients)	Remission in 1-3 month (patients)	Remission in 6 month (patients)	Total no of patients in remission
1	Psoriasis	21	2	4	6	12 (20)
2	Idiopathic	8	1	1	2	4 (6.66)
3	Photo dermatitis	6	1	1	2	4 (6.66)
4	NBIE	5	-	-	-	-
5	Malignancy	5	-	-	-	-
6	Drug induced	3	3	-	-	3 (5)
7	Atopic dermatitis	2	-	-	-	-
8	Seborrheic dermatitis	2	1	1	-	2 (3.33)
9	Dermatophytosis	1	1	-	-	1 (1.66)
10	CBIE	1	-	-	-	-
11	Netherton's syndrome	1	-	-	-	-
12	Papuloerythroderma of ofuzi	1	-	1	-	1 (1.66)
13	HIV	1	-	-	1	1 (1.66)
14	Pemphigus foliaceus	1	-	1	-	1 (1.66)
15	PRP	1	-	1	-	1 (1.66)
16	GVHD	1	1	-	-	1 (1.66)
		60	10	10	11	31 (51.66)

Discussion

Erythroderma, characterized by widespread erythema and scaling involving more than 90% of the body surface area, is a severe dermatological condition that can result in significant morbidity and mortality. Its presentation often masks underlying etiologies, making the diagnostic process complex and multifaceted. Furthermore, its systemic impact, including electrolyte imbalances, nutritional deficiencies, and secondary infections, adds layers of therapeutic challenges.

In this context, our study of 60 patients with erythroderma provides valuable insights into the condition's demographic patterns, underlying causes, and clinical manifestations, contributing to the growing body of knowledge in the field. By analyzing these cases over a two-year period, we aimed to identify key trends and correlations that can guide clinical practice. Our findings reinforce the heterogeneity of erythroderma, as the etiologies range from common dermatoses like psoriasis to rare conditions such as Netherton's syndrome. The study also highlights the significant burden of chronic presentations, which often stem from long-standing dermatological disorders. (30) Additionally, the observed demographic trends, such as the marked male predominance and peak prevalence in middle-aged and older adults, are consistent with global data, suggesting potential biological and environmental factors influencing disease occurrence. (31)

The observed male predominance (82%) in our study aligns with findings from Vasconcellos et al. (1995) and Rothe et al. (2005), suggesting that males are more commonly affected by erythroderma. This could be attributed to higher occupational exposure to irritants, allergens, or harsh environmental conditions in industries where men predominantly work. Additionally, lifestyle factors such as increased smoking and alcohol use, known to exacerbate dermatological conditions, might contribute. Hormonal differences may also play a role, as testosterone can influence immune responses and skin inflammation. The peak prevalence in the 50–59 years age group aligns with cumulative exposure to triggers and aging-related immune dysregulation. (32, 33, 34)

Psoriasis was identified as the leading etiology (35%), corroborating findings from studies by Singh et al. (2016) and Rosenbach et al. (2010), where psoriasis accounted for 25–40% of cases. This reinforces psoriasis as a significant contributor to chronic erythroderma. (35, 36) The proportion of idiopathic cases (13.33%) is comparable to the 10–20% range reported in the literature, emphasizing the diagnostic uncertainty often encountered in erythroderma. Drug-induced erythroderma accounted for 5% of cases in our study, a lower prevalence compared to Akhyani et al. (2005), where it constituted 14% of cases. This discrepancy may reflect regional differences in prescribing practices, medication availability, and patient compliance. In Akhyani et al.'s study, allopurinol emerged as the primary culprit, frequently used for managing hyperuricemia and gout. (37) Differences in the prevalence of conditions requiring such medications, along with variations in awareness of potential adverse reactions, may explain this variation.

Chronic erythroderma predominated in our cohort (78.33%), consistent with other studies indicating that chronic cases often stem from pre-existing dermatoses like psoriasis (Hoxha et al., 2020). (38) Acute cases, primarily drug-induced, highlight the need for thorough medication histories in such presentations, as emphasized by recent reviews (Khaled et al., 2010). (39) Interestingly, rarer etiologies such as pityriasis rubra pilaris (PRP) and pemphigus

foliaceus were exclusively seen in females, consistent with case series highlighting gender-related differences in less common forms of erythroderma (Wang et al., 2018). (40)

Pruritus (86.66%) emerged as the most common symptom, paralleling the findings from Pal et al. (1998), where itching was reported in over 80% of cases. (41) Systemic features like fever and edema (60%) were frequently associated with malignancy-related erythroderma, underscoring the importance of systemic evaluation in suspected malignancy cases. Nail changes, notably ebonization (16.66%), were significant diagnostic clues, as highlighted in studies by Tan et al. (2014). (42)

Hypoproteinemia (61.6%) and eosinophilia (52.6%) were the most common laboratory abnormalities, reflecting systemic inflammation and nutritional depletion, as reported by Lu et al. (2024). (43) Raised ESR (53.3%) and atypical cells in peripheral smears (20%) were consistent with findings in malignancy-associated erythroderma, emphasizing the value of laboratory investigations in identifying underlying malignancies (Zervakis et al., 2020). (44) Our findings broadly align with global data but also highlight regional variations in etiology and clinical features. For instance, the lower prevalence of drug-induced erythroderma compared to studies in Western populations may reflect differences in prescribing practices and pharmacogenetics. Similarly, the higher proportion of idiopathic cases underscores the need for improved diagnostic protocols in resource-limited settings.

Conclusion

This study provides a detailed analysis of erythroderma, emphasizing its multifactorial etiology, male predominance, and chronic presentation. Psoriasis emerged as the leading cause, reflecting its global significance in erythroderma etiology. The predominance of male patients aligns with findings from other studies, possibly linked to environmental and occupational exposures. Chronic cases outweighed acute presentations, underscoring the complexity and prolonged course of erythroderma management.

The high prevalence of systemic symptoms, nail changes, and laboratory abnormalities highlights the need for a multidisciplinary approach to enhance diagnostic accuracy and treatment outcomes. Future research should focus on elucidating the genetic predispositions, regional differences in etiological factors, and the role of environmental triggers in erythroderma progression. Incorporating advancements in immunopathology and personalized medicine could further refine the management strategies for this challenging dermatological condition.

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