Vol 1. Iss. 1 (January-June, 2025)

A Prospective Sudy

The prevalence of metabolic syndrome in psoriatic patients in Albania

Dorina Hajro[1], Monika Fida[1*], Edjon Hajro[2], Sabina Dedej[1] and Ermira Vasili[1]

[1]*University of Medicine of Tirana, Department of Dermatology and Venerology, University Hospital Center "Mother Theresa", Tirana, Albania;*

[2]*Department of Cardiology, American Hospital 3, Tirana, Albania*

KEYWORDS

psoriasis, metabolic syndrome, comorbidities, obesity, cohort study, prevalence, Albania

CORRESPONDING AUTHOR

Prof. As. Monika Fida
University of Medicine of Tirana,
Department of Dermatology and Venereology,
University Hospital Center "Mother Theresa",
Dibra Street, No. 372,
Tirana, Albania
Tel: +355682064725
e-mail:monikafida@gmail.com

ABSTRACT

Psoriasis is a chronic, immune-mediated skin, now recognized as a systemic inflammatory disease linked to comorbidities such as metabolic syndrome (MetS), cardiovascular disease, and psychiatric disorders. This study explores the prevalence of MetS among psoriasis patients in Albania. This is a prospective case-control study conducted in the University Hospital Center "Mother Theresa", Tirana, Albania. It included 148 psoriasis patients and 150 age- and sex-matched controls. Data collected from patients included age, sex, psoriasis severity (PASI score), and metabolic parameters such as fasting blood glucose, lipid levels, and blood pressure. MetS was diagnosed based on NCEP-ATP III criteria. Statistical analyses were performed using SPSS software. The mean age was 52.3±12.6 years in psoriatic patients and 54.46±15.18 years in controls. Psoriatic patients were 38,5% women and 61,5 % men. The prevalence of MetS was significantly higher in psoriasis patients (62.8%) compared to controls (37.2%) ($p<0.002$). PASI score was greater in patients with MetS than those without MetS ($p=0.004$). Psoriasis severity correlated with an increased likelihood of MetS (OR: 2.6, $p<0.0001$). There was a significant relationship between PASI>10 and obesity ($p=0.0152$). Significant positive correlations were observed between age, disease duration, and MetS ($p<0.0001$). Stress was also significantly associated with MetS ($p=0.006$). No significant associations were found between smoking or sex and MetS in this cohort. The study confirms a high prevalence of MetS in psoriasis patients in Albania. Disease severity, age, and duration are significantly associated with MetS, underscoring the importance of early identification and comprehensive management. Addressing both physical and psychological factors is critical for improving patient outcomes.

1. Introduction

Psoriasis is a chronic, immune-mediated skin condition characterized by erythematous plaques with silvery scales, affecting approximately 2-3% of the global population. The prevalence varies significantly by region and affects individuals of all ages, but it often manifests in early adulthood or between the ages of 50 and 60 years (1). The public health implications of psoriasis extend beyond its cutaneous manifestations. Psoriasis is associated with a significant psychosocial burden, negatively impacting patients' quality of life. Furthermore, psoriasis is increasingly recognized as a systemic inflammatory disease linked to various comorbidities, including metabolic syndrome, cardiovascular disease, and psychiatric disorders (2, 3). This dual burden underscores the importance of prioritizing psoriasis in public health policies to reduce its physical, psychological, and systemic impacts.

Metabolic syndrome (MetS), a cluster of interrelated conditions including central obesity, hypertension, dyslipidemia, and insulin resistance, is strongly linked to psoriasis (4). Numerous global studies have confirmed that patients with psoriasis are more likely to develop metabolic syndrome than the general population. This association persists across diverse populations, suggesting a universal underlying mechanism involving chronic systemic inflammation. However, study methodologies and population demographic variations warrant cautious interpretation (5).

Psoriasis and metabolic syndrome share several pathophysiological mechanisms. One key link is the role of pro-inflammatory cytokines, particularly IL-17 and TNF-α, which contribute to both psoriasis pathogenesis and metabolic dysfunction. IL-17 has been implicated in insulin resistance, type 2 diabetes, vascular inflammation, and hypertension. Targeting IL-17 with biologics like secukinumab has shown not only improvements in psoriasis but also reductions in body weight, fasting glucose levels, and metabolic parameters. Similarly, TNF-α inhibitors, widely used in psoriasis treatment, have demonstrated beneficial effects on lipid metabolism, blood pressure, and insulin sensitivity, though some studies indicate conflicting results regarding their overall metabolic impact (6, 7). Adipocytokines, particularly leptin, and adiponectin, also play a crucial role in linking psoriasis and MetS. While leptin is pro-inflammatory and associated with obesity and psoriasis severity, adiponectin has anti-inflammatory and insulin-sensitizing properties, and its levels are reduced in psoriasis patients. The imbalance between these adipokines may contribute to the development of metabolic complications in psoriasis (8). Elevated oxidative stress markers correlate with psoriasis severity and metabolic dysfunction, suggesting that targeting oxidative pathways could have therapeutic potential for both conditions (9). Changes in gut microbial composition can influence systemic inflammation, intestinal permeability, and metabolic homeostasis. Reduced levels of beneficial bacteria have been observed in both psoriasis and MetS, and gut barrier dysfunction may exacerbate systemic inflammation and metabolic complications (10, 11). Overall, these shared pathways suggest that psoriasis and MetS are closely interconnected through inflammatory, metabolic, and microbial factors. Targeting these common mechanisms may provide a more comprehensive approach to managing both conditions (6, 12).

Severe psoriasis is strongly linked to cardiovascular diseases, though the exact mechanisms remain unclear. Furthermore, both conditions share common genetic pathways, including genetic factors such as IL-23R and IL-23 polymorphisms, as well as genes related to lipid metabolism, the renin–angiotensin system, and endothelial function. Further research is needed to clarify these mechanisms, which could lead to personalized treatment strategies based on an individual's molecular and clinical, biological, and immunological profile (10).

This study marks the first exploration of the psoriasis-metabolic syndrome relationship in Albania, addressing a significant knowledge gap. Albania's healthcare system, like those in many developing countries, faces challenges related to non-communicable diseases, which are a leading cause of morbidity and mortality. In Albania, non-communicable diseases account for about 85% of the overall disease burden and 94% of mortality related to risk factors such as hypertension and smoking (13). This research can inform public health strategies tailored to Albania's context by elucidating the prevalence and characteristics of metabolic syndrome in psoriasis

patients. Policymakers can leverage these findings to implement multidisciplinary care models, enhance patient education (focused on promoting healthy lifestyles, implement gender-sensitive antismoking initiatives, and encourage physical activity), and integrate psoriasis and metabolic syndrome screening into primary care.

2. Materials and methods

Study subjects

This prospective case-control study includes 148 patients with psoriasis and 150 age and sex-matched controls admitted to the Service of Dermatology at "Mother Theresa" University Hospital Center, the only tertiary center in Tirana. The controls were subjects referred during the study period for various dermatological complaints other than psoriasis. Individuals who were less than 18 years old, pregnant, or who had received and/or were receiving systemic and topical treatment for psoriasis were excluded from the study.

Data collection

Data collected from enrolled subjects include age, sex, medical history, personal history of psoriasis and psoriatic arthritis, dermatologic condition for controls, age onset of psoriasis, smoking habit, and stress presence (defined as yes or no). Weight and height were measured barefoot. Waist circumference was measured by pacing a measuring tape at the level of the iliac crest. Psoriasis severity was assessed by the psoriasis area severity index (PASI) (14). Psoriasis was considered mild to moderate if the PASI score was <10 and severe if the PASI score was >10. Venous blood samples were collected from fasting subjects and tested for glucose, HDL cholesterol, and triglycerides.

MetS was diagnosed in the presence of three or more criteria of the National Cholesterol Education Program Adult Panel III:

1. Fasting blood sugar ≥100mg/dl or treatment for hyperglycemia,
2. Serum HDL level <40mg/dl in men or <50mg/dl in women or treatment for low HDL,
3. Serum triglyceride level ≥150mg/dl or treatment for elevated triglycerides,
4. Obesity defined by waist circumference ≥102 cm in men or ≥88 in women,
5. Blood pressure ≥130/85mm Hg or treatment for hypertension.

Statistical analyses

Statistical analyses were made using the SPSS version 20.0 software package. Continuous variables are presented as means ±SD unless stated otherwise. Data were considered statistically significant if $p< 0,05$. The Chi-squared test and binary logistic regression assessed the relationship between two categorical variables. The independent t-test was used to compare mean values of continuous variables such as age between patients and controls, the mean of age, disease duration, and PASI score between patients with psoriasis with MetS and those without MetS. Multivariate binary logistic regression models were built to assess the relationship between MetS and psoriasis.

The authors have followed and reported the necessary elements that comply with STROBE guidelines for observational studies.

3. Results

Baseline characteristics

The study included 148 psoriatic patients and 150 control individuals. The mean age of psoriatic patients was 52.3 ±12.6 years, while the mean age in the control group was 54.46 ±15.18 years, with no significant difference observed between the two groups. In psoriatic patients, the mean disease duration was 10 years±7.78 years. Among the psoriatic patients, 57 (38.5%) were women, and 91 (61.5%) were men. Conversely, the control group comprised 74 women (49.3%) and 76 men (50.7%).

Psoriasis and MetS

Patients with psoriasis exhibited a significantly higher prevalence of MetS (93 patients, 62.8%) compared to controls (56 patients, 37.2%) ($p<0.002$). The confidence intervals for the prevalence of MetS in psoriatic patients (95% CI: 0.001-0.003) and controls (95% CI: 0.800-0.816) confirmed the statistical significance. However, individual components of MetS, including hypertension ($p=0.491$), triglycerides ($p=0.473$), HDL cholesterol ($p=0.572$), and obesity ($p=0.747$), did not show significant differences between the groups**.**

Psoriasis Area and Severity Index (PASI) and MetS

Among the psoriatic cohort, 107 patients (72.3%) had a PASI score >10, while 41 patients (27.7%) had a PASI score ≤10. Psoriatic patients with a PASI score >10 were more likely to have MetS than those with PASI ≤10 ($p<0.0001$). Furthermore, individuals with severe psoriasis (PASI >10) had an odds ratio (OR) of 2.6 for developing MetS compared to those with milder disease. A significant relationship was identified between PASI >10 and type II diabetes mellitus ($p<0.0001$).

Correlation analysis

Table I. The results of study There was a significant positive correlation between age, disease duration, and MetS in psoriatic patients. The Pearson correlation coefficients were as follows: age and MetS ($r=0.771$, $p<0.0001$), disease duration and MetS ($r=0.416$, $p<0.0001$), and age and disease duration ($r=0.604$, $p<0.0001$).

Stress, smoking, and MetS

Stress was significantly associated with MetS in psoriatic patients ($p=0.006$). However, no significant relationship was observed between smoking and MBS ($p=0.167$). Sex did not significantly affect MetS in this cohort ($p=0.404$).

The results are summarized in Table I.

Table I. *The results of study*

Variable	Psoriatic Patients (n=148)	Control Group (n=150)	Comments
Age (mean ± SD, years)	52.3 ± 12.6	54.46 ± 15.18	
Disease duration (mean ± SD, years)	10 ± 7.78	N/A	
Sex [female, n (%)]	57 (38.5%)	74 (49.3%)	
Sex [male, n (%)]	91 (61.5%)	76 (50.7%)	
MetS prevalence [n (%)]	93 (62.8%)	56 (37.2%)	p <0.002
95% CI for MetS	0.001–0.003	0.800–0.816	
PASI score >10 [n (%)]	107 (72.3%)	N/A	
PASI score ≤10 [n (%)]	41 (27.7%)	N/A	
PASI >10 and MetS (OR)	2.6	N/A	p <0.0001
Correlation: age & MetS (r, p)	0.771, <0.0001	N/A	Positive correlation
Correlation: disease duration & MetS (r, p)	0.416, <0.0001	N/A	Positive correlation
Correlation: age & disease duration (r, p)	0.604, <0.0001	N/A	Positive correlation

(N/A= not applicable)

4. Discussion

The understanding of psoriasis has evolved from a purely dermatologic disorder to a systemic inflammatory disease with significant metabolic and cardiovascular implications. In 1988, Gerald Reaven introduced the term Syndrome X, describing the cluster of insulin resistance, hyperglycemia, dyslipidemia, and hypertension (15). In 1999, the World Health Organization (WHO) formalized the definition of metabolic syndrome, linking it to cardiovascular disease and diabetes risk (16). The Third Report of the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) introduced metabolic syndrome as a critical target for intervention, highlighting its role in increasing CHD risk. The findings and definitions provided by NCEP-ATP III were adopted as criteria for the inclusion and registration of our patients in the current study (17).

Understanding the link between psoriasis and metabolic syndrome is crucial for several reasons. Firstly, metabolic syndrome is a significant contributor to morbidity and mortality, primarily due to its role in escalating cardiovascular disease risk. Secondly, the systemic inflammation underlying psoriasis exacerbates metabolic syndrome's pathogenesis, creating a vicious cycle that amplifies disease severity and complications (18, 19). By studying this association, healthcare providers can develop targeted screening and intervention strategies to prevent complications in psoriasis patients. Early identification of metabolic syndrome components in psoriasis patients allows timely intervention, reducing long-term cardiovascular risks. Moreover, such studies have provided a scientific foundation for public health initiatives, fostering integrated care approaches and raising awareness about the systemic nature of psoriasis (20). Inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and interleukin-17 (IL-17), play central roles in both psoriasis and metabolic syndrome, creating a pro-inflammatory milieu that promotes insulin resistance, endothelial dysfunction, and lipid abnormalities. The interplay between these conditions emphasizes the need for holistic management strategies addressing the dermatological and systemic

components of psoriasis (12).

Our findings show a significantly higher prevalence of MetS among psoriatic patients than controls (62.8% vs. 37.2%, p<0.002), aligning with previous research suggesting systemic inflammation in psoriasis contributes to metabolic dysregulation (21, 22). Male predominance in the psoriasis group might have independently affected the high prevalence of MetS in our study. Meta-analyses provide robust evidence on the psoriasis-metabolic syndrome relationship. For instance, Singh et al. analyzed 15 studies involving over 46.714 psoriasis patients and reported a pooled odds ratio of 2.14 for metabolic syndrome (23). Similarly, a systemic review found a global MetS prevalence of 32% in patients with psoriasis, with higher rates in adults (32%) compared to children and adolescents (9%); regionally, Latin America had the highest prevalence (47%), while North America had the lowest (26%) (24).

While the link between psoriasis and metabolic syndrome is well-documented, several controversies persist. One key debate concerns causality: whether psoriasis directly contributes to metabolic syndrome or if shared risk factors, such as obesity and sedentary lifestyles, drive the association. Additionally, some studies suggest that lifestyle modifications alone can reduce metabolic syndrome in psoriasis patients, challenging the emphasis on systemic inflammation as the primary mechanism. Another area of contention involves the role of biological therapies. While TNF-α inhibitors and IL-17 blockers improve psoriasis symptoms and some metabolic parameters, their long-term effects on cardiovascular outcomes remain unclear (25, 26).

Interestingly, in our study, while the prevalence of MetS was markedly higher in psoriatic patients, individual MetS components such as hypertension, triglycerides, HDL cholesterol, and obesity did not show significant differences between the psoriatic and control groups. Geographic and climatic factors regard sunlight and vitamin D protection potential, and the Mediterranean diet influences cardiovascular heart disease risk in Albania, as mentioned by Grimes et al. (27).

Additionally, this study presents the relationship between disease severity, as measured by PASI and MetS. Psoriatic patients with a PASI score >10 had a significantly higher likelihood of developing MetS than those with milder disease (OR: 2.6, p<0.0001). Severe psoriasis is associated with an increased risk of developing metabolic syndrome through complex mechanisms. The heightened systemic inflammation characteristic of severe disease, driven by elevated levels of TNF-α and interleukins, extends beyond the skin and impacts multiple organ systems. This pro-inflammatory state promotes adipose tissue dysfunction, favoring the secretion of pro-inflammatory adipokines while reducing protective factors such as adiponectin, thereby exacerbating insulin resistance. Concurrently, oxidative stress and endothelial dysfunction accelerate vascular injury and hypertension, while dyslipidemia, characterized by elevated triglycerides and small dense LDL particles, further enhances cardiovascular risk. Together, these pathological alterations—chronic inflammation, metabolic imbalance, vascular damage, and impaired glucose homeostasis—converge to substantially increase the prevalence of metabolic syndrome among patients with more severe forms of psoriasis (28). Numerous studies affirm the correlation between psoriasis severity and metabolic syndrome, although exceptions have been reported (29, 30). This association extends to specific metabolic components such as type II diabetes mellitus, which was significantly correlated with higher PASI scores (p<0.0001). These findings suggest that severe psoriasis acts as a systemic pro-inflammatory state, heightening the risk of metabolic disturbances. Psoriasis is strongly associated with diabetes, with studies reporting an increased risk of type 2 diabetes in psoriasis patients. Chronic inflammation plays a vital role in this relationship, as elevated levels of TNF-α and IL-6 impair insulin signaling pathways, promoting insulin resistance. Moreover, psoriasis-related inflammation exacerbates pancreatic beta-cell dysfunction, further contributing to hyperglycemia (31, 32).

Age and disease duration were strongly correlated with MetS in the psoriatic cohort, as evidenced by Pearson correlation coefficients for age and MetS (r=0.771, p<0.0001) and disease duration and MetS (r=0.416, p<0.0001). These results reinforce the concept of psoriasis as a chronic condition whose cumulative inflammatory and metabolic impact increases with time (33). The significant correlation between age and disease duration (r=0.604, p<0.0001) further underscores the potential compounded risk in older individuals with longstanding

disease.

Psychosocial factors also play a role in the metabolic complications associated with psoriasis. Stress, significantly associated with MetS in this study (p=0.006), may exacerbate systemic inflammation through neuroendocrine pathways. This finding highlights the importance of addressing psychological well-being in a comprehensive management plan for psoriatic patients (33). Smoking is a significant modifiable risk factor for MetS. It contributes to the pathogenesis of MetS through multiple mechanisms, including increased adiposity, insulin resistance, leptin resistance, low-grade systemic inflammation, endothelial dysfunction, and autonomic dysfunction. It promotes central obesity by increasing waist circumference and waist-to-hip ratio in a dose-dependent manner while also disrupting lipid metabolism by elevating triglycerides and reducing HDL cholesterol. Additionally, smoking induces a proinflammatory and prothrombotic state by increasing C-reactive protein, fibrinogen, and endothelial dysfunction, further exacerbating MetS development (35, 36). A meta-analysis based on 13 prospective cohort studies (56,691 participants) confirms a strong association between smoking and an increased risk of metabolic syndrome (MetS), with active smokers having a 26% higher risk than nonsmokers. Furthermore, smoking cessation showed potential benefits in reducing MetS risk, particularly in males (37).

In our study, smoking and sex did not exhibit significant associations with MetS, suggesting that these factors may play a less direct role in metabolic dysregulation in this context in our population. However, potential bias due to self-reported smoking habits and cultural and racial disparities in study data must be considered key confounders in every report (37). Research has indicated that smoking independently contributes to an increased risk of developing both psoriasis and metabolic syndrome because it induces inflammation (38).

Different reports observe variances between sex and metabolic syndrome in psoriatic patients, some indicating distinct male or female risk, and some others report no association (39-41). In a population-based study in the UK, the strongest association was observed among women in younger age groups, with nearly fourfold increased odds of MetS, while the odds decreased with age. In contrast, men with psoriasis had a consistent 35% increase in odds of MetS across all age groups compared to men without psoriasis (42).

While this study provides valuable insights, some limitations should be considered. The single-center setting may limit the broader applicability of the results. Stress was evaluated based on personal perceptions rather than standardized scales, and lifestyle factors such as diet and physical activity, which significantly impact metabolic syndrome risk, were not included in the assessment.

5. Conclusion

The interplay between psoriasis and metabolic syndrome is a critical area of research with significant implications for public health and clinical practice. This study, the first of its kind in Albania, aims to illuminate this relationship, providing valuable insights for healthcare providers and policymakers. The significant association between PASI scores, age, disease duration, and MetS highlights the need for early identification and holistic management of metabolic risk factors in psoriatic patients. Addressing both physical and psychological dimensions of care could improve outcomes and reduce the long-term burden of comorbidities in this vulnerable population.

References

1. Boehncke WH, Schön MP. Psoriasis. Lancet. 2015;386:983-94.

2. Kovitwanichkanont T, Chong AH, Foley P. Beyond skin deep: addressing comorbidities in psoriasis. Med J Aust. 2020;212:528-534.

3. Rapp SR, Feldman SR, Exum ML, et al. Psoriasis causes as much disability as other major medical diseases. J Am Acad Dermatol. 1999:401-7.

4. Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation. 2005;112:2735-2752.

5. Chan WMM, Yew YW, Theng TSC, et al. Prevalence of metabolic syndrome in patients with psoriasis: a cross-sectional study in Singapore. Singapore Med J. 2020;61:194-199.

6. Piaserico S, Orlando G, Messina F. Psoriasis and Cardiometabolic Diseases: Shared Genetic and Molecular Pathways. Int J Mol Sci. 2022;23:9063.

7. Timis TL, Beni L, Florian IA, et al. Prevalence of metabolic syndrome and chronic inflammation in psoriasis before and after biologic therapy: a prospective study. Med Pharm Rep. 2023;96:368-383.

8. Goolam Mahyoodeen N, Crowther NJ, Pillay L, et al. Relationship of Visceral Fat and Adipokines with Cardiometabolic Diseases in Psoriasis. Acta Derm Venereol. 2019;99:1218-1223.

9. Holmannova D, Borsky P, Andrys C, et al. Chromosomal Aberrations and Oxidative Stress in Psoriatic Patients with and without Metabolic Syndrome. Metabolites. 2022;12:688.

10. Mustata ML, Neagoe CD, Ionescu M, et al. Clinical Implications of Metabolic Syndrome in Psoriasis Management. Diagnostics. 2024;14:1774.

11. Secchiero P, Rimondi E, Marcuzzi A, et al. Metabolic Syndrome and Psoriasis: Pivotal Roles of Chronic Inflammation and Gut Microbiota. Int J Mol Sci. 2024;25:8098.

12. Hao Y, Zhu YJ, Zou S, et al. Metabolic Syndrome and Psoriasis: Mechanisms and Future Directions. Front Immunol. 2021;12:711060.

13. Burazeri G. Burden of non-communicable diseases and behavioral risk factors in Albania. Eur J Public Health. 2020;30(Suppl 5).

14. New Zealand Dermatological Society page on PASI with scoring pictures. https://dermnetnz.org/topics/pasi-score

15. Reaven GM. Role of insulin resistance in human disease. Diabetes. 1988;37:1595–1607.

16. WHO. Definition, diagnosis and classification of diabetes mellitus and its complications. 1999.

17. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA. 2001;285:2486-2497.

18. Davidovici BB, Sattar N, Prinz J, et al. Psoriasis and systemic inflammatory diseases: potential mechanistic links between skin disease and co-morbid conditions. J Invest Dermatol. 2010;130:1785-1796.

19. Mottillo S, Filion KB, Genest J, et al. The metabolic syndrome and cardiovascular risk a systematic review and meta-analysis. J Am Coll Cardiol. 2010;56:1113-1132.

20. Wu JJ, Suryavanshi M, Davidson D, et al. Economic Burden of Comorbidities in Patients with Psoriasis in the USA. Dermatol Ther (Heidelb). 2023;13:207-219.

21. Patwekar S, Chaudhari N, Poulkar CB, et al. A Case-Control Study to Find Out the Prevalence of Metabolic Syndrome in Patients With Psoriasis As

Compared to Age and Sex Matched Controls. Int J Res Dermatol. 2021;8:15-20.

22. Tas B, Kabeloglu V. Prevalence of Metabolic Syndrome and Its Parameters and Their Correlations With Psoriasis Duration, Severity, and Sleep Quality In Psoriasis Patients: A Cross-Sectional Study. Dermatol Pract Concept. 2021:2021049.

23. Singh S, Young P, Armstrong AW. An update on psoriasis and metabolic syndrome: A meta-analysis of observational studies. PLoS One. 2017;12:e0181039.

24. Liu L, Cai XC, Sun XY, et al. Global prevalence of metabolic syndrome in patients with psoriasis in the past two decades: current evidence. J Eur Acad Dermatol Venereol. 2022;36:1969-1979.

25. Patrick MT, Li Q, Wasikowski R, et al. Shared genetic risk factors and causal association between psoriasis and coronary artery disease. Nat Commun. 2022;13:6565.

26. Wu JJ, Kavanaugh A, Lebwohl MG, et al. Psoriasis and metabolic syndrome: implications for the management and treatment of psoriasis. J Eur Acad Dermatol Venereol. 2022;36:797-806.

27. Grimes DS, Hindle E, Dyer T. Albanian paradox, another example of protective effect of Mediterranean lifestyle? Lancet. 1998;351(9105):835-836.

28. Armstrong AW, Harskamp CT, Armstrong EJ. Psoriasis and metabolic syndrome: a systematic review and meta-analysis of observational studies. J Am Acad Dermatol. 2013;68:654–662.

29. Sommer DM, Jenisch S, Suchan M, et al. Increased prevalence of the metabolic syndrome in patients with moderate to severe psoriasis. Arch Dermatol Res. 2006;298:321-328.

30. Gisondi P, Tessari G, Conti A, et al. Prevalence of metabolic syndrome in patients with psoriasis: a hospital-based case-control study. Br J Dermatol. 2007;157:68-73.

31. Takeshita J, Grewal S, Langan SM, et al. Psoriasis and comorbid diseases: Epidemiology. J Am Acad Dermatol. 2017;76:377-390.

32. Abramczyk R, Queller JN, Rachfal AW, Schwartz SS. Diabetes and Psoriasis: Different Sides of the Same Prism. Diabetes Metab Syndr Obes. 2020;13:3571-3577.

33. Praveenkumar U, Ganguly S, Ray L, et al. Prevalence of Metabolic Syndrome in Psoriasis Patients and its Relation to Disease Duration: A Hospital Based Case-Control Study. J Clin Diagn Res. 2016;10:WC01-WC5.

34. Blackstone B, Patel R, Bewley A. Assessing and Improving Psychological Well-Being in Psoriasis: Considerations for the Clinician. Psoriasis (Auckl). 2022;12:25-33.

35. Behl TA, Stamford BA, Moffatt RJ. The Effects of Smoking on the Diagnostic Characteristics of Metabolic Syndrome: A Review. Am J Lifestyle Med. 2022;17:397-412.

36. Balhara YP. Tobacco and metabolic syndrome. Indian J Endocrinol Metab. 2012;16:81-87.

37. Sun K, Liu J, Ning G. Active smoking and risk of metabolic syndrome: a meta-analysis of prospective studies. PLoS One. 2012;7:e47791.

38. Wei L, Chen S, Qiang Y, et al. Tobacco smoking was positively associated with metabolic syndrome among patients with psoriasis in Shanghai: A cross-sectional study. Tob Induc Dis. 2022;20:05.

39. Zindancı I, Albayrak O, Kavala M, et al. Prevalence of metabolic syndrome in patients with psoriasis. Scientific World Journal. 2012;2012:312463.

40. Lee HJ, Han KD, Park HE, et al. Changes in metabolic syndrome and risk of psoriasis: a nationwide population-based study. Sci Rep. 2021;11:24043.

41. Kim GW, Park HJ, Kim HS, et al. Analysis of cardiovascular risk factors and metabolic syndrome in Korean patients with psoriasis. Ann Dermatol. 2012;24:11–5.

42. Danielsen K, Wilsgaard T, Olsen AO, et al. Elevated odds of metabolic syndrome in psoriasis: a population-based study of age and sex differences. Br J Dermatol. 2015;172:419-427.