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Factors Associated with Exacerbation in Psoriasis Compared to Eczema

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ABSTRACT

Introduction: Psoriasis and eczema are chronic inflammatory skin diseases. Environmental factors play an important role in the pathogenesis and exacerbation of both conditions.

Objective: This study aimed to investigate factors associated with exacerbation of psoriasis and eczema and compare those factors between both diseases, with the aim of identifying the significant differences between the two conditions.

Methods: A cross-sectional study was conducted on adult patients diagnosed with psoriasis and eczema in Thailand. Demographic characteristics, clinical data, and aggravating factors were collected and compared between both groups. Demographic characteristics and clinical data were analyzed using descriptive statistics, while aggravating factors were analyzed by logistic regression analysis.

Results: A total of 280 patients participated in this study: 192 psoriasis patients and 88 eczema patients. In 97.3% of psoriasis patients and 99.7% of eczema patients, aggravating factors were reported during disease exacerbation. Mental stress and inadequate sleep were significantly associated with psoriasis exacerbation, while humid environment and dust were significantly associated with eczema exacerbation rather than psoriasis exacerbation.

Conclusion: Internal factors, such as mental stress and inadequate sleep, have a greater influence on the worsening of psoriasis, whereas external factors, including a humid environment and dust, have a more significant impact on eczema flare-ups than on psoriasis exacerbation.

Introduction

Psoriasis is a chronic, recurrent immune-mediated inflammatory skin disease, affecting 2-3% of the world's population [1]. It has a great impact on patients' quality of life. The pathogenesis is complex and remains unclear. However, genetic susceptibility combined with environmental factors and immune dysfunction have been shown to play a significant role in pathogenesis. Dysregulation and interaction of T cells, particularly Th1 and Th17 cells, result in the production of various cytokines (IFN-γ, IL-2, IL-12, IL-17, IL-22, and IL-23), stimulating keratinocyte proliferation, and ultimately forming psoriatic plaques [2]. Many factors have been reported to trigger psoriasis, including rash scratching, psychological stress, environmental pollution, UV radiation exposure, medications (e.g., imiquimod, lithium, beta-blockers, anti-TNF antibodies), infection, smoking, and alcohol consumption [1,3-6]. Moreover, unbalanced dietary intake and foods such as red meat and gluten-containing food may aggravate psoriasis flare-ups [7,8].

Similarly, endogenous eczema, including atopic dermatitis, nummular eczema, dyshidrosis, lichen simplex chronicus, and prurigo nodularis, is a chronic inflammatory skin disorder influenced by genetic, environmental, and immunologic factors. In atopic dermatitis, Th2 cytokines dominate the acute phase, contributing to barrier dysfunction and pruritus, while Th1, Th22, and Th17 cytokines drive chronic changes such as epidermal thickening [9]. In prurigo nodularis, T cells, mast cells, and eosinophils release mediators such as IL-31 and histamine, leading to intense pruritus [10]. Various triggering factors have been reported to exacerbate atopic dermatitis flares, such as sweating, foods, stress, hot and humid environment, cold and dry environment, and sun exposure, whereas stress and scratching are the main aggravating factors of prurigo nodularis [11,12].

Objectives

This study was conducted to better understand the differences in aggravating factors between psoriasis and endogenous eczema and to provide appropriate recommendations to prevent flare-ups of these diseases. Our study aimed to explore factors associated with psoriasis and eczema exacerbation and to determine the differences in those factors between both conditions.

Methods

The cross-sectional study was conducted at the Dermatology Clinic of Khon Kaen University's Hospital in Thailand. All patients aged 18 years or older diagnosed with psoriasis or endogenous eczema, including atopic dermatitis, nummular eczema, dyshidrosis, lichen simplex chronicus, and prurigo nodularis, between 20 July 2019 and 20 December 2022 were enrolled in the study. Psoriasis and eczema were diagnosed based on clinical manifestations. Psoriasis is characterized by well-defined erythematous plaques with silvery-white scales, with or without scalp and nail involvement. Eczema is characterized by pruritus, a chronic and relapsing course, and typical morphological features. In cases where the clinical appearance was not typical, a histopathological examination was performed to confirm the diagnosis. For analysis purposes, all endogenous eczema subtypes were grouped as a single eczema category. Patients who could not read the questionnaires or declined to sign the informed consent were excluded. A structured questionnaire was developed ad hoc for this study to capture relevant triggers reported by patients, incorporating potentially important factors identified through a literature review. The questionnaires covered patients' demographic data, duration of disease, co-morbidities, pruritus, potential aggravating factors such as scratching, illness, foods, weather, chemicals, mental stress, smoking, alcohol drinking, medications or herbal use, and inadequate sleep. The severity of pruritus during disease exacerbation was assessed using an 11-point numeric rating scale (NRS-11), ranging from 0 (no itch) to 10 (worst imaginable itch).

Sample Size Calculation

The determination of the sample size was based on the recommended guideline from statisticians for multiple logistic regression analysis, which suggests that the number of participants with psoriasis and eczema should be five to ten times greater than the number of risk factors. Given that nine factors were associated with the disease according to previous data in Thailand, approximately 90 subjects with psoriasis and eczema were deemed necessary [13].

Statistical Analysis

The statistical analysis was conducted using STATA version 10.0 (StataCorp, College Station, Texas). Descriptive statistics were employed, presenting categorical data as numbers and percentages. Numerical data are described as mean ± standard deviation (SD) for normally distributed parameters or median ± interquartile range (IQR) for non-normally distributed parameters. For univariate analysis, crude odds ratios (OR) and 95% confidence intervals (CI) were calculated to assess the strength of association. Factors with a p-value of <0.20 in univariate analysis were then included in a stepwise multiple logistic regression model. A p-value of <0.05 was considered indicative of a statistically significant difference. Adjusted odds ratios (AOR) and 95% CI were utilized to determine the strength of association in the multiple logistic regression model.

Results

A total of 192 psoriasis patients and 88 eczema patients participated in the study. The baseline characteristics of the patients are shown in Table 1. The median duration of disease was 102 months (range: 36–204) for psoriasis and 24 months (range: 12–60) for eczema patients. Comorbidities were found in 38.5% of psoriasis patients and 52.3% of eczema patients. The most common comorbidity associated with psoriasis and eczema was hypertension. Allergic rhinitis or asthma was more frequently reported in patients with eczema than in those with psoriasis (P=0.001; Table 1). A family history of the same disease was more commonly found in psoriasis patients than in eczema patients (P=0.025; Table 1). Pruritus was a common feature in both psoriasis and eczema patients; however, patients with eczema had greater itching severity than those with psoriasis, as demonstrated by the NRS-11.

Regarding aggravating factors, 187 (97.3%) of the 192 psoriasis patients and 86 (97.7%) of the 88 eczema patients reported having aggravating factors during disease exacerbation, as shown in Table 2. The most common aggravating factor reported in psoriasis was weather (76%), followed by scratching (67.3%), foods (66.7%), mental stress (65.6%), and inadequate sleep (64.6%). Similarly, the most common aggravating factor reported in eczema was weather (75%), followed by scratching (54.5%), foods (46.6%), inadequate sleep (30.7%), and mental stress (23.9%).

The comparison of aggravating factors between psoriasis and eczema patients using univariate analysis is demonstrated in Table 2. Scratching, illness, pickled food, monosodium glutamate, mental stress, and inadequate sleep showed a statistically significant difference in psoriasis patients compared to eczema patients. All those factors and factors with a p-value of less than 0.2 by univariate analysis, including cold and humid conditions, were subjected to subsequent multiple logistic regression.

According to multiple logistic regression analysis (Table 3), mental stress (AOR, 5.27, 95% CI: 2.47–10.52, P<0.001) and inadequate sleep (AOR 2.14, 95% CI: 1.31–5.08, P=0.006) were significantly associated with psoriasis exacerbation rather than eczema exacerbation. In contrast, a humid environment (AOR 0.33, 95% CI: 0.14–0.79, P=0.013) and dust (AOR 0.37, 95% CI: 0.19–0.72, P=0.004) were significantly associated with eczema exacerbation rather than psoriasis exacerbation.

Discussion

Several studies have reported that environmental factors play a significant role in the occurrence and exacerbation of psoriasis [1,3-6], especially in genetically predisposed patients,

Table 1. Comparison of baseline characteristics between psoriasis and eczema patients.

Variables	Psoriasis (N=192)	Eczema (N=88)	*P*-values
Age (years), med (IQR 1,3)	53.5(38,62)	57(46.5,64.3)	0.025
Female, N (%)	89(46.4%)	32(36.4%)	0.118
Weight (kg), med (IQR 1,3)	62(55.8,71.4)	63(55,73)	0.879
Height (cm), med (IQR 1,3)	162(158,168.3)	162(155,167.3)	0.864
Comorbidities, N (%)	74(38.5%)	46(52.3%)	0.032
• DM	23(12.0%)	6(6.8%)	0.194
• Hypertension	43(22.4%)	13(14.8%)	0.613
• Dyslipidemia	8(4.2%)	8(9.1%)	0.108
• CKD	5(2.6%)	1(1.1%)	0.444
• Allergic rhinitis/asthma	5(2.6%)	12(13.6%)	0.001
• Hyperthyroidism	5(2.6%)	1(1.1%)	0.444
• Others*	16(8.3%)	15(30.7%)	0.034
History of smoking	15(7.8%)	8(9.1%)	0.72
History of alcohol drinking	28(14.6%)	11(12.5%)	0.641
Family history of the same disease	20(10.4%)	1(1.1%)	0.025
Disease duration (month), med (IQR 1,3)	102(36,204)	24(12,60)	<0.001
Itching, N (%)	153(79.7%)	78(88.6%)	0.071
NRS-11, med (IQR 1,3)	4(1,5)	5(3,7)	0.001

Note: N; numbers of variable, med; median, IQR; inter-quartile range, DM; diabetes mellitus, CKD; chronic kidney disease, NRS-11; 11-point numeric rating scale. *Other comorbidities in psoriasis group: gout 5, solid tumor 2, coronary arterial disease 2, systemic lupus erythematosus 1, lumbar spondylosis 1, thalassemia 1, stroke 1, glomerulonephritis 1, gastroesophageal reflux disease 1, cirrhosis 1. Other comorbidities in eczema group: gout 3, rheumatoid arthritis 2, benign prostatic hyperplasia 1, Nonalcoholic fatty liver disease 1, lumbar spondylosis 1, epilepsy 1, coronary arterial disease 1, myasthenia gravis 1, solid tumor 1, lymphoma 1, cardiac arrhythmia 1, stroke 1.

Table 2. Comparison of aggravating factors between psoriasis and eczema patients using bivariate logistic regression.

Factors	Psoriasis (N=192)	Eczema (N=88)	Crude OR	95%CI	p-value
Aggravating factors were suspected	187(97.3%)	86(97.7%)			
Scratching	133(67.3%)	48(54.5%)	1.88	(1.12-3.16)	0.017
Illness	39(17.2%)	6(6.8%)	3.48	(1.42-8.57)	0.007
Foods	128(66.7%)	41(46.6%)	2.29	(1.37-3.84)	0.002
• Seafood	85(44.2%)	28(31.8%)	1.70	(1.01-2.90)	0.050
• Pickled foods	40(20.8%)	8(9.1%)	2.63	(1.17-5.89)	0.019
• Traditional pickled fish ("Pla-Ra")	27(14.1%)	5(5.7%)	1.61	(0.58-4.52)	0.364
• Chicken	21(10.9%)	7(8.0%)	1.42	(0.58-3.48)	0.442
• Beef	25(13.0%)	8(9.1%)	1.50	(0.65-3.47)	0.346
• Pork	4(2.1%)	2(2.2%)	0.91	(0.16-5.09)	0.919
• Monosodium glutamate	25(13.0%)	4(4.5%)	3.14	(1.06-9.32)	0.039
• Others*	25(13.0%)	6(6.8%)	2.05	(0.81-5.18)	0.131
Weather	146(76.0%)	66(75%)	1.06	(0.58-1.89)	0.850
• Hot	98(51.0%)	48(54.5%)	0.87	(0.52-1.44)	0.586
• Cold	60(31.3%)	19(21.6%)	1.65	(0.91-2.99)	0.097
• Humidity	21(10.9%)	16(18.2%)	0.55	(0.27-1.12)	0.100
Environment	79(41.2%)	43(48.8%)	0.73	(0.44-1.22)	0.227
• Dust	61(31.8%)	36(40.9%)	0.67	(0.39-1.13)	0.137
• Chemicals	46(23.9%)	20(22.7%)	1.07	(0.59-1.94)	0.822
Smoking	19(9.9%)	5(5.7%)	1.82	(0.66-5.05)	0.248
Alcohol drinking	42(21.9%)	13(14.8%)	1.62	(0.82-3.19)	0.168
Herb use	6(3.1%)	2(2.3%)	1.39	(0.27-7.01)	0.692
Mental stress	126(65.6%)	21(23.9%)	6.09	(3.43-10.81)	<0.001
Inadequate sleep	124(64.6)	27(30.7%)	4.12	(2.40-7.07)	<0.001

*Other food in psoriasis group: fresh bamboo shoots 5, duck 4, egg 3, fruits 2, fresh-water fish 2, shrimp paste 2, insect 2, flour 2, soy milk 1, potatoes 1, fresh-water shrimp 1. Other food in eczema group: fresh bamboo shoots 2, insect 1, duck 1, honey 1, cheese 1.

Table 3. Comparison of aggravating factors between psoriasis and eczema patients using multiple logistic regression.

Factors	Adjusted OR	95% CI	p-value
Scratching	0.98	0.52-1.87	0.957
Illness	1.39	0.48-4.03	0.539
Seafood	1.06	0.54-2.06	0.873
Pickled foods	1.64	0.65-4.10	0.294
Monosodium glutamate	2.16	0.62-7.52	0.228
Cold	1.92	0.93-3.91	0.074
Humidity	0.33	0.14-0.79	0.013
Dust	0.37	0.19-0.72	0.004
Alcohol drinking	0.77	0.33-1.76	0.530
Mental stress	5.27	2.47-10.52	<0.001
Inadequate sleep	2.14	1.31-5.08	0.006

as well as in the exacerbation of eczema [14-20]. This study showed that almost all psoriasis and eczema patients had aggravating factors associated with the exacerbation of the diseases. This may be due to a chronicity of diseases leading to patients' recognition of trigger factors. Previous studies found that stressful events, smoking, and alcohol consumption were common trigger factors in psoriasis exacerbation, while sweating, emotional stress, and house dust were common trigger factors for flare-ups of atopic dermatitis [21,22]. Our study found that the most common aggravating factors in both psoriasis and eczema were weather, scratching, foods, mental stress, and inadequate sleep, some of which were consistent with previous studies. Our study also found that mental stress and inadequate sleep were strongly associated with psoriasis exacerbation rather than with eczema exacerbation, while a humid environment and dust were significantly associated with eczema exacerbation rather than with psoriasis exacerbation. This could be because individuals with eczema may have a compromised skin barrier that makes their skin more sensitive.

A systematic review study in northern and central Europe revealed that half of psoriasis patients experience seasonal-dependent disease, consistent with our study. Most cases indicated improvement in psoriasis in the summer and a deterioration in winter [23]. In contrast with our study, 51% of psoriasis patients reported worsening in hot weather and 31.3% in cold weather. This may be due to sweat-induced itching in summer, causing further Koebnerization. Moreover, an uncommon subset of patients with psoriasis–photosensitive psoriasis–exhibit exacerbation in the summer months [24]. Photosensitive psoriasis patients have a strong association with HLA-Cw*0602 [24]. This may be another explanation for the high rate of worsening in hot weather in our study; further investigation regarding seasonal variation and genetic association is needed. Regarding eczema, seasonal variation is one factor influencing disease flare-ups. In general, most patients tend to experience disease flare-ups in winter with low ambient humidity [25]. However, hot weather can exacerbate eczema symptoms. A previous study classified eczema into two patterns: a summer-type pattern (aggravation of symptoms in summer) and a winter-type pattern (aggravation of symptoms in winter) [26]. Our study found that most patients with eczema experienced disease worsening in summer (54.5%) rather than in winter (21.6%). Moreover, we found that a humid climate had a significant effect on eczema exacerbation compared to the psoriasis group. This may be due to warmth and humidity causing an increase in perspiration and producing excessive sweat, which provokes itch and the itch-scratch cycle.

Scratching is a well-known aggravating factor in both psoriasis and eczema. In our study, scratching was the second most common aggravating factor in both conditions. The Koebner phenomenon, i.e., the emergence of skin lesions following various injuries or trauma, is commonly found in psoriasis patients. The pathogenesis is related to the activation of lesional mast cells and their mediators, leading to an increased expression of nerve growth factor and vascular endothelial growth factor [27]. The development of new psoriatic lesions can occur after various mechanical injuries such as tattooing, surgical incisions, needle acupuncture, cupping therapy, and even scratching due to itching as part of this phenomenon. In eczema, scratching can worsen the symptoms by inducing the itch-scratch cycle.

Diet has been suggested to play a role in the pathogenesis of psoriasis [7,28]. Some studies have indicated that fasting periods, low-energy diets, vegetarian diets, and n-3 polyunsaturated fatty acids from fish oil have shown beneficial effects in psoriasis [29]. Meanwhile, saturated fatty acids, simple sugars, red meat, or alcohol can exacerbate psoriasis via inflammatory cytokine activation [7,8]. In our study, there was a surprisingly high report of food as an aggravating factor compared to only 14% in a previous study [27]. The types of food most frequently reported in our study were seafood, pickled food, and pickled fish ("Pla-Ra"), which were not mentioned before. In contrast to previous studies suggesting that fish oil in seafood improves psoriatic rash, our study reported seafood as an aggravating factor [30–34]. This difference may be attributed to the fact that seafood in our region lacks fish oil fatty acids, unlike the mackerel, sardine, salmon, or herring found in regions studied in previous research. The proposed theories behind a high reported rate of food-aggravating factors in our study could be due to an under-detected rate in previous studies due to an unawareness of these factors, to speculative explanations such as local food preservation processes involving pickling, or even the presence of bacteria or parasites in undercooked food that might lead to oxidative stress and increased free radicals, which are linked to skin inflammation in psoriasis, and/or to contamination of heavy metals in seafood in our region [35]. There are supporting studies indicating that heavy metals, especially cadmium, may contribute to psoriasis and eczema [36]. Patients with psoriasis have shown higher blood cadmium levels than the general population [37]. Additionally, studies have supported a positive association between cadmium, lead, and mercury with eczema [38–42]. In Thailand, a study found higher cadmium levels in urine among the population in the north and northeastern regions, where our study was conducted, compared to other regions, and people are primarily exposed to cadmium

through the inhalation of contaminated dust in the air and the ingestion of contaminated water and food [43]. Major food groups contributing to cadmium exposure include rice and grains, shellfish, and seafood [44.] This could speculatively explain why our study identified seafood and dust as significant aggravating factors in both psoriasis and eczema.

Beyond heavy metal contamination in food, the idea of food as an exacerbating factor for eczema has been controversial. Eczematous reactions due to food, especially in children with atopic eczema, have been reported [23,24]. Another distinct type of dermatitis called "systemic contact dermatitis" has also been reported to be aggravated by food [26]. However, seafood was not a common food aggravating these types of eczematous reactions in previous findings, contrary to our results. Based on our results, further studies are needed to clarify the relationship between specific types of food in psoriasis and eczema. Investigating the theory of pathomechanism behind both the food preservation process and heavy metal contamination requires further exploration. Measuring blood levels of heavy metals in patients consuming this type of food is necessary to validate this hypothesis.

Mental stress is one of the major aggravating factors in psoriasis. Psoriasis patients often suffer from embarrassment due to appearance, itching, or pain of the skin lesions, which leads to anxiety, depression, mental stress, or even suicidal ideation. At the same time, mental stress itself can exacerbate skin lesions. A previous study reported that psychological stress can cause skin flares in up to 40% of psoriasis patients [45]. In a large systematic review involving 32,537 patients, 54% reported preceding stressful events prior to exacerbation, and 46% of patients suspected that stress aggravated the rash [46]. The mechanism between stress and psoriasis is still unclear. However, dysregulation and complex interplay among the hypothalamic–pituitary–adrenal (HPA) axis, sympathetic–adrenal–medullary (SAM) axis, peripheral nervous system, and immune-mediated pathways are involved in stress-associated psoriasis exacerbation [47]. Similarly, mental stress is one of the most mentioned aggravating factors in eczema. A previous study found that emotional stress can cause disease flares in up to 48% of atopic dermatitis patients [22]. However, our study found that stress was the most significant aggravating factor associated with psoriasis exacerbation (65.6%) compared to eczema exacerbation (23.9%).

Sleep disturbance is a common associated condition in psoriasis and eczema. Previous studies have shown that up to 77.1% of patients with psoriasis experience sleep disturbance [48,49]. Various factors can cause sleep disturbance in psoriasis, including pruritus, anxiety, depression, systemic inflammation, and comorbidities [50]. The relationship between psoriasis and sleep deprivation is bidirectional. Sleep deprivation leads to an increase in proinflammatory cytokines, including IL-6 and tumor necrosis factor-α (TNF-α), which in turn can cause keratinocyte hyperproliferation in psoriasis patients [40]. Therefore, poor sleep quality may trigger psoriasis, and psoriasis may worsen the quality of sleep. Similarly, itching can cause sleep disturbance in patients with eczema, and poor sleep quality can induce eczema exacerbation. A previous study found that a lack of sleep can cause eczema exacerbation in up to 29% of cases [22]. Our study found that inadequate sleep was another factor significantly associated with psoriasis exacerbation (64.6%) compared to eczema exacerbation (30.7%).

Our study also showed that industrial dust is a prominent aggravating factor for eczema, especially when compared to psoriasis. Previous studies have shown that air pollutants, including particulate matter (PM2.5, PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), and carbon monoxide (CO), are significantly associated with the incidence of eczematous rashes [15,51,52]. Exposure to the pollutants has an adverse effect on the skin by increasing the level of free radicals, inducing cutaneous inflammation, activating mechanisms linked to the aryl hydrocarbon receptor, and altering the skin microflora [52]. Although our study did not directly collect data on the levels of these pollutants, the high rate of industrial dust reported by eczema patients as an aggravating factor could imply a connection with these pollutants, especially PM2.5, based on the current pollution situation in Thailand.

Patient education on aggravating factors is crucial to prevent flare-ups of chronic inflammatory skin diseases, particularly psoriasis and eczema.

Our study explored the aggravating factors of psoriasis, focusing on detailed aspects of foods and climate, and evaluated these factors in a comparison to eczema. However, there are some limitations to this study. First, our study had a small sample size and was conducted at a single center. Additionally, the reliance on self-reported data introduces potential recall bias. The lack of objective environmental exposure measurements such as specific pollutant levels or quantitative dietary assessments, limits the ability to establish precise relationships between exposure and outcomes. Further multicenter studies with objective exposure measurements are needed to clarify the pathogenesis of food-related and environmental exacerbations in psoriasis and eczema.

Conclusions

Weather, scratching, foods, mental stress, and inadequate sleep were common aggravating factors in both psoriasis and eczema. However, internal factors such as mental stress and inadequate sleep have a greater influence on the worsening of psoriasis, whereas external factors including humid environment and dust have a more significant impact on eczema

flare-ups than on psoriasis exacerbation. Providing advice to patients regarding aggravating factors is beneficial to prevent flare-ups of both chronic inflammatory skin conditions.

Ethics Approval Statement: The study received approval from the university's ethics committee [HE621284], and written informed consent was obtained from all participants before enrollment.

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