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Original Research Article

ASSOCIATION OF METABOLIC SYNDROME WITH PSORIASIS AND ITS RELATIONSHIP TO CLINICAL SEVERITY

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ABSTRACT

Background: Psoriasis is a chronic immune-mediated inflammatory disorder increasingly recognized as a systemic disease associated with metabolic and cardiovascular comorbidities. Metabolic syndrome shares common inflammatory pathways with psoriasis and may influence disease severity and outcomes.

Materials and Methods: This hospital-based cross-sectional study included 144 adult patients with clinically diagnosed psoriasis. Demographic and clinical details were recorded, and psoriasis severity was assessed using the Psoriasis Area and Severity Index (PASI). Metabolic syndrome was diagnosed using modified NCEP ATP III criteria with Asian cut-offs. Associations between metabolic syndrome and clinical severity of psoriasis were analyzed using appropriate statistical tests.

Results: Metabolic syndrome was present in 40.3% of patients with psoriasis. Patients with metabolic syndrome were significantly older and had a longer duration of psoriasis. Mean PASI scores were significantly higher among patients with metabolic syndrome compared to those without (17.9 ± 7.2 vs. 10.8 ± 5.6; $p < 0.001$). The prevalence of metabolic syndrome increased progressively with psoriasis severity, being observed in 17.2% of patients with mild psoriasis and 41.4% of those with severe disease ($p < 0.001$).

Conclusion: Metabolic syndrome is highly prevalent among patients with psoriasis and is strongly associated with increased disease severity. These findings emphasize the need for routine metabolic screening and a multidisciplinary approach to the management of psoriasis to reduce long-term cardiometabolic risk.

Keywords: Psoriasis; Metabolic syndrome; PASI; Disease severity; Cardiovascular risk; Inflammation.

INTRODUCTION

Psoriasis is a chronic, immune-mediated inflammatory dermatosis affecting approximately 2–3% of the global population, with a considerable burden reported from Asian and Indian settings.[1] Although traditionally considered a disease limited to the skin and joints, psoriasis is now widely recognized as a systemic inflammatory disorder associated with multiple metabolic and cardiovascular comorbidities.[1] The chronicity of the disease, recurrent exacerbations, and visible skin lesions significantly impair quality of life and are often accompanied by psychological stress, which may further aggravate systemic inflammation.[1]

Metabolic syndrome (MetS) is a cluster of interrelated metabolic abnormalities including central obesity, insulin resistance or impaired glucose tolerance, dyslipidaemia (elevated triglycerides and reduced high-density lipoprotein cholesterol), and hypertension. The global prevalence of MetS ranges from 20% to 35% in adults, with higher rates observed in South Asian populations due to genetic susceptibility, sedentary lifestyle, and dietary factors.[2] In India, urban prevalence of MetS has

been reported to range between 25% and 45%, posing a significant public health challenge.[3]

A growing body of evidence suggests a strong epidemiological and pathophysiological link between psoriasis and metabolic syndrome. Patients with psoriasis have been shown to exhibit a higher prevalence of obesity, type 2 diabetes mellitus, hypertension, and dyslipidaemia compared to the general population.[4] The concept of the "psoriatic march" has been proposed to describe the progression from chronic cutaneous inflammation to systemic inflammation, insulin resistance, endothelial dysfunction, and ultimately increased cardiovascular risk.[5]

The shared inflammatory pathways between psoriasis and MetS form the biological basis of this association. Psoriasis is characterized by dysregulated innate and adaptive immune responses, with overexpression of pro-inflammatory cytokines such as tumor necrosis factor-α (TNF-α), interleukin (IL)-6, IL-17, and IL-23. These cytokines not only drive keratinocyte hyperproliferation but also play a central role in the development of insulin resistance, adipocyte dysfunction, and atherogenesis.[6] Adipose tissue in obese individuals acts as an active endocrine organ, releasing adipokines such as leptin and resistin, which further amplify systemic inflammation and may exacerbate psoriatic disease activity.[6]

Clinical severity of psoriasis, commonly assessed using the Psoriasis Area and Severity Index (PASI), body surface area (BSA) involvement, or Physician Global Assessment (PGA), has been reported to correlate with the presence and severity of metabolic abnormalities. Several studies have demonstrated that patients with moderate-to-severe psoriasis have a significantly higher risk of metabolic syndrome compared to those with mild disease.[7] Longer disease duration and earlier age of onset have also been associated with increased metabolic risk, suggesting a cumulative inflammatory burden over time.[7]

Despite increasing recognition of this association, data from developing countries, particularly India, remain limited and heterogeneous.[8,9] Variations in lifestyle, genetic background, diagnostic criteria for MetS, and patterns of psoriasis severity may influence the strength of this relationship. Furthermore, routine screening for metabolic syndrome is not uniformly integrated into dermatological practice, leading to underdiagnosis and missed opportunities for early intervention.[10]

Understanding the association between metabolic syndrome and psoriasis, as well as its relationship with clinical severity, is essential for adopting a holistic approach to patient care. Early identification of metabolic abnormalities in patients with psoriasis may not only reduce long-term cardiovascular morbidity and mortality but also influence therapeutic decisions and improve overall disease outcomes. In this context, the present study aimed to evaluate the association of metabolic syndrome with psoriasis and examine its relationship with the clinical severity of the disease.

MATERIALS AND METHODS

Study design and setting: This hospital-based analytical cross-sectional study was conducted in the Department of Dermatology of a tertiary care teaching hospital in India. The study was carried out over a period of 24 months, from June 2023 to May 2025. The objective was to assess the association between metabolic syndrome and psoriasis and to evaluate the relationship between metabolic syndrome and the clinical severity of psoriasis.

Study population: The study population consisted of adult patients with clinically diagnosed psoriasis attending the dermatology outpatient department during the study period. Diagnosis of psoriasis was made by a consultant dermatologist based on characteristic clinical features, and where required, supported by histopathological examination. Consecutive eligible patients were enrolled to minimize selection bias.

Inclusion and exclusion criteria

Patients aged 18 years and above with a confirmed diagnosis of psoriasis of any clinical type and duration were included in the study after obtaining informed written consent. Patients with pustular or erythrodermic psoriasis requiring emergency management, pregnant or lactating women, patients with known endocrine disorders other than diabetes mellitus, those on systemic corticosteroids or drugs known to influence lipid or glucose metabolism (except antidiabetic or antihypertensive medications), and patients with acute infections or chronic inflammatory or autoimmune diseases other than psoriasis were excluded to avoid confounding metabolic parameters.

Sample size and sampling technique

A convenience sampling method was employed, enrolling all eligible patients presenting during the study period. The sample size was estimated based on previously published study reporting a prevalence of metabolic syndrome among patients with psoriasis ranging from 30% to 50%.[10] Assuming an expected prevalence of 40%, a 95% confidence level, and an absolute precision of 8%, the minimum required sample size was calculated to be 144 participants. To enhance the reliability of subgroup analysis based on disease severity, all eligible patients during the study period were included.

Data collection and clinical evaluation

After enrollment, detailed demographic and clinical information was collected using a predesigned and pretested proforma. Data included age, sex, duration of psoriasis, age at onset, family history of psoriasis, smoking and alcohol consumption, physical activity, and current or past treatment history. A thorough dermatological examination was performed in all patients to document the type and distribution of psoriatic lesions.

Clinical severity of psoriasis was assessed using the Psoriasis Area and Severity Index (PASI). The PASI score was calculated by assessing erythema, induration, and desquamation across four anatomical regions (head, upper limbs, trunk, and lower limbs), with scores ranging from 0 to 72. Based on PASI scores, psoriasis severity was categorized as mild (PASI <10), moderate (PASI 10–20), and severe (PASI >20). Body surface area involvement was additionally recorded to support severity assessment.

Assessment of metabolic syndrome: Metabolic syndrome was diagnosed using the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria, with modifications for Asian populations where applicable. The diagnosis required the presence of three or more of the following components: waist circumference ≥90 cm in men or ≥80 cm in women; fasting plasma glucose ≥100 mg/dL or previously diagnosed type 2 diabetes mellitus; blood pressure ≥130/85 mmHg or use of antihypertensive medication; serum triglycerides ≥150 mg/dL or on treatment for hypertriglyceridaemia; and high-density lipoprotein cholesterol <40 mg/dL in men or <50 mg/dL in women.

Waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest using a non-stretchable measuring tape. Blood pressure was recorded in the sitting position after a minimum of five minutes of rest, using a calibrated sphygmomanometer, and the average of two readings was considered.

Laboratory investigations: All participants were instructed to fast for at least 8–10 hours prior to blood sample collection. Venous blood samples were obtained under aseptic precautions and analyzed in the central laboratory of the institution. Fasting plasma glucose was measured using the glucose oxidase-peroxidase method. Serum triglycerides and high-density lipoprotein cholesterol levels were estimated using enzymatic colorimetric methods on an automated analyzer with regular internal and external quality control.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of the institution. Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was strictly maintained, and the study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Statistical analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 20.0. Continuous variables were expressed as mean ± standard deviation or median (interquartile range) depending on data distribution, while categorical variables were presented as frequencies and percentages. The prevalence of metabolic syndrome and its individual components was calculated among patients with psoriasis. Associations between metabolic syndrome and categorical variables, including psoriasis severity categories, were assessed using the chi-square test or Fisher's exact test as appropriate. Comparison of mean PASI scores between patients with and without metabolic syndrome was performed using the independent samples t-test or Mann–Whitney U test. A p-value <0.05 was considered statistically significant.

RESULTS

The study included 144 adult patients with psoriasis, with a mean age of 42.8 ± 12.6 years. The majority of patients belonged to the 31–45 year age group (37.5%), followed by 46–60 years (30.6%). Males constituted 68.1% of the study population, resulting in a male-to-female ratio of approximately 2.1:1. The mean duration of psoriasis was 6.9 ± 4.8 years, with a mean age at onset of 35.9 ± 11.2 years. A positive family history of psoriasis was reported in 15.3% of patients. Lifestyle risk factors were common, with 28.5% of patients reporting smoking and 31.9% reporting alcohol consumption [Table 1].

Table 1: Baseline demographic and clinical characteristics of psoriasis patients (n = 144).

Variable	Frequency (%)/mean ± SD
Age (years)	42.8 ± 12.6
Age group (years)	
• 18–30	28 (19.4%)
• 31–45	54 (37.5%)
• 46–60	44 (30.6%)
• >60	18 (12.5%)
Gender	
• Male	98 (68.1%)
• Female	46 (31.9%)
Duration of psoriasis (years)	6.9 ± 4.8
Age at onset (years)	35.9 ± 11.2
Family history of psoriasis	22 (15.3%)
Smoking	41 (28.5%)
Alcohol consumption	46 (31.9%)

The mean Psoriasis Area and Severity Index (PASI) score among the study participants was 13.6 ± 7.4. Based on PASI categorization, 36.1% of patients had mild psoriasis (PASI <10), 40.3% had moderate psoriasis (PASI 10–20), and 23.6% had severe psoriasis (PASI >20). The mean body surface area (BSA) involvement was 18.9 ± 11.5%, indicating

substantial skin involvement in a significant proportion of patients [Table 2].

Metabolic syndrome was identified in 58 patients, yielding a prevalence of 40.3% among individuals with psoriasis. Among the individual components of metabolic syndrome, abdominal obesity was the most prevalent (56.9%), followed by low high-density lipoprotein (HDL) cholesterol levels (47.9%) and hypertension (44.4%). Hypertriglyceridaemia was present in 43.1% of patients, while elevated fasting plasma glucose or known diabetes mellitus was observed in 35.4% of cases [Table 3].

Table 2: Distribution of psoriasis severity based on PASI and body surface area involvement.

Severity parameter	Frequency (%)/mean ± SD
PASI score	13.6 ± 7.4
PASI category	
• Mild (PASI <10)	52 (36.1%)
• Moderate (PASI 10–20)	58 (40.3%)
• Severe (PASI >20)	34 (23.6%)
Body surface area involved (%)	18.9 ± 11.5

PASI – Psoriasis Area and Severity Index; BSA – body surface area.

Table 3: Prevalence of metabolic syndrome and its individual components among psoriasis patients.

Parameter	Frequency (%)
Metabolic syndrome present	58 (40.3%)
Abdominal obesity	82 (56.9%)
Hypertension	64 (44.4%)
Elevated fasting glucose / diabetes	51 (35.4%)
Hypertriglyceridaemia	62 (43.1%)
Low HDL cholesterol	69 (47.9%)

MetS – metabolic syndrome; HDL – high-density lipoprotein.

Patients with metabolic syndrome were significantly older compared to those without metabolic syndrome (47.9 ± 11.4 vs. 39.3 ± 12.1 years; p = 0.001). The mean duration of psoriasis was also significantly longer among patients with metabolic syndrome (8.3 ± 5.1 years) compared to those without (5.9 ± 4.3 years; p = 0.004). Smoking and alcohol consumption were significantly more common in patients with metabolic syndrome (p = 0.038 and p = 0.007, respectively). Although male gender was more frequent among patients with metabolic syndrome, this difference was not statistically significant (p = 0.206). The mean PASI score was significantly higher in patients with metabolic syndrome compared to those without metabolic syndrome (17.9 ± 7.2 vs. 10.8 ± 5.6; p < 0.001). Severe psoriasis was observed in 41.4% of patients with metabolic syndrome, compared to only 11.6% among those without metabolic syndrome. Conversely, mild psoriasis was significantly more common in patients without metabolic syndrome. The overall distribution of psoriasis severity differed significantly between the two groups (p < 0.001) [Table 4].

Table 4: Association of metabolic syndrome with demographic and clinical variables.

Variable	MetS present (n = 58)	MetS absent (n = 86)	p-value
	Frequency (%)/mean ± SD		
Age (years)	47.9 ± 11.4	39.3 ± 12.1	0.001
Gender			
Male	43 (74.1%)	55 (64.0%)	0.206
Female	15 (25.9%)	31 (36.0%)	
Duration of psoriasis (years)	8.3 ± 5.1	5.9 ± 4.3	0.004
Smoking	22 (37.9%)	19 (22.1%)	0.038
Alcohol use	26 (44.8%)	20 (23.3%)	0.007
PASI score	17.9 ± 7.2	10.8 ± 5.6	<0.001
Severity			
Mild psoriasis	10 (17.2%)	42 (48.8%)	<0.001
Moderate psoriasis	24 (41.4%)	34 (39.5%)	
Severe psoriasis	24 (41.4%)	10 (11.6%)	

MetS – metabolic syndrome; PASI – Psoriasis Area and Severity Index; MetS – metabolic syndrome; SD – standard deviation.

DISCUSSION

The present study demonstrates a strong and clinically meaningful association between psoriasis and metabolic syndrome, with 40.3% of patients with psoriasis fulfilling criteria for metabolic syndrome. This prevalence is substantially higher than estimates reported for the general adult Indian population, which range between 25% and 35%, reinforcing the concept of psoriasis as a systemic inflammatory disorder rather than a disease confined to the skin.[11,12] Similar prevalence rates of metabolic syndrome among psoriasis patients have been reported in Indian studies by Padma et al., and

Reshma et al., and international study by Li et al., typically ranging from 30% to 50%, depending on study design and diagnostic criteria used.[13–15] The relatively high burden observed in our cohort highlights the importance of routine metabolic screening in dermatology practice.

Age and disease duration emerged as significant factors associated with metabolic syndrome in patients with psoriasis. Patients with metabolic syndrome were significantly older and had a longer duration of psoriasis compared to those without metabolic syndrome. These findings are consistent with earlier studies by Milčić et al., and Aggarwal et al., suggesting that cumulative inflammatory burden over time contributes to metabolic derangements.[16,17] Chronic exposure to pro-inflammatory cytokines such as TNF-α, IL-6, and IL-17 is known to promote insulin resistance, endothelial dysfunction, and adipocyte dysregulation, thereby increasing the risk of metabolic syndrome as disease duration increases.[18] Lifestyle factors such as smoking and alcohol consumption were significantly more prevalent among patients with metabolic syndrome. These behaviors are known to independently worsen systemic inflammation and oxidative stress, potentially amplifying both psoriatic disease activity and metabolic abnormalities. Similar associations have been documented in previous studies by Adışen et al., and Asokan et al., where smoking and alcohol intake were linked to more severe psoriasis and higher cardiometabolic risk.[19,20] Although male gender predominated in the study population, gender was not independently associated with metabolic syndrome, aligning with several Indian studies by Swamy et al., and Girisha et al., that report comparable metabolic risk across sexes in psoriasis.[21,22]

A key finding of the study is the strong relationship between metabolic syndrome and psoriasis severity. Patients with metabolic syndrome had significantly higher mean PASI scores, and severe psoriasis was disproportionately common in this group. Moreover, the prevalence of metabolic syndrome increased progressively from mild (17.2%) to moderate (41.4%) and severe psoriasis (41.4%), demonstrating a clear dose–response relationship. This gradient supports the hypothesis that greater cutaneous disease severity reflects heightened systemic inflammation, which in turn drives metabolic dysfunction.[23] Similar severity-dependent associations have been reported by Wu et al. and Singh et al., who observed higher odds of metabolic syndrome and cardiovascular risk factors in patients with moderate-to-severe psoriasis.[24,25]

Among the individual components of metabolic syndrome, abdominal obesity, dyslipidaemia, and hypertension were particularly common in the present study. Adipose tissue, especially visceral fat, acts as an active endocrine organ producing adipokines such as leptin and resistin, which exacerbate Th17-mediated inflammation central to psoriasis pathogenesis.[26] Reduced HDL cholesterol and elevated triglycerides further contribute to a pro-atherogenic state, explaining the increased cardiovascular risk observed in patients with severe psoriasis. The bidirectional relationship between psoriasis and metabolic syndrome suggests that each condition may aggravate the other through shared inflammatory pathways.[27]

The findings of this study have important clinical implications. The strong association between metabolic syndrome and psoriasis severity underscores the need for an integrated, multidisciplinary approach to management.[28] Early identification and treatment of metabolic abnormalities may not only reduce long-term cardiovascular morbidity but also potentially improve psoriasis outcomes, as supported by studies showing better treatment responses in patients with optimized metabolic profiles.[24,25] From a public health perspective, incorporating routine metabolic screening into psoriasis management protocols could significantly reduce the burden of non-communicable diseases in this high-risk population.[29]

Limitations

This study has certain limitations that should be considered while interpreting the findings. The cross-sectional design limits the ability to establish a causal relationship between psoriasis and metabolic syndrome. As the study was conducted in a single tertiary care center, the findings may not be fully generalizable to the broader community or primary care settings. The use of convenience sampling may have introduced selection bias, with a possible overrepresentation of patients with moderate to severe disease. Additionally, inflammatory biomarkers such as C-reactive protein, adipokines, or cytokine profiles were not assessed, which could have provided deeper insight into the mechanistic links between psoriasis and metabolic syndrome. Longitudinal studies with larger, multicentric samples are warranted to confirm temporal relationships and evaluate the impact of metabolic control on psoriasis outcomes.

CONCLUSION

The present study demonstrates a high prevalence of metabolic syndrome among patients with psoriasis and establishes a significant association between metabolic syndrome and increasing clinical severity of psoriasis. Older age, longer disease duration, and adverse lifestyle factors such as smoking and alcohol consumption were significantly associated with metabolic syndrome. The progressive rise in metabolic syndrome prevalence with increasing PASI severity highlights psoriasis as a systemic inflammatory disease with important cardiometabolic implications. Routine screening for metabolic syndrome in patients with psoriasis, particularly those with moderate to severe disease, is

essential for early detection and comprehensive management aimed at reducing long-term cardiovascular morbidity.

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