

ORIGINAL ARTICLE

Association between Fasting Blood Sugar Levels and Psoriasis Severity using the PASI Score: A Single-Center Cross-Sectional Study

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ABSTRACT

Objectives: Psoriasis is a chronic immune-mediated inflammatory skin disease characterized by dry, thick, raised patches. The Psoriasis Area and Severity Index (PASI) measures disease severity body surface area and treatment efficacy. Psoriasis can increase the risk of diabetes and worsen insulin resistance, resulting in increased fasting blood sugar (FBS) and worsening diabetic symptoms. This study aimed to study the correlation between FBS and PASI score in psoriasis patients.

Materials and Methods: This retrospective study analyzed the relationship between PASI scores and FBS levels in psoriasis patients who visited the Dermatology Outpatient Clinic between 2019 and 2023. PASI scores were assessed by dermatologists, and FBS levels collected within a month of PASI evaluation were analyzed. Patients were categorized into diabetes mellitus (DM) and non- diabetes mellitus (non-DM) groups. Those on systemic therapy or without FBS were excluded.

Results: Data from 65 psoriasis patients were analyzed (non-DM (n = 58), DM (n = 7)). The average PASI score was 8.4 (5.9, 10.9) in non-DM patients and 7 (2.7, 4) in DM patients, respectively. Mean FBS levels were evaluated based on PASI severity: mild (n = 36) - 109.4 (100.1, 118.8), moderate (n = 13) - 103.6 (95.9, 111.4), and severe (n = 16) - 96.8 (92.9, 100.6). Comparison of mean FBS across PASI severity categories showed no statistically significant differences (mild vs. moderate: mean difference 5.7 milligrams (mg)/ deciliter (dL), p = 0.416, 95% confidence interval (CI) -8.3 to 19.8; moderate vs. severe: mean difference 6.8 mg/dL, p = 0.402, 95% CI -9.4 to 23.1; mild vs. severe: mean difference 12.6 mg/dL, p = 0.058, 95% CI -0.4 to 25.7).

Conclusion: No significant correlation was found between FBS levels and PASI scores in either the DM or non-DM groups.

Keywords: fasting plasma sugar level, psoriasis area and severity index, psoriasis

INTRODUCTION

Psoriasis is a chronic inflammatory systemic condition that is challenging to cure but controllable. The infiltration of activated T cells into the skin, which stimulates the proliferation of keratinocytes, plays a critical role in its pathogenesis.¹ In particular, pro-inflammatory cytokines such as interleukin-17 and tumor necrosis factor alpha have been linked to systemic inflammation that can impair insulin signaling and glucose metabolism.² Psoriasis symptoms vary from person to person, but it typically presents as well-defined erythematous plaques with white-silvery scales. These plaques commonly appear on the elbows, knees, scalp, and lumbosacral areas, forming a recognizable pattern.³ Psoriasis affects approximately 2-3% of the world's population, or approximately 125 million individuals. In Thailand, psoriasis prevalence is 2% of the population.⁴ Psoriasis is associated with several complications, including metabolic syndrome and increased risk of cardiovascular disease.⁵⁻⁷ Diabetes is one of the most prevalent metabolic disorders in Thailand, affecting 9.7% of the population.⁸ Psoriasis has been linked to an increased risk of developing diabetes and poorer insulin resistance, leading to elevated fasting blood sugar (FBS) levels and exacerbated diabetic symptoms.^{5,9}

Several previous studies have evaluated the relationship between psoriasis severity and metabolic parameters in both diabetic and non-diabetic populations. While population-based studies consistently demonstrate an increased risk of diabetes among patients with psoriasis, evidence regarding the direct association between the Psoriasis Area and Severity Index (PASI) score and glycemic indices remains inconsistent. Some investigations have reported increased insulin resistance in psoriasis patients regardless of PASI severity, whereas others found no significant correlation between disease severity and fasting glucose after adjustment for confounding factors such as age, obesity, and systemic treatment.^{2,10,11} These inconsistencies highlight the need to further examine the relationship between FBS levels and psoriasis severity in both diabetes mellitus (DM) and non-diabetes mellitus (non-DM) groups. Given this association, the researchers aim to examine the correlation between FBS levels and psoriasis severity using the PASI score, the gold standard assessment tool.^{12,13}

MATERIALS AND METHODS

This study is a retrospective analysis of psoriasis patients at Siriraj Hospital. The primary objective is to analyze the association of FBS levels and PASI scores. As a retrospective study, anonymized data

was used, and patient consent waived. The study was approved by the Siriraj Institutional Review Board (COA no. Si 227/2024).

Patients included in the study were those diagnosed with psoriasis at Siriraj Hospital between 2019 and 2023, aged 18 or older, with available diabetic laboratory data including complete blood count, liver and kidney function tests, and diabetic laboratory assessments. The exclusion criteria were prior treatment with phototherapy for more than one month before the index date or had incomplete laboratory data. Patients were categorized into DM and non-DM groups based on documented medical diagnosis and/or a diagnostic threshold of FBS > 126 milligrams (mg)/deciliter (dL). Given the retrospective design, DM classification was based on available FBS measurements within one month before and after the index date. Hemoglobin A1c (HbA1c) values, when available, were reported descriptively but were not used as the primary classification criterion due to incomplete data across participants. Psoriasis severity was categorized according to PASI score as mild (< 10), moderate (10–15), and severe (> 15).¹³⁻¹⁶

This study aims to predict PASI scores using FBS levels. Based on a 2015 study on DM in psoriasis patients, the prevalence of DM was reported as 4.7% ($n = 2017$, $p = 0.0476$, confidence interval (CI) = 95%).¹⁷ Using Cochran's sample size formula, a minimum of 70 individuals were needed to provide adequate statistical power. To account for an expected 30% exclusion rate, we adjusted the sample size using the following formula: $N_{\text{adjusted}} = N_{\text{required}} / (1 - \text{exclusion rate}) = 70 / (1 - 0.30) \approx 100$. Consequently, we initially recruited 100 participants to ensure enough number of analyzable cases.

Relevant variables were extracted from electronic records for each patient and compiled into a datasheet. The recorded values included enrollment date, sex, date of birth, current age, DM status (yes or no), FBS one month before and after the index date, HbA1c, current PASI score, age of psoriasis onset (years), type of psoriasis, presence of psoriatic arthritis (yes or no), presence of plaque (yes or no), history of phototherapy (yes or no), history of systemic treatment (yes or no), and presence of other skin diseases (yes or no).

Data analysis was performed using SPSS software version 26.0. Categorical variables, including sex, treatment history, psoriasis severity, and psoriasis type were analyzed and reported as frequencies. Continuous variables, such as age, comorbidities, laboratory investigations, and disease severity were analyzed using means, interquartile ranges, and standard

deviations. Descriptive statistics were used to compare mean FBS levels across PASI severity subdivisions (mild, moderate, severe) and mean PASI scores between DM and non-DM groups. Mean FBS levels were compared across PASI severity subdivisions (mild, moderate, severe) using one-way analysis of variance with Least Significant Difference (LSD) post hoc multiple comparisons. Mean PASI scores were descriptively compared between DM and non-DM groups. A p -value < 0.05 was considered statistically significant.

RESULTS

A total of 65 subjects were included in the final analysis. Of the 100 initially recruited participants, 35 were excluded due to incomplete laboratory data or meeting exclusion criteria. The characteristics of the study population are described in **Table 1**. Patients were categorized by PASI severity as mild (< 10), moderate (10–15), and severe (> 15).^{14,15} Mean FBS levels were compared across these three PASI severity categories, and pairwise comparisons were performed (mild vs moderate, mild vs severe, and moderate vs severe) using the LSD post hoc procedure (**Table 2**). For descriptive presentation, moderate and severe psoriasis were combined due to small subgroup sizes.

Initially, 16 patients were diagnosed with DM. After assessing their FBS levels 1 month before and after the index date using the cut-off, only seven patients met the criteria for DM. The comparison between each PASI severity (**Table 2**), among mild and moderate PASI severity showed no statistically significant difference (mean difference = 5.7, $p = 0.416$, 95% CI: -8.3 to 19.8). Similarly, the difference between moderate and severe PASI severity was also not statistically significant (mean difference = 6.8, $p = 0.402$, 95% CI: -9.4 to 23.1). A larger difference was observed between mild and severe PASI severity (mean difference = 12.6, $p = 0.058$, 95% CI: -0.4 to 25.7), but this difference did not reach statistical significance. These results suggest that there were no significant differences in FBS levels among PASI severity groups, despite a trend suggesting higher FBS levels in the severe PASI group compared to the mild PASI group.

Across PASI severity subdivisions, differences in mean FBS levels were observed within a one-month period. The highest mean FBS was recorded in the mild PASI severity group (109.4 ± 27.6 mg/dL), followed by the moderate PASI severity group (103.6 ± 12.8 mg/dL). The severe PASI group had the lowest mean FBS level (96.8 ± 7.2 mg/dL). Overall, the mean FBS for all subjects was 105.2 ± 22.1 mg/dL. These findings are consistent with results presented in **Table 3**.

Table 1 Demographic Data of Psoriasis Patients with Varying FBS Levels within a 1-Month Period of PASI Score Evaluation ($n = 65$)

Demographic Data	n (%)
Sex	
Male	39 (60)
Female	26 (40)
Mean age $\pm$ SD, years	49.3 $\pm$ 14.6
Comorbidities	
Hypertension	19 (29.2)
Dyslipidemia	18 (27.7)
DM	16 (24.6)
Severity of Psoriasis	
Mild	49 (75.4)
Moderate to severe	16 (24.6)
Types of psoriasis	
Plaque type	58 (89.2)
Guttate type	3 (4.6)
Erythroderma type	2 (3.1)
Pustular type	2 (3.1)
Psoriatic arthritis involvement	15 (23.1)
Investigations	
FBS, mg/dL (IQR)	105.2 (92.0, 112.5)
HbA1c, mg%(IQR) ($n = 36$)	6.2 (5.6, 6.4)
Disease severity	
BSA, % (IQR)	4.4 (2.7, 10.3)
PASI score (IQR)	7.0 (4.0, 15.0)
Treatment*	
Topical steroid	63 (96.9)
Systemic medication (Oral methotrexate)	41 (63.1)
Systemic medication (cyclosporine)	11 (16.9)
Systemic medication (acitretin)	18 (27.7)
Phototherapy	17 (26.2)

Abbreviations: BSA, body surface area; dL, deciliter; DM, diabetes mellitus; FBS, fasting blood sugar; HbA1c, hemoglobin A1c; IQR, interquartile range; mg, milligrams; PASI, psoriasis area and severity index; SD, standard deviation

* Some patients were prescribed more than one type of treatment.

Table 2 Multiple Comparisons using Least Significant Difference between PASI Severity and Mean FBS Levels in Subjects

(I) PASI Severity	(J) PASI Severity	Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval	
					Lower Bound	Upper Bound
Mild	Moderate	5.7	7.0	.416	-8.3	19.8
	Severe	12.6	6.5	.058	-0.4	25.6
Moderate	Mild	-5.7	7.0	.416	-19.8	8.3
	Severe	6.8	8.1	.402	-9.4	23.1
Severe	Mild	-12.6	6.5	.058	-25.7	0.4
	Moderate	-6.8	8.1	.402	-23.1	9.4

Abbreviations: FBS, fasting blood sugar; PASI, psoriasis area and severity index; Sig, significance; Std, standard
(I) PASI_severity and (J) PASI_severity refer to psoriasis severity categories defined as mild (< 10), moderate (10–15), and severe (> 15)

The mean PASI score was higher in the non-DM group compared to the DM group (Table 4). The non-DM group (n = 58) had a mean PASI score of 8.4 ± 9.4 (95% CI: 5.9 to 10.8), with a range from 0.0 to 49.0. In contrast, the DM group (n = 7) had a significantly lower mean PASI score of 3.3 ± 0.7 (95% CI: 2.6 to 4.0), with a range from 2.2 to 4.5. The overall PASI score across all participants was 7.8 ± 9.0 .

DISCUSSION

The findings of this study suggest that FBS levels do not have a significant correlation with psoriasis severity, as measured by the PASI. Interestingly, the DM group demonstrated lower mean PASI scores compared to the non-DM group. This observation may be influenced by treatment-related factors. Some participants were already on blood-sugar lowering medications prior to the study. Previous research suggests that certain anti-diabetic medications may reduce psoriasis severity

in patients with DM. Specifically, anti-diabetic agents, such as thiazolidinediones, glucagon-like peptide-1 receptor agonists, dipeptidyl peptidase-4 inhibitors, and biguanides have been reported to significantly decrease psoriasis area and PASI scores from baseline.¹⁸ The use of these medications may have influenced FBS levels and could be a contributing factor to the statically non-significant relationship between FBS and PASI severity.¹⁹ However, detailed information regarding glucose-lowering medication class, dose, and duration was not consistently available in this retrospective dataset. Therefore, adjustment, stratification, or sensitivity analyses based on medication use could not be performed, and glucose-lowering therapy remains a potential confounder in interpreting the association between FBS and psoriasis severity.

Patients with diabetes are also often under closer medical supervision and may be more likely to receive systemic psoriasis therapy. Systemic treatments such as methotrexate or cyclosporine may reduce

Table 3 Descriptive Statistics Comparing Severity of Psoriasis and FBS (including mean and standard deviation)

	N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Mild	36	109.4	27.6	4.6	100.1	118.8	77	192
Moderate	13	103.6	12.8	3.5	95.9	111.4	87	125
Severe	16	96.8	7.2	1.8	92.9	100.6	82	110
Total	65	105.2	22.1	2.7	99.7	110.6	77	192

Abbreviations: FBS, fasting blood sugar; N, number; Std, standard

Table 4 Descriptive Statistics of PASI Scores in the DM and Non-DM Groups

	N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Non-DM	58	8.4	9.4	1.2	5.9	10.8	0.0	49.0
DM	7	3.3	0.7	0.2	2.6	4.0	2.2	4.5
Total	65	7.8	9.0	1.1	5.6	10.1	0.0	49.0

Abbreviations: DM, diabetes mellitus; FBS, fasting blood sugar; N, number; Std, standard

inflammatory burden and improve psoriasis severity. Therefore, concurrent systemic treatment may have masked the true clinical severity of psoriasis in the DM group, potentially attenuating any observable association between FBS and PASI scores in this cross-sectional analysis.

Several explanations may account for the lack of statistically significant association. FBS reflects short-term glycemic status and may not adequately capture chronic insulin resistance. Systemic psoriasis therapy and glucose-lowering medications may attenuate inflammatory burden and mask disease severity. Previous studies have reported inconsistent findings regarding PASI and metabolic parameters,^{2,10,11} suggesting that the interaction between psoriasis severity and glycemic status is complex and influenced by multiple confounders.

This study has several limitations. Data were collected from a single center, which may affect the generalizability of the findings. The relatively small number of patients in the DM subgroup ($n = 7$) may limit statistical power and increase the risk of type II error. The final analyzable sample ($n = 65$), which was slightly below the planned minimum sample size ($n = 70$), may have further reduced statistical power and limited the ability to detect small-to-moderate associations between FBS and PASI. Moreover, the retrospective cross-sectional design relied on available clinical data, limiting control over treatment exposure and laboratory timing. Because the association was evaluated using group comparisons across PASI severity categories rather than direct correlation or regression modeling, residual confounding cannot be excluded. Prospective longitudinal studies incorporating direct association analyses with adjustment for key covariates (e.g., age, sex, BMI), systemic psoriasis treatments, and glucose-lowering medications are warranted to better clarify potential causal relationships between glycemic status and psoriasis severity.

A multi-center study involving a larger and more diverse group of participants could provide more reliable insights into whether the association between FBS and PASI scores is consistent across different populations. Demographic factors, such as dietary habits and cultural differences within Thailand can influence the risk factors for metabolic syndrome, including elevated FBS levels.^{19,20} Therefore, variations in demographic characteristics and treatment practices might affect both FBS level and psoriasis severity. A multicenter approach could improve the validity and applicability of the findings. Although our analysis did not reveal a strong link between FBS and PASI scores, the link between psoriasis and metabolic comorbidities such as DM is well-established. DM is both a risk factor for psoriasis and a potential consequence of the disease.²¹ Future research should prioritize investigating psoriasis as an early indicator of DM. Monitoring FBS levels in psoriasis patients could help identify undiagnosed DM or prediabetes, enabling early intervention. Preventive measures, such as lifestyle changes, dietary adjustments, and early pharmacological interventions could help delay or prevent the onset of diabetes.

CONCLUSION

In conclusion, although this study did not reveal a statistically significant correlation between FBS levels and PASI severity, several factors need to be considered when interpreting these results, such as the use of blood sugar-lowering treatments by some participants and the limitations of a single-center study. Future research should explore the potential role of psoriasis in the preclinical diagnosis of DM and emphasize FBS monitoring in psoriasis patients as an early marker for DM in this population.

Conflict of Interest

The authors declare no conflict of interest.

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The authors declare that Artificial Intelligence (AI) tools were used only to assist with language editing of this manuscript. The authors remain fully responsible for the content, interpretation, and conclusions presented in this work.

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Data Availability Statement

The datasets generated or analysed during this study are available from the corresponding author upon reasonable request.

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