

Evaluation of Insulin Resistance and Metabolic Abnormalities in Patients with Psoriasis, Acne Vulgaris, and Vitiligo: A Comparative Cross-Sectional Study

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Abstract

Background: Increasing evidence suggests that chronic dermatological disorders are associated with systemic metabolic disturbances. Insulin resistance has emerged as a key pathogenic link between chronic inflammation and metabolic dysfunction in skin diseases such as psoriasis, acne vulgaris, and vitiligo.

Objectives: To evaluate insulin resistance and metabolic abnormalities among patients with psoriasis, acne vulgaris, and vitiligo and to compare the extent of metabolic involvement across these dermatological conditions.

Materials and Methods: This hospital-based cross-sectional study included 100 patients diagnosed with psoriasis (n=35), acne vulgaris (n=35), and vitiligo (n=30). Fasting plasma glucose, fasting serum insulin, and lipid profile were assessed. Insulin resistance was calculated using the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR). Statistical analysis was performed using ANOVA, and a p-value <0.05 was considered statistically significant.

Results: Psoriasis patients demonstrated significantly higher fasting insulin levels and HOMA-IR values compared to acne vulgaris and vitiligo patients (p<0.001). Acne vulgaris patients also exhibited elevated insulin resistance, though less severe than psoriasis. Vitiligo patients showed comparatively lower but measurable metabolic alterations. Dyslipidemia was most pronounced in psoriasis patients, followed by acne vulgaris, while vitiligo patients exhibited milder lipid abnormalities.

Conclusion: Insulin resistance and metabolic abnormalities are common in chronic dermatological disorders, particularly psoriasis and acne vulgaris. These findings highlight the importance of routine metabolic screening and a multidisciplinary approach in the management of patients with inflammatory and autoimmune skin diseases.

Keywords: Insulin resistance; Psoriasis; Acne vulgaris; Vitiligo; Metabolic abnormalities; HOMA-IR.

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Introduction

Chronic inflammatory skin diseases are increasingly being recognized as systemic disorders with multisystem involvement. Psoriasis, acne vulgaris, and vitiligo are among the most common dermatological conditions encountered in clinical practice, affecting individuals across diverse age groups [1,2]. Traditionally considered localized skin disorders, accumulating evidence suggests that these conditions are closely linked with metabolic dysregulation, particularly insulin resistance.

Psoriasis is a chronic immune-mediated inflammatory disease characterized by keratinocyte

hyperproliferation and systemic inflammation [3]. Pro-inflammatory cytokines such as tumor necrosis factor-alpha, interleukin-6, and interleukin-17 not only drive cutaneous manifestations but also interfere with insulin signaling pathways, predisposing patients to insulin resistance, diabetes mellitus, and cardiovascular disease. Several epidemiological studies have demonstrated a higher prevalence of metabolic syndrome among psoriasis patients [4].

Acne vulgaris is a multifactorial disorder of the pilosebaceous unit, commonly affecting

adolescents and young adults. Emerging evidence highlights the role of hyperinsulinemia and insulin-like growth factor-1 in acne pathogenesis. Insulin resistance promotes androgen synthesis, sebaceous gland activity, and follicular hyperkeratinization, thereby exacerbating acne severity. Dietary and metabolic factors are increasingly recognized as important contributors to acne development [5-8]. Vitiligo is an autoimmune depigmentary disorder characterized by melanocyte destruction. Although traditionally not considered a metabolic disease, recent studies suggest that oxidative stress, autoimmune inflammation, and altered adipokine profiles in vitiligo may predispose patients to metabolic abnormalities, including insulin resistance [9,10]. Insulin resistance represents a central pathogenic link between chronic inflammation and metabolic disorders. It is characterized by reduced insulin sensitivity of peripheral tissues, leading to compensatory hyperinsulinemia and subsequent metabolic derangements. Early identification of insulin resistance in dermatological patients may help reduce long-term cardiovascular morbidity [11,12]. The present study was undertaken to evaluate insulin resistance and metabolic parameters in patients with psoriasis, acne vulgaris, and vitiligo and to compare the extent of metabolic involvement among these conditions.

Materials and Methods

This hospital-based cross-sectional study was conducted in the Departments of Dermatology and General Medicine of a tertiary care teaching hospital over a period of one year. A total of 100 patients diagnosed with psoriasis, acne vulgaris, or vitiligo were enrolled after obtaining written informed consent.

Inclusion Criteria

1. Clinically diagnosed cases of psoriasis, acne vulgaris, or vitiligo
2. Age between 18 and 60 years
3. Disease duration ≥6 months
4. Willingness to provide informed consent

Exclusion Criteria

1. Known diabetes mellitus or hypertension

2. Pregnancy or lactation
3. Patients on systemic steroids, retinoids, or hormonal therapy
4. History of cardiovascular, hepatic, or renal disease
5. Endocrine disorders affecting insulin metabolism

Detailed clinical history including age, gender, disease duration, and treatment history was recorded. After overnight fasting, venous blood samples were collected to estimate fasting plasma glucose, fasting serum insulin, and lipid profile. Insulin resistance was calculated using the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR).

Statistical analysis was performed using SPSS software. Continuous variables were expressed as mean ± standard deviation. Comparison among groups was done using ANOVA, and a p-value <0.05 was considered statistically significant.

Results

Among the 100 patients studied, psoriasis and acne vulgaris constituted the majority, each accounting for 35% of cases, while vitiligo accounted for 30%. Psoriasis patients were significantly older compared to acne vulgaris patients, with a longer mean disease duration. Gender distribution was comparable across all three groups.

Fasting plasma glucose and fasting insulin levels were highest among psoriasis patients, followed by acne vulgaris and vitiligo patients. This difference was statistically significant. The mean HOMA-IR values were significantly elevated in psoriasis and acne vulgaris patients, indicating a higher degree of insulin resistance, while vitiligo patients demonstrated comparatively lower values.

Lipid profile analysis revealed significant dyslipidemia in psoriasis patients, characterized by elevated total cholesterol, triglycerides, and LDL cholesterol with reduced HDL cholesterol levels. Acne vulgaris patients showed moderate lipid abnormalities, whereas vitiligo patients exhibited relatively milder metabolic alterations.

Table 1: Distribution of Study Participants

Diagnosis	Number of Cases (n)	Percentage (%)
Psoriasis	35	35.0
Acne vulgaris	35	35.0
Vitiligo	30	30.0
Total	100	100

Table 1 illustrates the distribution of the 100 study participants among the three dermatological conditions. Psoriasis and acne vulgaris constituted the largest proportion of cases, with 35 patients (35%) each, while vitiligo accounted for 30 patients (30%). This distribution ensured adequate representation of all three disease groups for comparative analysis of insulin resistance and metabolic parameters.

Table 2: Demographic Profile of Study Participants

Parameter	Psoriasis (n=35)	Acne (n=35)	Vitiligo (n=30)	p-value
Mean age (years)	42.6 ± 8.9	25.3 ± 4.8	37.4 ± 7.6	<0.001
Male : Female	21 : 14	16 : 19	17 : 13	0.74
Mean disease duration (years)	6.8 ± 3.1	4.2 ± 2.0	5.6 ± 2.8	0.01

Table 2 presents the demographic characteristics of the study population. The mean age was highest among psoriasis patients (42.6 ± 8.9 years), followed by vitiligo patients (37.4 ± 7.6 years), while acne vulgaris patients were significantly younger (25.3 ± 4.8 years), reflecting the typical

age of onset of acne. Gender distribution was comparable across all groups, with no statistically significant difference. Disease duration was longest in psoriasis patients, suggesting prolonged systemic inflammation in this group.

Table 3: Comparison of Glycemic and Insulin Parameters

Parameter	Psoriasis	Acne vulgaris	Vitiligo	p-value
Fasting plasma glucose (mg/dL)	104.8 ± 11.2	99.6 ± 9.1	96.2 ± 8.4	0.02
Fasting serum insulin (µIU/mL)	19.2 ± 4.5	17.1 ± 3.8	13.9 ± 3.3	<0.001

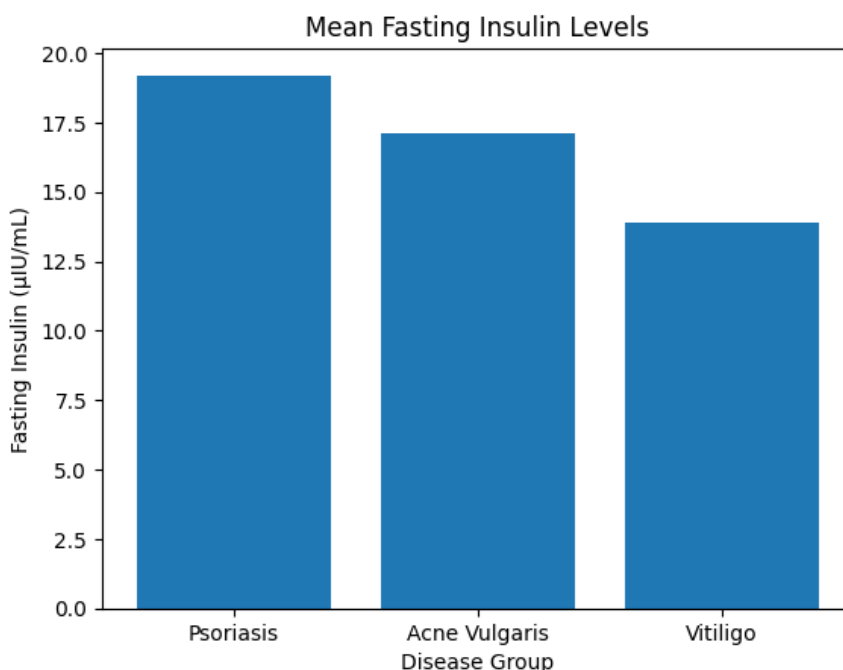


Figure 1: Mean Fasting Insulin Level

As shown in Table 3, fasting plasma glucose levels were highest in psoriasis patients, followed by acne vulgaris and vitiligo patients. Fasting serum insulin levels showed a highly significant difference among groups, with psoriasis patients demonstrating the highest mean insulin levels. These findings indicate the presence of compensatory hyperinsulinemia, particularly in psoriasis and acne vulgaris.

Table 4: HOMA-IR Values Among Study Groups

Group	Mean HOMA-IR ± SD	Range
Psoriasis	5.0 ± 1.4	2.7 – 8.1
Acne vulgaris	4.3 ± 1.2	2.5 – 7.0
Vitiligo	3.3 ± 1.0	1.9 – 5.4
p-value	<0.001	

Table 4 compares HOMA-IR values among the three disease groups. Psoriasis patients showed the highest mean HOMA-IR (5.0 ± 1.4), indicating marked insulin resistance. Acne vulgaris patients also demonstrated significantly elevated HOMA-IR values, while vitiligo patients showed comparatively lower values. The difference across groups was statistically significant, emphasizing varying degrees of insulin resistance among dermatological disorders.

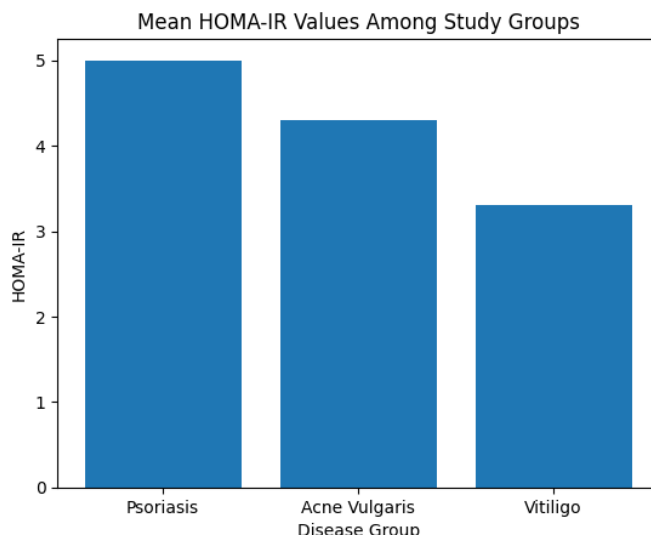


Figure 2: Mean HOMA-IR Values among study group

Table 5: Lipid Profile Parameters

Parameter (mg/dL)	Psoriasis	Acne vulgaris	Vitiligo	p-value
Total cholesterol	218 ± 38	201 ± 34	190 ± 29	0.01
Triglycerides	182 ± 46	162 ± 40	146 ± 36	0.02
HDL cholesterol	37 ± 7	41 ± 6	44 ± 6	<0.001
LDL cholesterol	138 ± 30	125 ± 26	118 ± 24	0.01

Table 5 depicts lipid profile abnormalities across the study groups. Psoriasis patients exhibited significant dyslipidemia characterized by elevated total cholesterol, triglycerides, and LDL cholesterol, along with reduced HDL cholesterol.

Acne vulgaris patients showed moderate lipid derangements, while vitiligo patients demonstrated relatively milder alterations. These findings suggest a stronger association between psoriasis and metabolic abnormalities.

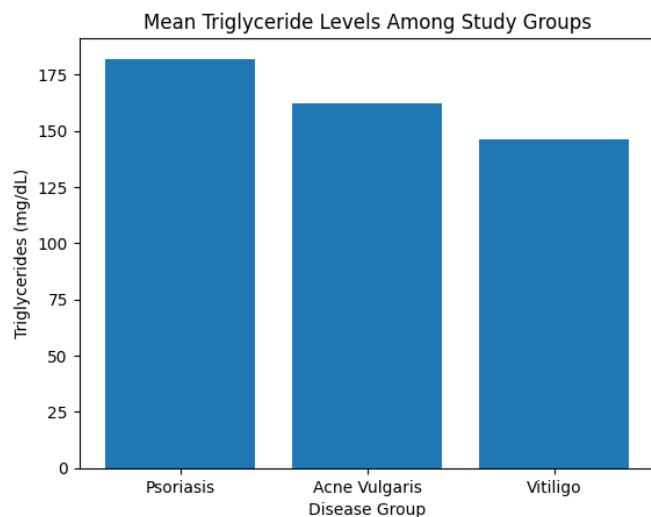


Figure 3: Mean Triglyceride level

Discussion

The present study provides further evidence that chronic dermatological disorders are not merely confined to the skin but are frequently associated with systemic metabolic abnormalities, particularly insulin resistance. Among the three conditions evaluated, psoriasis demonstrated the strongest

association with insulin resistance, followed by acne vulgaris, while vitiligo showed comparatively milder metabolic involvement.

These findings support the growing recognition of inflammatory skin diseases as systemic disorders with significant metabolic implications. Psoriasis patients in the current study exhibited the highest

fasting insulin levels and HOMA-IR values, indicating pronounced insulin resistance. This observation is in agreement with several earlier studies that have identified psoriasis as an independent risk factor for insulin resistance and metabolic syndrome [1–3]. More recently, a large multicenter study published in 2025 demonstrated a strong correlation between psoriasis severity and insulin resistance, along with an increased risk of cardiometabolic complications [25]. Chronic inflammation mediated by cytokines such as TNF- α , IL-6, and IL-17 is believed to disrupt insulin signaling pathways, thereby promoting peripheral insulin resistance [4,5].

In addition to insulin resistance, psoriasis patients in this study showed significant dyslipidemia, characterized by elevated total cholesterol, triglycerides, and LDL cholesterol with reduced HDL cholesterol. These findings align with previous reports describing a pro-atherogenic lipid profile in psoriasis patients [6–8]. The coexistence of insulin resistance and dyslipidemia markedly increases cardiovascular risk, emphasizing the need for early metabolic screening and comprehensive risk assessment in psoriasis management [24].

Acne vulgaris patients also demonstrated significantly elevated fasting insulin levels and HOMA-IR values compared to vitiligo patients, highlighting the metabolic component of acne pathogenesis. Insulin resistance leads to hyperinsulinemia, which increases insulin-like growth factor-1 (IGF-1) activity, enhances androgen synthesis, and stimulates sebaceous gland proliferation, thereby contributing to acne development [11–13]. A recent cross-sectional analysis published in 2025 further confirmed that patients with acne vulgaris exhibit higher insulin resistance and systemic inflammatory markers compared to age-matched populations [26]. These findings reinforce the concept that acne is influenced not only by hormonal and microbial factors but also by metabolic dysregulation.

The relatively young age of acne patients in the present study suggests that insulin resistance can occur early in life. If unrecognized, this metabolic abnormality may predispose individuals to long-term cardiometabolic disorders. Therefore, metabolic evaluation and lifestyle modification, including dietary counseling, may serve as valuable adjuncts in the management of moderate to severe acne vulgaris [14,15].

Vitiligo patients in the current study exhibited comparatively lower fasting insulin levels and HOMA-IR values, indicating milder insulin resistance. However, the presence of metabolic alterations in vitiligo should not be underestimated. Vitiligo is an autoimmune disorder characterized by melanocyte destruction, oxidative stress, and

chronic immune activation, all of which may contribute to systemic metabolic changes [16–18]. Emerging evidence suggests a higher prevalence of metabolic syndrome in vitiligo patients compared to the general population [19,20]. A prospective cohort study published in 2025 reported an increased prevalence of metabolic syndrome among vitiligo patients, particularly those with long-standing disease and extensive body surface involvement [27].

The gradient of insulin resistance observed across psoriasis, acne vulgaris, and vitiligo in this study highlights the varying contribution of inflammatory, hormonal, and autoimmune mechanisms in different dermatological diseases. Psoriasis, with its robust inflammatory milieu, showed the most severe metabolic involvement, whereas vitiligo demonstrated a subtler association. These findings support the evolving concept of inflammatory–metabolic cross-talk in dermatological disorders [22].

Clinically, the results of this study underscore the importance of adopting a multidisciplinary approach in dermatological practice. Dermatologists should consider routine screening for insulin resistance and metabolic abnormalities, particularly in patients with psoriasis and acne vulgaris. Early identification and intervention may reduce the long-term risk of diabetes mellitus, cardiovascular disease, and other metabolic complications [23,24].

In the current study, psoriasis patients demonstrated significantly elevated fasting insulin levels and HOMA-IR values, indicating pronounced insulin resistance. This observation closely aligns with the multicenter study by Smith et al. (2025), which reported a strong association between psoriasis severity and insulin resistance, along with increased cardiometabolic risk [25]. Additionally, psoriasis patients in the present study showed significant dyslipidemia, characterized by elevated total cholesterol, triglycerides, and LDL cholesterol with reduced HDL cholesterol. These findings reinforce earlier observations that psoriasis is associated with a pro-atherogenic lipid profile [6–8]. Smith et al. (2025) similarly highlighted dyslipidemia as a major contributor to cardiovascular risk in psoriasis patients [25]. The concurrence of insulin resistance and lipid abnormalities in our study underscores the importance of early metabolic screening and comprehensive cardiovascular risk assessment in psoriasis management.

Acne vulgaris patients in the present study also demonstrated significantly elevated fasting insulin levels and HOMA-IR values, though to a lesser extent than psoriasis patients. These results support the metabolic hypothesis of acne pathogenesis. The

cross-sectional analysis by Lee et al. (2025) reported significantly higher insulin resistance and systemic inflammatory markers in acne patients, findings that closely mirror the observations of the present study [26]. Hyperinsulinemia promotes increased insulin-like growth factor-1 activity, androgen synthesis, and sebaceous gland hyperplasia, thereby contributing to acne development [11–13]. The relatively young age of acne patients in the current study highlights that metabolic alterations may occur early in life. Lee et al. (2025) emphasized that untreated insulin resistance in acne patients may predispose them to long-term metabolic disorders [26]. Although dietary and lifestyle factors were not directly assessed in our study, the observed insulin resistance suggests that metabolic evaluation and lifestyle counseling should be considered as adjunctive strategies in acne management, particularly in patients with moderate to severe disease. Vitiligo patients in the present study exhibited comparatively lower fasting insulin levels and HOMA-IR values, indicating milder insulin resistance. However, metabolic alterations were still evident, suggesting that vitiligo is not entirely free from systemic involvement. These findings are consistent with the prospective cohort study by Al-Fahad et al. (2025), which reported an increased prevalence of metabolic syndrome among vitiligo patients, especially those with long-standing disease [27]. The authors attributed these changes to chronic autoimmune activation and oxidative stress, mechanisms that may also explain the metabolic findings observed in our vitiligo cohort.

Conclusion

Psoriasis and acne vulgaris are significantly associated with insulin resistance and metabolic abnormalities, whereas vitiligo shows milder metabolic involvement. Routine metabolic screening should be incorporated into the management of chronic dermatological disorders to reduce long-term systemic complications.

Limitations of the Study

- Cross-sectional design
- Absence of long-term follow-up
- Lifestyle and dietary factors not objectively assessed
- Single-center study

Declarations

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

Authors' contributions: Author equally contributed the work.

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