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RESEARCH ARTICLE

Study of the Correlation of Erythroderma and Histopathologic Features, Clinical Presentations and Causative Factors

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ABSTRACT

Erythroderma is a medical condition characterized by inflammation involving skin over 90% of the body's surface area. This condition can result in high mortality rate and many systemic complications including fluid and electrolyte imbalance, infections, thermoregulatory disturbance and high output cardiac failure. In Thailand, limited data have been reported in the literature.

This study aims to investigate epidemiologic, clinical and histologic data relevant to etiologies of erythroderma among adults.

We performed a retrospective study among all patients acquiring erythroderma, aged above 16 years and visiting at the Division of Dermatology, Department of Internal Medicine, Phramongkutklao Hospital, Thailand from January 2015 to December 2019. The following data were recorded: personal data, medical history, clinical manifestations, histopathologic results, possible etiologies, laboratory profiles, treatment methods and outcomes.

During the 5-year study, 35 patients with erythroderma were collected. Men outnumbered women 6:1 (30 men and 5 women). The age of these patients ranged from 18-90 with mean age of 66.4 years. Idiopathic was the predominant etiology with 20/35 cases (57.1%), followed by drug eruption (17.1%). Herbal medicine (33.3%) and spironolactone (33.3%) were the most implicated drugs. Pre-existing skin diseases were observed including psoriasis (17.1%), pityriasis rubra pilaris (2.8%) and malignancy associated erythroderma (2.8%). Epidermal spongiosis was the most common histological feature observed in all etiologies (85.7%), (p=0.029). Complete clearance was obtained in 15/35 (42.8%). Death 2/35 (5.6%) occurred in one patient with drug reaction and one patient with pemphigus vulgaris associated erythroderma complicated with sepsis.

Although data are limited, erythroderma remains a serious condition effecting quality of life of patients. Our study demonstrated further epidemiology, etiologies and clinicopathologic information of erythroderma among Thai patients.

Key words- Erythroderma, exfoliative dermatitis, adult

Introduction

Erythroderma is a medical condition characterized by inflammation involving skin over 90% of the body's surface area. This condition can result in high mortality rate and many systemic complications including fluid and electrolyte imbalance, infections, thermoregulatory disturbance and high output cardiac failure.[1, 2] Regarding epidemiology, erythroderma is presented in 0.44% of all dermatosis case,.[3] and mean age of onset was 54.4 years with a 1.5:1 male to female ratio.[3, 4]

Fever, anemia and hypoalbuminemia, leading to high output cardiac failure, usually appear among patients with erythroderma. a A small number of patients with erythroderma have secondary infections or septicemia. The diversified etiologies of erythroderma constitute a challenge for dermatologists to investigate, diagnose and facilitate management to their patients.[3] The etiologies include pre-existing skin diseases, drug-induced, malignant associated and idiopathic conditions.[3] In general, drug-induced erythroderma commonly results from carbamazepine, allopurinol and beta-lactam antibiotics.[3, 4]

The treatment depends on underlying diseases. Initial management comprises correcting fluid and electrolyte imbalances, preventing hypothermia and managing nutrition status.[5]

Therefore, clinical history, physical examination and histologic features represent a fundamental aid to diagnose its etiologies. The selection of treatment modalities depend on etiology and clinical manifestation. To date, little literature is available concerning erythroderma in Thai populations. This study aims to investigate epidemiologic, clinical and histologic data relevant to etiologies of erythroderma among adults visiting our dermatology division in Phramongkutklao Hospital, Bangkok, Thailand.

Materials and Methods

We performed a retrospective study among all patients acquiring erythroderma, aged above 16 years and visiting the Division of Dermatology, Department of Internal Medicine, Phramongkutklao Hospital, Bangkok, Thailand from January 2015 to December 2019. The following data were recorded: personal data, medical history, clinical manifestations, histopathologic results, possible etiologies, laboratory profiles, treatment methods and outcomes.

Erythroderma was defined as patients with erythema involving more than 90% of body surface area. Laboratory investigations included basic laboratory investigations (complete blood count (CBC), liver and renal function tests), malignancy investigations which including chest radiographies, ultrasound abdomen and/or computerized tomography. Skin biopsies were taken in all patients with erythroderma and evaluated by dermatopathologists. The histopathologic features included epidermal and dermal abnormalities and inflammatory cells infiltration in the dermis.

Data were analyzed using SPSS® (Statistical Package for Social Sciences, Version 26, IBM Inc., USA). Statistical significance was considered as $p < 0.05$. We analyzed the data using Chi-square test determining relationships.

Results

During the 5-year study, 35 patients with erythroderma were enrolled. Men outnumbered women by 6:1 (30 men and 5 women). The age of onset ranged from 18 to 90 years with mean age of 66.4 years. Duration of erythroderma at a mean of 30.5 days (ranges: 7-183 days) with shorter duration was observed in the case of drug induced erythroderma and longer periods with idiopathic erythroderma.

According to medical history, 27 patients (77%) had metabolic syndrome including hypertension, dyslipidemia and diabetic mellitus. Hematologic conditions were also observed including myelodysplastic syndrome (MDS) (n=1) and hyper eosinophilic syndrome (n=1). Four patients (11.4%) had previous dermatoses conditions: psoriasis (3 patients) and vitiligo (1 patient).

According to extracutaneous symptoms, fever was significantly observed in pemphigus vulgaris related erythroderma (1/1; 100%) due to complication from sepsis ($p = 0.018$). Eight patients (22.8%) had fever found in the psoriasis (3/6; 50%), drug reaction (1/6; 16.6%) and idiopathic groups (3/20; 15%)

Significant weight loss was presented among seven patient (20%) found in one patient in both psoriasis (1/6; 16.6%) and drug reaction (1/6; 16.6%) groups followed by idiopathic group (3/20; 15%). Malignancy associated erythroderma and pemphigus vulgaris related erythroderma were significantly related to weight loss ($p = 0.012$). Two patients (2/20; 10%) in the idiopathic group presented lymphadenopathy.

Possible etiologies among our patients are shown in Figure 1 and Table 1

Etiology		Idiopathic n=20, 57.1%		Drug reaction n=6, 17.1%		Psoriasis n=6, 17.1%		Pityriasis rubra pilaris n=1, 2.8%		Malignancy (HCC) n=1, 2.8%		Pemphigus vulgaris n=1, 2.8%		Total n=35	
Age at visit (years)	Mean	68.9		71.6		53.5		57.0		60.0		78.0		66.4	
	Range	(18-90)		(49-87)		(26-64)		(57)		(60)		(28-76)		(18-90)	
Male:Female ratio		9 : 1		6 : 0		2 : 1		1 : 0		1 : 0		0 : 1		6 : 1	
Duration of erythroderma before visit (days)	Mean	145		13		25		60		14		180		30.5	
	Range	4-730		2-30		8-90		60		14		180		(2-730)	
Duration of treatment (days)	Mean	215		37.3		100		730		1095		21		122	
	Range	14-1825		14-60		5-365		730		1095		21		(4-1825)	
Clinical findings		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Fever		3	15	1	16.6	3	50	0	0	0	0	1	100	8	22.8
Lymphadenopathy		2	10	0	0	0	0	0	0	0	0	0	0	2	5.71
Weight loss		3	15	1	16.6	1	16.6	0	0	1	100	1	100	7	20
Underlying disease		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Hypertension		10	50	3	50	2	33.3	0	0	1	100	1	100	17	48.5
Diabetes		10	50	2	33.3	0	0	0	0	1	100	0	0	13	37.1
Dyslipidemia		5	25	3	50	3	50	0	0	0	0	0	0	11	31.4
Chronic kidney disease		5	25	3	50	0	0	0	0	0	0	0	0	8	22.8
Laboratory data		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Leukocytosis		4	20	0	0	3	50	1	100	0	0	1	100	9	25.7
Eosinophilia		8	40	2	33.3	0	0	0	0	1	100	0	0	11	31.4
Anemia		2	10	1	16.6	1	16.6	0	0	0	0	0	0	4	11
Renal failure		2	10	3	50	0	0	0	0	0	0	0	0	5	14.2
Hepatitis		1	5	1	16.6	2	33.3	0	0	0	0	1	100	5	14.2
Treatment		Topical therapy:20 (100%) Oral Prednisolone:9		Topical therapy:6 (100%) Oral Prednisolone:		Topical therapy:6 (100%) Oral Prednisolone:		Topical therapy:1 (100%) Oral Prednisolone:		Topical therapy:1 (100%) Oral Prednisolone:		Topical therapy:1 (100%) Oral Prednisolone:		Topical therapy:35 (100%) Oral Prednisolone:	

	(45%) Oral retinoid:1 (5%) Oral Methotrexate:2 (10%) Phototherapy:6 (30%)	4 (66.6%) Oral retinoid:- (-) Oral Methotrexate:- (-) Phototherapy:- (-)	- (-) Oral retinoid:5 (83.3%) Oral Methotrexate:2 (33.3%) Phototherapy: - (-)	1 (100%) Oral retinoid:1 (100%) Oral Methotrexate:1 (100%) Phototherapy: 1 (100%)	- (-) Oral retinoid:- (-) Oral Methotrexate - (-) Phototherapy: - (-)	1 (100%) Oral retinoid:- (-) Oral Methotrexate: - (-) Phototherapy:- (-)	15 (42.8%) Oral retinoid:7 (20%) Oral Methotrexate:5 (14.2%) Phototherapy: 7 (20%)
Outcome	LF:4 (20%) Clearance:13 (65%) Remission:1 (5%) NR:1 (5%)	LF:2 (33.3%) Clearance:1 (16.6%) Remission:2 (33.3%) NR:-	LF:2 (33.33) Clearance:1 (16.6) Remission:3 (50%) NR:-	LF:- Clearance:- Remission:1 (100%) NR:-	LF:- Clearance:- Remission:1 (100%) NR:-	LF:- Clearance:- Remission:- NR:-	LF:8 (22.8%) Clearance:15 (42.8%) Remission:8 (22.8%) NR:1 (2.8%)
Relapse	1 (5%)	0	0	0	0	0	1 (2.8%)
Death	0	1 (16.6%)	0	0	0	1 (16.6%)	2 (5.6%)

Table 1 Epidemiology, clinical and laboratory results of patients with erythroderma (LF; lost to follow-up, NR: no response)

Idiopathic erythroderma was the predominant etiology with 20/35 cases (57.1%), followed by drug eruption and pre-existing skin diseases and shown in Figure 1. Interestingly, mean age in each etiology revealed a similar range from 53.8 to 78 years. Males were predominantly observed in almost all etiologies.

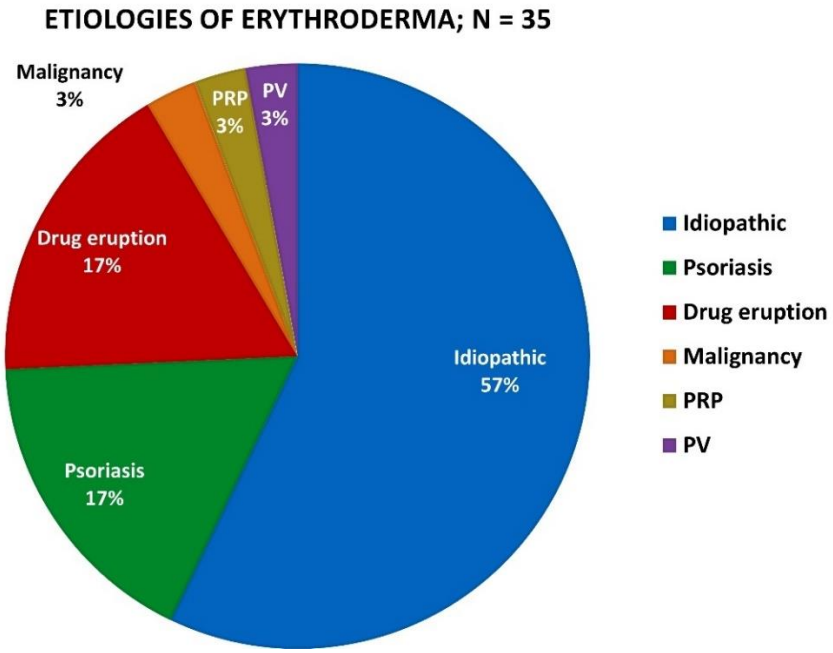

Figure 1 Etiologies of erythroderma

Drug eruption had a shorter duration of erythroderma compared with other groups. The relationship between drug intake and erythroderma was established from the history of drug consumption during onset of erythroderma and clinical improvement after withdrawing the suspected drug.

Culprit drugs (Figure 2) were as follows: herbal medicines in two cases (33.3%), spironolactone in two cases (33.3%), radiocontrast media in one case (16.6%) and ceftriaxone in one

case (16.6%). In these group, three patients presented renal failure (3/6; 50%) and two patients had peripheral blood eosinophilia (2/6; 33.3%).

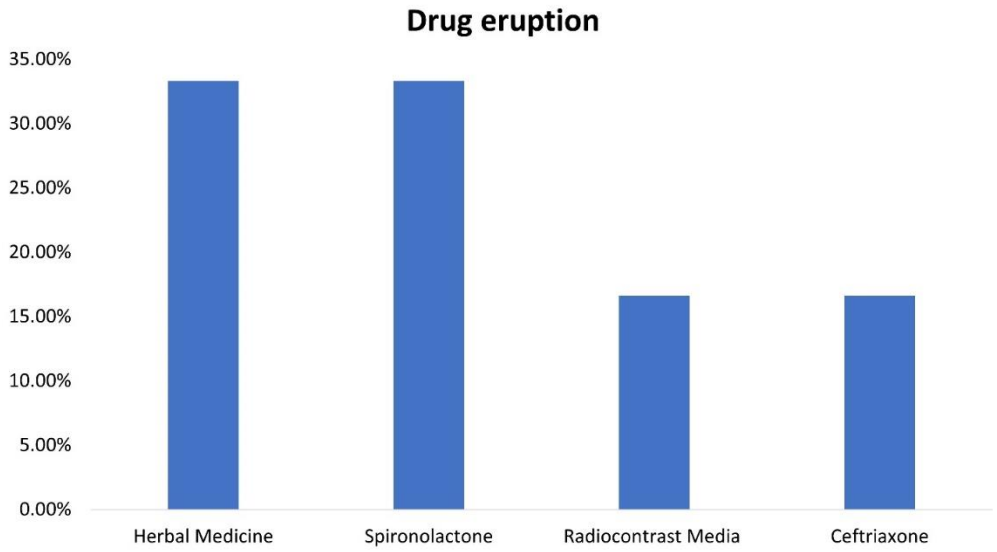

Figure 2 Culprit drugs in erythroderma from drug eruption

Pre-existing skin diseases among our patients included psoriasis (6/35; 17.1%), pityriasis rubra pilaris (1/35; 2.8%) and pemphigus vulgaris (1/35; 2.8%). Psoriasis was the third predominant etiology with youngest age of onset (53.5) compared with those of other groups.

Laboratory abnormalities were found among 27 patients (27/35; 77.1%) as shown in Table 1. Eosinophilia was the most common finding (31.4%) in all groups of erythrodermas. Interestingly, eosinophilia presented in idiopathic erythroderma (8/20; 40%) greater than that in the drug reaction group (2/6; 33%). Nine patients (9/35; 25.8%) presented with leukocytosis found in the psoriasis group (3/6; 50%), idiopathic erythroderma (1/20; 5%), pityriasis rubra pilaris (1/1; 100%) and pemphigus vulgaris groups (1/1; 100%), respectively. Hepatitis defined as increase of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) presented among 14.2% (5/35; 14.2%) of the patients, mostly observed in the psoriasis group (2/6; 33.3%) follow by drug reaction (1/6; 16.6%) and idiopathic erythroderma (1/20; 5%) groups, respectively. Renal failure (5/35; 14.2%) and anemia (4/35; 11%) also presented as shown in Table 1.

Hepatitis was found significantly associated with pemphigus vulgaris in a related case of erythroderma ($p = 0.018$). No other cause of erythroderma was significantly associated with any of the remaining laboratory abnormalities including anemia, leukocytosis or renal failure.

In our study, one case with malignancy (hepatocellular carcinoma) associated erythroderma was identified. This case was a 60-year-old male patient presenting significant weight loss and erythroderma. Further investigation including CT whole abdomen revealed liver mass, later reported as hepatocellular carcinoma.

Cutaneous biopsy was performed in all 35 patients. The most common histologic feature observed in erythroderma was epidermal spongiosis (31/35; 86%) and superficial perivascular infiltration (35/35; 100%). Seven cases (7/35; 20%) presented deep perivascular inflammatory cells infiltration. Predominant inflammatory cells infiltration were lymphocytes (22/35; 62.8%) followed by lymphocytes with eosinophils (8/35; 22.8%).

Regarding the idiopathic subgroup, epidermal spongiosis (19/20; 95%) was the most common histopathologic finding, follow by orthokeratosis (15/20; 75%) and parakeratosis (6/20; 30%). We also observed superficial perivascular infiltration with lymphocytes (20/20; 100%) followed by superficial perivascular infiltration with eosinophil (5/20; 25%). Other histopathologic features are shown in Table 2.

Histologic features	Final etiologies of erythroderma						p-value
	Idiopathic	Drug eruption	Psoriasis	Malignancy (HCC)	Pemphigus vulgaris	Pityriasis rubra pilaris	
N	**20**	**6**	**6**	**1**	**1**	**1**	
Orthokeratosis	15 (75%)	5 (83.3%)	3 (50%)	1 (100%)	1 (100%)	1 (100%)	0.676
Parakeratosis	5 (25%)	1 (16.7%)	3 (50%)	0 (0%)	0 (0%)	1 (100%)	0.393
Spongiosis	19 (95%)	6 (100%)	4 (66.7%)	1 (100%)	1 (100%)	0 (0%)	0.029*
Psoriasiform	5 (25%)	0 (0%)	3 (50%)	0 (0%)	0 (0%)	1 (100%)	0.185
Atrophic	1 (5%)	2 (33.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.32
Necrotic keratinocyte	2 (10%)	1 (16.7%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0.11
Interface change	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	N/A
Intraepidermal separation	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.979
Subepidermal separation	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	N/A
Superficial Perivascular infiltration	20 (100%)	6 (100%)	6 (100%)	1 (100%)	1 (100%)	1 (100%)	1
Deep Perivascular infiltration	4 (20%)	1 (16.7%)	1 (16.7%)	0 (0%)	1 (100%)	0 (0%)	0.469
Superficial and Deep Perivascular infiltration	4 (20%)	1 (16.7%)	1 (16.7%)	0 (0%)	1 (100%)	0 (0%)	0.469
Interstitial infiltration	5 (25%)	1 (16.7%)	2 (33.3%)	0 (0%)	1 (100%)	0 (0%)	0.546
Predominant inflammatory cell infiltration							
Lymphocytes	13 (65%)	4 (66.7%)	3 (50%)	1 (100%)	0 (0%)	1 (100%)	0.051
Lymphocytes, Eosinophils	4 (20%)	2 (33.3%)	2 (33.3%)	0 (0%)	0 (0%)	0 (0%)	
Lymphocytes, Eosinophils, Neutrophils	0 (0%)	0 (0%)	1 (16.7%)	0 (0%)	0 (0%)	0 (0%)	
Lymphocytes, Histiocytes, Plasma cells	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
Lymphocytes, Plasma cells	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	
Lymphocytes, Plasma cells, Eosinophils	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
Atypical lymphocytes	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	N/A
Exocytosis	7 (35%)	1 (16.7%)	1 (16.7%)	0 (0%)	1 (100%)	0 (0%)	0.475
Epidermotrophism	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.979

Table 2 Relationship between etiologies and histopathologic features among patients with erythroderma (HCC; Hepatocellular carcinoma)

Concerning drug reaction, the most common histopathologic feature was spongiosis of the epidermis (6/6; 100%) one case (1/6; 16.6%) had necrotic keratinocytes. The presence of superficial perivascular infiltration with lymphocytes was observed among all patients (6/6; 100%). Superficial perivascular infiltration with eosinophils (2/6; 33.3%) was found in fewer numbers.

Regarding psoriasis, the histopathologic features were the presence of epidermal spongiosis (4/6; 66%) and psoriasiform epidermis (3/6; 50%) followed by diffuse parakeratosis (3/6; 50%). Superficial perivascular infiltration with lymphocytes (6/6; 100%) was the most common presentation, followed by superficial perivascular infiltration with eosinophils (3/6; 50%) and neutrophils (1/6; 16.6%).

Histopathology of one patient presenting malignancy associated erythroderma showed orthokeratosis, epidermal spongiosis with superficial perivascular infiltration with predominant lymphocytes.

The remaining patients whose clinical signs suggested a diagnosis of pityriasis rubra pilaris and pemphigus vulgaris were correlated with histopathologic results.

We further investigated the correlation between etiologies and specific histopathology features. The Chi-square test demonstrated the significant association in epidermal spongiosis and idiopathic erythroderma ($p = 0.029$). Other specific histopathology features failed to represent the relationship to all etiologies of erythroderma in this study ($p > 0.05$) as shown in Table 2.

Topical treatment was obtained in all patients with erythroderma, while systemic treatment was observed among 22/35 patients (62.8%). The systemic treatments included oral prednisolone, oral retinoid and methotrexate as shown in Table 1.

Complete clearance was obtained among 15/35 (42.8%) patients, while 8/35 (22.8%) patients were in remission and 8/35 (22.8%) patients were lost to follow-up. One case in the idiopathic group experienced relapse. Death was found among 2/35 (5.6%) patients occurring in one patient with drug reaction and one patient with pemphigus vulgaris associated erythroderma complicated with sepsis.

Discussion

We collected 35 cases over a 5-year period. In this study, the annual incident of erythroderma was 7 cases yearly. Compared with related studies, hospital incidence varies from 4.9 cases yearly in Thailand[6] to 9.4 cases yearly in the Netherlands.[7]

In our study, median age of onset among patients with erythroderma was 66.4 years. Males predominated more than females similar to related literature and corresponding to high sample sized studies in Singapore[8] and Brazil.[9]

Country	Author(s), year	Number	Age of onset	Male : Female ratio
Thailand	Our study	35	66.4	6 : 1
Thailand	Leenutaphong et al., 1999[6]	49	51.7	2 : 1
Iran	Akhyani et al., 2005[10]	97	46.2	1.85 : 1
Singapore	Tan et al., 2014[8]	225	66	3 : 1
Brazil	Miyashiro et al., 2020[9]	309	57	2.2 : 1

Table 3 Demographic data of our study compare to other studies.

The etiologies of erythroderma in our study compared with those of other studies are shown in Table 4. In our study, idiopathic etiology was the main cause of erythroderma. This was in contrast with other reports where the predominant etiologies were drug reaction and pre-existing dermatosis. [4, 6, 7] The diversified etiologies in erythroderma were related to genetic, geographic and cultural factors in each country and period of each study.

Country	Author(s), year	N	Idiopathic (%)	Drug reaction (%)	Pre-existing dermatosis (%)	Malignancies (%)
Thailand	Our study	35	57	17	23	3
Thailand	Leenutaphong et al., 1999[4]	49	33	39	26	2
Singapore	Tan et al., 2014[6]	225	14.2	10.7	68.9	4
Brazil	Miyashiro et al., 2020[7]	309	16.8	12.3	53	17.8

Table 4 Comparison of related studies for erythroderma etiology

In our study, drug-induced erythroderma exhibited the shortest duration of onset and shorter hospitalization times compare with other etiologies. Similar to a related study, César A, et al. showed the result of drug-induced erythroderma tended to be more sudden and resulted in faster resolution than other etiologies.[4]

The culprit drugs varied between studies and appeared to be correlate with countries, time periods and cultures.[11] In our study, herbal medicine and diuretic agents were the most common causative drugs compared with antibiotics and anticonvulsants which were predominantly observed in related studies from Thailand.[6]

In our study, psoriasis was the majority cause of pre-existing dermatosis induce erythroderma. Related studies indicated that erythrodermic psoriasis may result from long standing and poorly controlled disease.[10,11]

Like findings of many other reports, extracutaneous symptoms of erythroderma including fever and pruritus were nonspecific.[3, 11] Surprisingly, we found a lower percentage of lymphadenopathies compared with related studies.[3, 10, 11] In related literature, lymphadenopathies correlated with cutaneous T-cell lymphoma (CTCL),[4] contrasting with our study indicating no case of CTCL. This may be explain the fewer number of lymphadenopathies in our study. In addition, lymphadenopathy among our patients resolved after treatment of erythroderma and no recurrence was found in the follow-up period. For these reasons, we did not perform lymph node biopsy among these patients. Furthermore, we also observed significant weight loss in pemphigus vulgaris related to erythroderma resulting from extensive loss of epidermal barrier function, leading to loss of body fluid and malnutrition.[12]

Liver enzyme alteration was significantly observed in pemphigus vulgaris related erythroderma, suspected from high dose corticosteroid therapy. Related studies demonstrated that high dose corticosteroid therapy in pemphigus vulgaris may trigger immunoallergic liver injury.[13, 14] Although other possible causes of liver enzyme alteration including viral hepatitis infection or alcoholic hepatis were ruled out, our study did not perform liver biopsy to identify the exact cause of liver injury.

Other laboratory abnormalities did not provide significant information correlated to any etiologies as well as in others.[15] In our study, anemia, leukocytosis, eosinophilia and renal failure were commonly found in erythroderma unspecific to any etiologies. No relationship was found between eosinophilia and drug-induced erythroderma. The related literature also suggested that eosinophilia and leukocytosis resulted from the inflammation process without significance.[6]

Studies reported that skin biopsies contributed a helpful diagnostic tool to identify final etiologies of erythroderma. The accuracy of histopathology ranged from 25 to 40%.[6,9] Our study demonstrated that histologic diagnosis was helpful in establishing a final etiology of erythroderma at 22.8% similar to a related study from Thailand.[6] Histopathologic results of erythroderma were usually nonspecific dermatitis including spongiosis or psoriasiform dermatitis without any association to its etiology.[6] Interestingly, our study demonstrated that epidermal spongiosis with superficial perivascular infiltration of lymphocytes indicated a significant association to idiopathic erythroderma ($p < 0.05$).

Although most histopathologic features are nonspecific and the final diagnosis can be made mainly by history and clinical manifestations, skin biopsy in erythroderma remains important to exclude other serious diseases such as CTCL.

Moreover, we observed dermal eosinophils infiltration in 50% of specimens of erythrodermic psoriasis. Compared with prior reports, dermal eosinophils were demonstrated 18 and 49% of skin biopsies among patients with psoriasis. Nevertheless, dermal eosinophils in psoriasis exhibit fewer number and may be coexisting with allergic contact or atopic dermatitis.[16,17]

Additionally, Moy AP et al. found that all cases of erythrodermic psoriasis exhibited dermal eosinophils.[18]

These could be explained in that by eosinophils may provide inflammatory signals to accelerate the pathogenesis of psoriasis. Eosinophilic cell line EoL-1 can secrete inflammatory mediators inducing neutrophil activation upon ligation with the toll-like receptor 7 (TLR7) agonist developing psoriatic inflammation.[19]

Similar to related literature[3], initial management of erythroderma consists of nutritional assessing, correcting fluid electrolyte imbalances and preventing secondary infections. Concurrent to specific treatment to each etiologic subtype of erythroderma, symptomatic treatments including topical corticosteroid, systemic corticosteroid and immunosuppressive drugs provide beneficial outcome in all etiologies.[3]

Most studies have reported favorable prognosis with death proportion ranging between 1 and 3.8%.[3,11] In our study, complete clearance was obtained in 42.8% of patients mostly observed in

idiopathic erythroderma, while 22.8% of patients were in remission and 22.8% patients were lost to follow-up. Death occurred in 5.6% of patient experiencing complications from sepsis due to immunosuppressive treatment strategy, not by disease itself corresponding to a related study.[3]

Limitations encountered in this study included retrospective design, small sample population and missing patient's information due to incomplete medical records.

Conclusion

Erythroderma is a medical condition characterized by inflammation involving skin over 90% of the body surface area and may result in serious complications. Most clinical features and laboratory abnormalities are nonspecific. Although the etiologies were diverse and difficult to identify, skin biopsy proved a helpful diagnostic tool. Clinicopathologic correlation with proper investigation and close monitoring were required.

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References

1. Wilson DC, Jester JD, King LE, Jr. Erythroderma and exfoliative dermatitis. *Clin Dermatol*. Jan-Mar 1993;11(1):67-72. doi:10.1016/0738-081x(93)90084-p

2. Sigurdsson V, Toonstra J, Hezemans-Boer M, van Vloten WA. Erythroderma. A clinical and follow-up study of 102 patients, with special emphasis on survival. *J Am Acad Dermatol*. Jul 1996;35(1):53-7. doi:10.1016/s0190-9622(96)90496-x

3. Khaled A, Sellami A, Fazaa B, Kharfi M, Zeglaoui F, Kamoun MR. Acquired erythroderma in adults: a clinical and prognostic study. *J Eur Acad Dermatol Venereol*. Jul 2010;24(7):781-8. doi:10.1111/j.1468-3083.2009.03526.x

4. César A, Cruz M, Mota A, Azevedo F. Erythroderma. A clinical and etiological study of 103 patients. *J Dermatol Case Rep*. Mar 31 2016;10(1):1-9. doi:10.3315/jdcr.2016.1222

5. Bolognia, J., Jorizzo, J. and Schaffer, J. *Dermatology*. 2018; 183 [Philadelphia]: Elsevier Saunders.

6. Leenutaphong V, Kulthanan K, Pohboon C, Suthipinittharn P, Sivayathorn A, Sunthonpalin P. Erythroderma in Thai patients. *J Med Assoc Thai*. Aug 1999;82(8):743-8.

7. Sigurdsson V, Steegmans PH, van Vloten WA. The incidence of erythroderma: a survey among all dermatologists in The Netherlands. *J Am Acad Dermatol*. Nov 2001;45(5):675-8. doi:10.1067/mjd.2001.116224

8. Tan G, Kong Y, Tan A, Tey HL. Causes and Features of Erythroderma. *Annals of the Academy of Medicine, Singapore*. 08/01 2014;43:391-4.

9. Miyashiro D, Sanches JA. Erythroderma: a prospective study of 309 patients followed for 12 years in a tertiary center. *Scientific Reports*. 2020/06/17 2020;10(1):9774. doi:10.1038/s41598-020-66040-7

10. Akhyani M, Ghodsi ZS, Toosi S, Dabbaghian H. Erythroderma: A clinical study of 97 cases. *BMC Dermatology*. 2005/05/09 2005;5(1):5. doi:10.1186/1471-5945-5-5

11. Li J, Zheng HY. Erythroderma: a clinical and prognostic study. *Dermatology*. 2012;225(2):154-62. doi:10.1159/000342365

12. Porro AM, Seque CA, Ferreira MCC, Simões MM, Enokihara S. Pemphigus vulgaris*. *Anais Brasileiros de Dermatologia*. 2019/05/01/ 2019;94(3):264-278. doi:https://doi.org/10.1590/abd1806-4841.20199011

13. Gutkowski K, Chwist A, Hartleb M. Liver injury induced by high-dose methylprednisolone therapy: a case report and brief review of the literature. *Hepat Mon*. Aug 2011;11(8):656-61. doi:10.5812/kowsar.1735143x.713

14. Shahshahani MM, Azizahari S, Soori T, et al. Hepatotoxicity and liver enzyme alteration in patients with immunobullous diseases receiving immunosuppressive therapy. *J Dermatol*. Dec 2011;38(12):1153-7. doi:10.1111/j.1346-8138.2011.01278.x

15. Botella-Estrada R, Sanmartín O, Oliver V, Febrer I, Aliaga A. Erythroderma. A clinicopathological study of 56 cases. *Arch Dermatol*. Dec 1994;130(12):1503-7. doi:10.1001/archderm.130.12.1503

16. Chau T, Parsi KK, Ogawa T, et al. Psoriasis or not? Review of 51 clinically confirmed cases reveals an expanded histopathologic spectrum of psoriasis. https://doi.org/10.1111/cup.13033. *Journal of Cutaneous Pathology*. 2017/12/01 2017;44(12):1018-1026. doi:https://doi.org/10.1111/cup.13033

17. Rosa G, Fernandez AP, Schneider S, Billings SD. Eosinophils are rare in biopsy specimens of psoriasis vulgaris. *J Cutan Pathol*. Dec 2017;44(12):1027-1032. doi:10.1111/cup.13042

18. Moy AP, Murali M, Kroshinsky D, Duncan LM, Nazarian RM. Immunologic Overlap of Helper T-Cell Subtypes 17 and 22 in Erythrodermic Psoriasis and Atopic Dermatitis. *JAMA Dermatology*. 2015;151(7):753-760. doi:10.1001/jamadermatol.2015.2

19. Kim HJ, Roh JY, Jung Y. Eosinophils Accelerate Pathogenesis of Psoriasis by Supporting an Inflammatory Milieu that Promotes Neutrophil Infiltration. *J Invest Dermatol*. Oct 2018;138(10):2185-2194. doi:10.1016/j.jid.2018.03.1509