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# THE ASSOCIATION BETWEEN TRANSEPIDERMAL WATER LOSS AND SKIN POWER OF HYDROGEN WITH PSORIASIS VULGARIS SEVERITY

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**ABSTRACT**
Psoriasis vulgaris is a chronic inflammatory skin disease associated with epidermal hyperproliferation and skin barrier dysfunction. Transepidermal water loss (TEWL) and skin power of hydrogen (pH) may reflect alterations in skin barrier function; however, their association with psoriasis severity remains unclear. This study aimed to investigate the association between TEWL, skin pH, and psoriasis vulgaris severity. This analytical observational study employed a cross-sectional design involving 30 patients with psoriasis vulgaris attending two hospitals in Medan, Indonesia, from February to May 2026. TEWL was measured using a Tewameter® TM Hex, while skin pH was assessed using a Skincheck® pH meter. Psoriasis severity was evaluated using the Psoriasis Area and Severity Index (PASI) and categorized as mild (PASI <5) or moderate-to-severe (PASI ≥5). Associations were analyzed using the Chi-square test and Mann–Whitney test, with statistical significance set at $p<0.05$. Fifteen subjects (50%) had normal TEWL, 11 (36.7%) had high TEWL, and 4 (13.3%) had low TEWL. Nine subjects in mild category had normal TEWL, eight subjects in moderate-severe category had high TEWL; however, the association was not statistically significant ($p=0.144$). Mean skin pH was 6.18 ± 0.326 in the mild group and 6.19 ± 0.318 in the moderate-to-severe group, with no significant difference ($p=0.709$). Neither TEWL nor skin pH was significantly associated with psoriasis vulgaris severity in this study.

Keywords: psoriasis area severity index; psoriasis vulgaris; skin barrier function; skin pH transepidermal water loss

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## INTRODUCTION

Psoriasis is a chronic inflammatory skin disease mediated by immune dysregulation and characterized by keratinocyte hyperproliferation. It can affect individuals of all age groups, although it is more commonly observed in adults than in children. The etiology of psoriasis remains unclear, however, a strong genetic association is suspected. The disease is characterized by complex alterations in epidermal growth and differentiation, biochemical, immunological, and vascular abnormalities, as well as involvement of the nervous system. Several clinical types of psoriasis have been described, with psoriasis vulgaris being the most common. Clinically, psoriasis vulgaris presents as round or oval plaques covered with thick, white scales resulting from keratinocyte hyperproliferation (Bhagwat & Madke, 2023; Gudjonsson & Elder, 2019).

Psoriasis affects both males and females, although early onset disease may occur earlier in females, and the condition may exhibit a hereditary pattern. The onset of psoriasis follows a bimodal distribution, with peaks at 30 – 39 and 60 – 69 years of age in males, while onset in females occurs

approximately 10 years earlier. The prevalence of psoriasis varies across populations. Globally, approximately 60 million people are affected by psoriasis, with a prevalence of 1.52% in the general population of the United States. The prevalence among the general population has been reported to be 0.05% in Taiwan and 1.88% in Australia. Psoriasis appears to be more prevalent in regions with higher per capita income and among older populations (Raharja et al., 2021; Guillet et al., 2022).

Psoriasis is a relatively common skin disease, however, its overall prevalence in Indonesia remains unclear. In Surabaya, the prevalence of psoriasis was reported to be 0.19% between 2016 and 2018 (Prakoeswa et al., 2021). A total of 53 new psoriasis cases were reported at Sanjiwani Regional General Hospital, Bali, between 2018 and 2019, comprising 37 males (69.81%) and 16 females (30.19%) (Alviariza & Widiawati, 2021). A 2022 study by Thanita describing the characteristics of patients with psoriasis in Medan, North Sumatra, identified 64 patients, of whom 48.43% were male and 51.57% were female. The most frequently affected age group was 15 – 30 years, accounting for 28.12% of cases (Thanita, 2023). A study by Hidayat FA, Nababan KA, and Roesyanto ID reported that the proportion of patients with psoriasis at Haji Adam Malik Hospital was 0.81%. Between March and June 2021, 54.1% of patients with psoriasis at the hospital were female and 45.9% were male. Moderate disease severity was the most frequently reported category, accounting for 56.8% of cases (Hidayat et al., 2021).

Several primary factors may trigger the development of psoriasis, including immune dysregulation, particularly in individuals with suspected genetic susceptibility involving cutaneous or immune-response pathways, as well as environmental triggers. The initial development of psoriatic lesions may be induced by physical trauma or inflammation caused by infection. These events activate the innate immune response and promote the release of nucleic acid complexes from injured skin, thereby contributing to the initiation of the inflammatory process (Hoffmann et al., 2021). The pathogenesis of psoriasis vulgaris involves immune dysregulation, resulting in chronic inflammation and uncontrolled keratinocyte proliferation. Initially, interactions between dendritic cells and T lymphocytes may occur within psoriatic skin lesions. T helper 1 (Th1) cells are activated by interleukin-12 (IL-12), which is produced by dendritic cells. This activation contributes to the production of tumor necrosis factor-alpha (TNF-α) and interferon-gamma (IFN-γ), which are implicated in the disruption of normal keratinocyte proliferation. Activation of T helper 17 (Th17) cells leads to the production of interleukin-17 (IL-17) and interleukin-22 (IL-22), both of which play major roles in the progression of psoriasis vulgaris (Zecevic-Pasic et al., 2023; Gisondi et al., 2020).

Assessing disease severity is essential for monitoring changes in psoriasis and evaluating the effects of treatment. The Psoriasis Area and Severity Index (PASI) is one of the most widely used instruments for assessing psoriasis severity and is considered the gold standard for this purpose. The PASI score is calculated before, during, and after treatment to evaluate the patient's response to the prescribed therapy (Schmitt & Wozel, 2005). The skin barrier in psoriatic lesions differs from that of normal skin. Several factors may affect transepidermal water loss (TEWL), including anatomical location, age, ethnicity, season, and ambient temperature. Water evaporation from the skin surface is associated with TEWL, which may increase at higher temperatures. Chronic exposure of the skin to elevated temperatures may therefore influence TEWL levels (Green et al., 2022). Morariu et al. reported higher TEWL values in psoriatic lesions than in unaffected skin (Morariu et al., 2024). Similar findings were reported by Maroto-Morales D, Montero-Vilchez T, and Arias-Santiago S, who found higher TEWL values in psoriatic lesions than in healthy skin (Maroto-Morales et al., 2021). A study conducted by Oktafiani A and Irawanto ME at Dr. Moewardi Regional General Hospital, Surakarta, demonstrated a significant association between TEWL and psoriasis vulgaris severity (Oktafiani & Irawanto, 2024).

The skin's power of hydrogen (pH) plays an important role in maintaining the skin barrier. Human skin is generally acidic, with a pH ranging from approximately 4.2 to 6.1. The acidic nature of the skin is thought to help prevent microbial invasion. Several factors may influence skin pH, including sex, age, and ethnicity. However, the role of skin pH in the pathogenesis of psoriasis remains unclear. Skin pH is thought to influence the development of psoriatic lesions through both direct and indirect mechanisms (Bigliardi, 2018). Changes in the surface pH of psoriatic plaques have been reported, with values differing from those of normal skin. Wangsa PGH et al. found that the surface pH of psoriatic plaques was lower than that of healthy skin, with mean values of 5.2 and 5.6, respectively. Maroto-Morales D, Montero-Vilchez T, and Arias-Santiago S also reported lower pH values in psoriatic lesions than in the control group. Increased fatty acid production in psoriatic plaques may contribute to a reduction in skin surface pH (Maroto-Morales et al., 2021; Wangsa et al., 2023; Mijaljica et al., 2025). To date, studies specifically investigating the association of TEWL and skin pH with psoriasis vulgaris severity remain limited. Therefore, this study aimed to investigate the association between TEWL and skin pH and the severity of psoriasis vulgaris and to assess if skin barrier function could predict the severity of psoriasis vulgaris.

## METHOD

This study was an analytical observational study with a cross-sectional design aimed at analyzing the association between transepidermal water loss (TEWL), skin pH, and the severity of psoriasis vulgaris. The study was conducted from February 2026 until May 2026 at the Dermatology and Venereology Outpatient Clinics of Prof. Dr. Chairuddin Panusunan Lubis Hospital Universitas Sumatera Utara, and Dr. Pirngadi Regional General Hospital, Medan, Indonesia.

The target population consisted of patients diagnosed with psoriasis vulgaris, while the accessible population included all patients with psoriasis vulgaris who attended the two hospitals during the study period. Participants were recruited using consecutive sampling, in which eligible patients who met the inclusion and exclusion criteria were enrolled consecutively until the required sample size was achieved. The inclusion criteria were patients aged 18 – 65 years who were willing to participate by signing an informed consent form and had lesion in the volar region. The exclusion criteria included pregnancy or breastfeeding; the presence of primary skin diseases other than psoriasis, such as atopic dermatitis, contact dermatitis, or ichthyosis; comorbid conditions, including diabetes mellitus, heart disease, renal failure, or thyroid disorders; the use of antihistamines, diuretics, antidepressants, retinoids, or statins within the preceding week; used moisturizers or topical medications within 12 hours before the examination. Based on the sample size calculation, a minimum of 26 participants was required for inferential analysis, while the planned sample size for this study was 30 participants.

The independent variables were TEWL and skin pH, while the dependent variable was psoriasis vulgaris severity. Participant characteristics, including age, sex, disease duration, and treatment modality, were obtained through medical history-taking and recorded on the study data collection form. Age was classified into the following categories: late adolescence (18 – 25 years), early adulthood (26 – 35 years), middle adulthood (36 – 45 years), early older adulthood (46 – 55 years), and late older adulthood (56 – 65 years). Disease duration was categorized as less than 5 years, 5 – 10 years, or more than 10 years, while treatment modality was classified as topical therapy and combination therapy.

The severity of psoriasis vulgaris was assessed using the Psoriasis Area and Severity Index (PASI). The body was divided into four regions: the head, upper extremities, trunk, and lower extremities. Each region was assessed for erythema, induration, and desquamation on a scale of 0 – 4, as well as the extent of psoriatic involvement on a scale of 0 – 6. The score for each region was calculated based on the combination of the severity scores, the extent of involvement, and the corresponding

regional weighting factor. The regional scores were then summed to obtain the total PASI score, which ranges from 0 to 72. For the purposes of analysis, disease severity was categorized as mild for PASI scores below 5 and moderate to severe for PASI scores of 5 or higher.

TEWL was measured using a Tewameter® TM Hex, while skin pH was measured using a Skincheck® pH meter. Before the examination, participants were asked to rest for 20 minutes in a room maintained at a temperature of 18 – 22 °C and a relative humidity of 40 – 60%. The examination area was cleaned using a cleansing pad, after which the device probe was placed perpendicular to the psoriatic lesion on either the right or left volar. Each parameter was measured three times, and the mean value was used for analysis. TEWL was expressed in g/m²/h and categorized as low (0 to ≤8 g/m²/h), normal (8 – 15 g/m²/h), or high (≥15 g/m²/h). Skin pH was recorded as a numerical variable.

Study data were collected through medical history-taking, physical and dermatological examinations, PASI assessment, and measurements of TEWL and skin pH. All data were subsequently processed and analyzed using statistical software. Univariate analysis was performed to describe participant characteristics using frequency distributions. Bivariate analysis was conducted to assess the association between TEWL and psoriasis vulgaris severity using the Chi square test, and the association between skin pH and psoriasis vulgaris severity using the Mann Whitney test. A p-value of less than 0.05 was considered statistically significant.

The study was conducted after obtaining ethical approval from the Research Ethics Committee of Universitas Sumatera Utara and research authorization from Prof. Dr. Chairuddin Panusunan Lubis Hospital Universitas Sumatera Utara, and Dr. Pirngadi Regional General Hospital Medan. All participants were informed about the study procedures and given an informed consent form before data collection commenced.

## RESULT

This study was conducted from February to May 2026 and included 30 patients with psoriasis vulgaris who attended the Dermatology and Venereology Outpatient Clinics of Prof. Dr. dr. Chairuddin Panusunan Lubis Hospital Universitas Sumatera Utara, and Dr. Pirngadi Regional General Hospital, Medan. All subjects underwent history-taking, physical and dermatological examinations, transepidermal water loss (TEWL) measurement, skin pH measurement, and assessment of psoriasis severity using the Psoriasis Area and Severity Index (PASI).

Regarding age distribution, the largest proportion of subjects belonged to the 26 – 35 year age group, comprising 10 subjects (33.3%), followed by the 36 – 45 year group with 7 subjects (23.4%) and the 18 – 25 year group with 5 subjects (16.7%). The 46 – 55 year and 56 – 65 year age groups each comprised 4 subjects (13.3%). The sex distribution was equal, with 15 male subjects (50%) and 15 female subjects (50%). Regarding disease duration, 15 subjects (50%) had experienced psoriasis vulgaris for more than 10 years, 12 subjects (40%) for 5 – 10 years, and 3 subjects (10%) for less than 5 years. In terms of treatment, 15 subjects (50%) received topical therapy, while the remaining 15 (50%) received a combination of topical and oral therapy. The distribution of psoriasis vulgaris severity according to PASI scores was balanced, with 15 subjects (50%) classified as having mild psoriasis and 15 subjects (50%) classified as having moderate-to-severe psoriasis.

TEWL measurements showed that most subjects had TEWL values within the normal range, accounting for 15 subjects (50%). Eleven subjects (36.7%) had high TEWL values, while 4 subjects (13.3%) had low TEWL values. The mean skin pH across all study subjects was 6.18 ± 0.32.

Analysis of the association between TEWL and psoriasis vulgaris severity showed that, among

subjects with mild psoriasis, 3 had low TEWL values, 9 had normal TEWL values, and 3 had high TEWL values. Among subjects with moderate-to-severe psoriasis, 1 had a low TEWL value, 6 had normal TEWL values, and 8 had high TEWL values. Although high TEWL values were more frequently observed in the moderate-to-severe psoriasis group, the *Chi square* test showed that the association between TEWL and psoriasis vulgaris severity was not statistically significant (p=0.144). The mean skin pH was 6.18 ± 0.326 in the mild psoriasis group and 6.19 ± 0.318 in the moderate-to-severe psoriasis group. The *Mann Whitney* test showed that the difference in skin pH between the two groups was not statistically significant (p=0.709). Therefore, this study found no statistically significant association between skin pH and psoriasis vulgaris severity.

Table 1.
Respondent characteristics (n=30)

| Respondent characteristics | f | % |
|---|---|---|
| Age | | |
| 18 – 25 years | 5 | 16,7 |
| 26 – 35 years | 10 | 33,3 |
| 36 – 45 years | 7 | 23,4 |
| 46 – 55 years | 4 | 13,3 |
| 56 – 65 years | 4 | 13,3 |
| Gender | | |
| Male | 15 | 50 |
| Female | 15 | 50 |
| Experienced of Disease | | |
| <5 years | 3 | 10 |
| 5 – 10 years | 12 | 40 |
| >10 years | 15 | 50 |
| Terms of Treatment | | |
| Topical | 15 | 50 |
| Combined (topical and oral) | 15 | 50 |
| Severity of Disease | | |
| Mild | 15 | 50 |
| Moderate-Severe | 15 | 50 |
| TEWL | | |
| Low | 4 | 13,3 |
| Normal | 15 | 50 |
| High | 11 | 36,7 |

## DISCUSSION

This study evaluated the association of transepidermal water loss (TEWL) and skin pH with psoriasis vulgaris severity in 30 subjects. The analysis revealed no statistically significant association between either TEWL or skin pH and psoriasis vulgaris severity, as assessed using the Psoriasis Area and Severity Index (PASI). Nevertheless, the distribution of TEWL values showed a tendency toward higher values in the moderate-to-severe psoriasis group, whereas mean skin pH values were relatively similar between the two severity groups.

The largest age group in this study was 26 – 35 years (33.3%). This finding is consistent with the study by Parisi et al., which identified one of the peaks in psoriasis incidence among individuals aged 30 – 39 years (Parisi et al., 2013). In contrast, Gu et al. reported that psoriasis was most prevalent among individuals aged 55 – 69 years (Gu et al., 2025). These differences in age distribution may be associated with the bimodal pattern of psoriasis onset, with peaks occurring at 30 – 39 and 60 – 69 years of age (Raharja et al., 2021). Thus, the age distribution observed in this study remains consistent with the epidemiological pattern of psoriasis, which can occur across a wide range of age groups.

The sex distribution in this study was equal, with the same number of male and female subjects. This finding differs from those of Oktafiani et al. and Wangsa et al., who reported a higher

proportion of male patients than female patients (Oktafiani & Irawanto, 2024; Wangsa et al., 2023). Conversely, studies by Thendria et al. and Hidayat FA, Nababan KA, and Roesyanto ID reported a higher proportion of female patients (Hidayat et al., 2021; Thendria et al., 2025). These differences indicate variations in subject characteristics across study populations. However, the balanced sex distribution in the present study cannot be interpreted as evidence of equal psoriasis risk between males and females, because this study was not designed to assess disease risk according to sex (Goldburg et al., 2022).

Most subjects in this study had a history of psoriasis vulgaris lasting more than 10 years (50%). This finding is consistent with the study by Dai et al., which reported that 60.7% of patients had a disease duration of at least 10 years (Dai et al., 2025). Alakbarov et al. also reported a mean disease duration of 16.18 ± 12.98 years (Alakbarov et al., 2021). The predominance of patients with long-standing disease in the present study is consistent with the chronic inflammatory nature of psoriasis, which may follow a relapsing course and require long-term monitoring (Dai et al., 2025). Regarding treatment, half of the subjects received topical therapy, while the other half received a combination of topical and oral therapy. Alakbarov et al. reported the use of topical therapy in 374 subjects and systemic therapy with methotrexate in 224 subjects (59.8%) (Alakbarov et al., 2021). Differences in treatment patterns across populations may reflect variations in clinical characteristics and therapeutic approaches among the patients studied.

The distribution of psoriasis severity in this study was equal between the mild and moderate-to-severe groups. This finding differs from that of Montero et al., who reported a higher number of patients with mild psoriasis than those with moderate-to-severe disease (Montero-Vilchez et al., 2021). Conversely, Morariu et al., in a study of patients with chronic plaque psoriasis, found that the number of patients with severe psoriasis was greater than that of patients with moderate or mild disease (Morariu et al., 2024). These differences should be considered when interpreting the study findings, as variations in population characteristics and severity classification may influence the distribution of subjects.

TEWL measurements showed that most subjects had values within the normal range (50%), while 36.7% had high values and 13.3% had low values. This finding is consistent with the study by Lee et al. involving 19 patients with psoriasis in Korea, which reported a mean TEWL of 13.52 ± 4.41 (Lee et al., 2012). However, the present findings differ from those of Nikam et al., who reported increased TEWL in psoriatic lesions, with a mean value of 54.25 ± 21.84, significantly higher than that observed in the control group ($p < 0.001$) (Monteiro et al., 2019). Malkalne et al. also reported a mean TEWL of 23.22 ± 7.88 at the elbow in patients with moderate-to-severe psoriasis vulgaris (Mālkalne et al., 2025). These variations indicate that TEWL values in patients with psoriasis may differ across studies depending on subject characteristics, measurement site, lesion characteristics, and measurement methods.

The mean skin pH in this study was 6.18 ± 0.32. This value is comparable to that reported by Maroto-Morales et al., who found a mean pH of 6.26 ± 0.36 in psoriatic plaques (Maroto-Morales et al., 2021). In contrast, Malkalne et al. reported a mean pH of 5.061 ± 0.403 at the elbow, while Cannavo et al. reported a mean value of 5.1 ± 0.6 (Mālkalne et al., 2025; Cannavò et al., 2016). These differences in skin pH may be influenced by individual characteristics and factors affecting the chemical environment of the skin surface, including fatty acid composition (Cannavò et al., 2016). Therefore, skin pH measurements should be interpreted in the context of the examination conditions and characteristics of the study population.

Analysis of the association between TEWL and psoriasis vulgaris severity showed that high TEWL values were more frequently observed in the moderate-to-severe psoriasis group than in the mild

psoriasis group. However, this association was not statistically significant according to the *Chi-square* test ($p = 0.144$). These findings suggest that, although TEWL tended to be higher in subjects with more severe disease, the present study did not provide sufficient statistical evidence to establish an association between the two variables.

The present findings differ from those of Morariu et al., who found significantly higher TEWL values in psoriatic plaques than in uninvolved normal skin, with values of 25.71 [24.76–27.03] and 10.3 [9.70–10.79] g/m²/h, respectively ($p < 0.0001$). The study also reported a significant difference in TEWL according to psoriasis severity, with higher values in the severe group than in the moderate and mild groups ($p = 0.032$) (Morariu et al., 2024). Maroto-Morales et al. likewise found that TEWL was higher in psoriatic plaques than in uninvolved psoriatic skin and healthy skin, with respective values of 13.23, 8.54, and 6.41 g/m²/h (Maroto-Morales et al., 2021). In addition, Oktafiani et al. reported a strong positive correlation between TEWL and psoriasis vulgaris severity, with a *Spearman* correlation coefficient of 0.621 ($p = 0.001$) (Oktafiani & Irawanto, 2024). Differences between these findings and those of the present study may be related to variations in analytical design, subject characteristics, and the classification of disease severity and TEWL values.

Pathophysiologically, increased TEWL in psoriasis is associated with impaired skin barrier function. Alterations in the late cornified envelope, the quantity and quality of fatty acids, ceramides, and extracellular lipids may increase skin permeability and water loss through the stratum corneum (Dai et al., 2025). Abnormal keratinocyte proliferation and differentiation, alterations in intercellular adhesion, and dysregulation of the extracellular matrix also contribute to skin barrier dysfunction. Reduced expression of aquaporin-3 (AQP3), a water-channel protein involved in epidermal hydration, has also been reported in psoriatic lesions and may contribute to reduced skin hydration (Oktafiani & Irawanto, 2024; Orsmond et al., 2021). Differences in TEWL between psoriatic plaques and uninvolved skin in the same patient have likewise been associated with changes in AQP3 expression (Maroto-Morales et al., 2021).

Skin barrier dysfunction in psoriasis also involves abnormalities in epidermal tight junctions, gap junctions, and adherens junctions. Altered expression of tight junction proteins, including ZO-1, occludin, and claudin-4, may compromise intercellular integrity and increase transepidermal water loss. Keratinocyte activation by inflammatory mediators such as IL-17 and IL-1 may also downregulate keratinocyte adhesion proteins. The presence of tight junction abnormalities during the early stages of lesion development suggests that changes in skin barrier function may contribute to psoriasis pathogenesis (Orsmond et al., 2021). Although these mechanisms support the occurrence of increased TEWL in psoriatic lesions, changes in skin barrier function do not necessarily correspond directly to PASI scores in every patient.

The absence of a statistically significant association between TEWL and psoriasis severity in this study may also be considered in light of the findings of Wangsa et al., who demonstrated that TEWL is influenced by age, sex, and lesion type. Their study reported an increase in TEWL of 0.074 for each one-year increase in age, an increase of 2.419 in males, and an increase of 13.036 in psoriatic lesions compared with uninvolved skin ($p<0.05$). The model had an adjusted $R^2$ of 0.781, indicating that these variables explained 78.1% of the variation in TEWL within the model (Wangsa et al., 2023). Accordingly, variation in TEWL in the present study may be associated not only with psoriasis severity but also with individual characteristics and lesion-related factors. However, because these factors were not analyzed using multivariable analysis in the present study, this explanation remains an interpretation that requires further investigation.

Analysis of the association between skin pH and psoriasis vulgaris severity showed nearly identical mean pH values in the mild and moderate-to-severe groups, at 6.18 ± 0.326 and 6.19 ± 0.318, respectively. The *Mann–Whitney* test indicated that this difference was not statistically significant (p=0.709). This finding is consistent with the study by Montero et al., who found no significant difference in pH between patients with psoriasis and healthy controls. That study reported variations in pH between psoriatic plaques and uninvolved skin across PASI score groups, but the differences did not reach statistical significance (p>0.05) (Mālkalne et al., 2025). These findings suggest that skin pH has not demonstrated a consistent association with psoriasis severity based on the available research evidence.

Psoriasis is characterized by abnormal keratinocyte proliferation and differentiation, resulting in the formation of erythematous plaques with thick, silvery scales. Epidermal structural abnormalities in psoriasis may also involve changes in intercellular junctions, lipid composition and organization, the skin microbiome, hydration, and skin surface pH (Mijaljica et al., 2025). Although these changes contribute to skin barrier dysfunction, the magnitude of pH alterations does not necessarily reflect the clinical severity assessed by PASI. This may help explain why the present study found no significant difference in skin pH between the two severity groups.

The present findings differ from those of Wangsa et al., who found that pH was significantly lower in psoriatic lesions than in uninvolved skin, with values of 5.25 ± 0.18 and 5.63 ± 0.21, respectively ($p < 0.01$). Their study also reported that skin pH was influenced by age, sex, and lesion type. Older age and male sex were associated with increased pH, whereas psoriatic lesions were associated with a pH decrease of 0.382 compared with uninvolved skin ($p < 0.05$). The model had an adjusted $R^2$ of 0.638, indicating that the analyzed variables explained 63.8% of the variation in skin pH within the model (Wangsa et al., 2023). These differences suggest that skin pH may be influenced by various factors other than psoriasis severity. Therefore, skin pH measurement alone may be insufficient to characterize disease severity in the population studied.

## CONCLUSION

This study found no statistically significant association between transepidermal water loss (TEWL) or skin pH and psoriasis vulgaris severity, as assessed using the Psoriasis Area and Severity Index (PASI). Although higher TEWL values were more frequently observed among patients with moderate-to-severe psoriasis, the association did not reach statistical significance. Similarly, mean skin pH values were comparable between patients with mild and moderate-to-severe psoriasis.

## DECLARATIONS

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### Author Contributions

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