Original Article

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Association between Psoriasis and Migraine in a Nationwide Cross-Sectional Study in Korea

Woo-Seok Ha[1], **Soohyun Cho**[2]

[1]Department of Neurology, Severance Hospital, Yonsei University College of Medicine, Seoul, Republic of Korea
[2]Department of Neurology, Uijeongbu Eulji Medical Center, Eulji University School of Medicine, Uijeongbu, Republic of Korea

Abstract

Purpose: Psoriasis and migraine are common chronic disorders that may share neuroimmune mechanisms, although the biological basis of their association remains uncertain. This study investigated the association between psoriasis and migraine, focusing on psoriasis severity and migraine subtypes, using a large population-based database.

Methods: This population-based cross-sectional study used data from the Korean National Health Insurance Service database. We identified 329,363 adults who underwent national health screening in 2019, including 8,892 patients with psoriasis and 320,471 individuals without psoriasis. Psoriasis severity was classified according to the use of systemic or biologic agents, and migraine was categorized according to the presence of aura. Multiple logistic regression analyses were performed with adjustment for age, sex, comorbidities, body mass index, smoking status, alcohol consumption, income, and residential area.

Results: In the fully adjusted model, patients with psoriasis had higher odds of prevalent migraine than individuals without psoriasis (odds ratio [OR], 1.172; 95% confidence interval [CI], 1.102–1.246). This association was observed in both mild psoriasis (OR, 1.167) and moderate-to-severe psoriasis (OR, 1.190). Psoriasis was also significantly associated with non-aura-coded migraine (OR, 1.171; 95% CI, 1.100–1.246), whereas migraine with aura was not significantly associated with psoriasis.

Conclusion: Psoriasis was cross-sectionally associated with higher odds of prevalent migraine, including non-aura-coded migraine, after adjustment for measured demographic, clinical, and lifestyle factors. Longitudinal studies are needed to determine temporality and address potential detection bias related to healthcare utilization.

Keywords: Headache, Migraine disorders, Psoriasis

INTRODUCTION

Migraine is a common neurological disorder that is frequently accompanied by a wide range of systemic comorbidities, including cardiovascular, metabolic, autoimmune, and psychiatric diseases.[1] Growing evidence suggests that these comorbidities may contribute to migraine burden and provide insights into shared biological mechanisms. Among them, psoriasis, a chronic immune-mediated inflammatory skin disease, has recently attracted attention

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Correspondence: Soohyun Cho, M.D., Ph.D.
Department of Neurology, Uijeongbu Eulji Medical Center, Eulji University School of Medicine, 712 Dongil-ro, Uijeongbu 11759, Republic of Korea
Tel: +82-31-951-1000, Fax: +82-31-951-2010, E-mail: anttop@naver.com

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because of its systemic inflammatory nature and its association with cardiovascular and metabolic disorders.[2]

The management of both migraine and psoriasis has evolved substantially with the introduction of mechanism-based therapies.[3] Calcitonin gene-related peptide (CGRP)-targeted therapies have transformed migraine prevention, whereas biologic agents targeting interleukin (IL)-17 and IL-23 have become the cornerstone of treatment for moderate-to-severe psoriasis.[4-6] Although psoriasis and migraine are distinct disorders, a potential overlap in inflammatory pathways has been proposed. Pro-inflammatory cytokines such as tumor necrosis factor (TNF)-α and IL-17, which play important roles in psoriasis, have also been implicated in migraine pathophysiology, although the evidence remains limited.[7] In addition, mast cell–mediated neuroimmune interactions have been suggested as another potential biological link between psoriasis and migraine.[8,9]

While a few studies have reported a positive association between the two diseases, they have often been limited by insufficient adjustment for lifestyle confounders.[10-13] Given that obesity, smoking, and alcohol consumption are critical risk factors for systemic inflammation, rigorous adjustment for these variables is essential to isolate the independent association between the two diseases.

Therefore, this study aimed to investigate the association between psoriasis and migraine using a large-scale, population-based database in South Korea.

MATERIALS AND METHODS

1. Data source

This study utilized data from the Korean National Health Insurance Service (NHIS) database.[14] The NHIS is a compulsory social insurance system in South Korea that covers approximately 97% of the population, with the remaining 3% covered by the Medical Aid program. The NHIS database contains comprehensive information, including sociodemographic variables, healthcare utilization, disease diagnoses based on the International Classification of Diseases, Tenth Revision (ICD-10) codes, and prescription records. Additionally, the NHIS provides a biennial national health screening program for all beneficiaries aged 40 years or older and employees aged over 20 years. This screening includes a self-reported questionnaire on lifestyle habits, anthropometric measurements, and laboratory tests.

This study was approved by the NHIS inquiry commission and Institutional Review Board (IRB) of the Severance Hospital (IRB No. 4-2023-1309). The requirement for informed consent was waived because of the retrospective design and the use of de-identified participant data.

2. Study population

We identified individuals aged 20 years or older who participated in the national health screening program in 2019, which served as the index date for this cross-sectional analysis. Prevalent psoriasis and prevalent migraine were identified using claims recorded between 2002 and each participant's 2019 health screening date, whereas demographic characteristics, lifestyle factors, and laboratory measurements were obtained from the 2019 health screening examination.

3. Definition of psoriasis

Patients with psoriasis were defined as individuals who had been diagnosed with psoriasis (ICD-10 code L40) at least twice between 2002 and the screening date in 2019. According to a previous validation study, this operational definition showed a sensitivity of 79.6% and specificity of 91.2%.[15] To evaluate the impact of disease severity, patients with psoriasis were further categorized into two subgroups: mild and moderate-to-severe. The moderate-to-severe psoriasis group was defined as patients who had been prescribed any of the following systemic agents or biologic therapies under the diagnosis of psoriasis: acitretin, cyclosporine, methotrexate, TNF-α inhibitors (infliximab, adalimumab, etanercept), IL-12/23 inhibitors (ustekinumab), or IL-17A inhibitors (secukinumab, ixekizumab). Patients who did not meet the criteria for moderate-to-severe disease were classified into the mild psoriasis group.

4. Definition of migraine

Patients with migraine were defined as individuals who had received a diagnosis of migraine (ICD-10 code G43) at least twice between 2002 and the screening date in 2019.

According to a previous validation study conducted in Korean secondary and tertiary hospitals, this operational definition showed a positive predictive value of 75.7% and a negative predictive value of 66.7%.[16] Migraine was further classified based on the presence of aura. Patients diagnosed with migraine with aura (ICD-10 code G43.1) were classified into the "migraine with aura" group. This operational definition for migraine with aura showed a positive predictive value of 78.7% and a negative predictive value of 100% in the validation study.[16] All other patients with migraine were classified into the "non-aura-coded migraine" group.

5. Covariates

We collected data on sociodemographic characteristics and lifestyle habits from the NHIS database and health screening results. Baseline comorbidities were identified using ICD-10 codes recorded at least once before the screening date: hypertension (I10–I15), diabetes mellitus (E10–E14), dyslipidemia (E78), heart failure (I50), stroke (I60–I64), chronic kidney disease (N18), and Crohn's disease (K50).

Information regarding lifestyle behaviors was derived from self-reported questionnaires and anthropometric measurements. Obesity was defined as a body mass index (BMI) ≥ 25 kg/m^2, according to the Korean obesity guideline.[17] Smoking status was categorized into current smokers and non-current smokers (including never and past smokers). Alcohol consumption was categorized based on daily intake. We defined moderate-to-heavy drinkers as those consuming ≥30 g/day for males and ≥20 g/day for females, thresholds that encompass the levels of significant alcohol consumption suggested by the Korean Association for the Study of the Liver guideline.[18] Income level was classified into three quartiles (lower, middle, and higher) based on insurance premiums. Residential area was dichotomized into urban (Seoul and six metropolitan cities) and rural areas.

6. Statistical analysis

Descriptive statistics were used to present the baseline characteristics. Continuous variables were expressed as mean±standard deviation, and categorical variables as numbers (percentages). We performed multiple logistic regression analysis to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) for the association between psoriasis and migraine. Three sequential models were applied: Model 1 was adjusted for age and sex. Model 2 was further adjusted for comorbidities (hypertension, diabetes mellitus, dyslipidemia, heart failure, stroke, chronic kidney disease, and Crohn's disease). Model 3 was fully adjusted for age, sex, comorbidities, obesity (BMI≥25 kg/m^2), alcohol consumption, smoking status (current vs. non-current), income level, and residential area. Before fitting the multivariable logistic regression models, multicollinearity among covariates was assessed using variance inflation factors (VIFs). No evidence of substantial multicollinearity was observed (all VIFs<2). All statistical analyses were performed using SAS statistical software (version 9.2; SAS Institute). A p-value <0.05 was considered statistically significant.

RESULTS

1. Baseline characteristics of the study population

Table 1 presents the demographic and clinical characteristics of the study population. A total of 329,363 individuals were included in the final analysis, comprising 8,892 patients with psoriasis and 320,471 controls. The mean age of the psoriasis group was significantly higher than that of the control group (53.5±15.1 years vs. 49.5±14.9 years, p<0.0001). The proportion of males was higher in the psoriasis group (55.9%) compared to the control group (51.8%, p<0.0001).

Patients with psoriasis exhibited a significantly higher prevalence of comorbidities compared to controls, including hypertension, diabetes mellitus, dyslipidemia, heart failure, stroke, and chronic kidney disease (all p<0.05). Regarding lifestyle factors, the psoriasis group had a higher mean BMI and a higher proportion of current smokers compared to the control group. Furthermore, the prevalence of migraine was significantly higher in patients with psoriasis than in controls (15.1% vs. 12.1%, p<0.0001). Non-aura-coded migraine was more common in participants with psoriasis than in those without psoriasis (14.5% vs. 11.5%, p<0.0001), whereas the prevalence of migraine with aura was similar between the groups (0.7% vs. 0.6%, p=0.4607).

Table 1. Baseline characteristics of the study population

	Participants without psoriasis (n=320,471)	Participants with psoriasis (n=8,892)	p-value
Sex			
Male	166,067 (51.8)	4,974 (55.9)	<0.0001
Female	154,404 (48.2)	3,918 (44.1)	
Age (yr)	49.5±14.9	53.5±15.1	<0.0001
Body mass index (kg/m^2)	24.3±3.6	24.5±3.5	<0.0001
Hypertension	89,560 (27.9)	3,301 (37.1)	<0.0001
Diabetes mellitus	66,084 (20.6)	2,702 (30.4)	<0.0001
Dyslipidemia	138,372 (43.2)	4,944 (55.6)	<0.0001
Heart failure	8,237 (2.6)	383 (4.3)	<0.0001
Stroke	11,349 (3.5)	547 (6.2)	<0.0001
Chronic kidney disease	2,983 (0.9)	169 (1.9)	<0.0001
Crohn's disease	713 (0.2)	35 (0.4)	0.0008
Migraine	38,712 (12.1)	1,344 (15.1)	<0.0001
Non-aura-coded migraine	36,793 (11.5)	1,285 (14.5)	<0.0001
Migraine with aura	1,919 (0.6)	59 (0.7)	0.4607
Alcohol consumption			
None or light	244,074 (76.2)	6,782 (76.3)	0.8106
Moderate-to-heavy	76,397 (23.8)	2,110 (23.7)	
Smoking			
None or past	201,773 (63.0)	5,158 (58.0)	<0.0001
Current	118,698 (37.0)	3,734 (42.0)	
Income			
Low	81,786 (25.5)	2,334 (26.2)	<0.0001
Middle	119,758 (37.4)	3,124 (35.1)	
High	118,927 (37.1)	3,434 (38.6)	
Residential area			
Rural	181,889 (56.8)	5,043 (56.7)	0.9358
Urban	138,582 (43.2)	3,849 (43.3)	
Psoriasis severity			
Mild		7,083 (79.7)	
Moderate-to-severe		1,809 (20.3)	

Values are presented as number (%) or mean±standard deviation.

2. Association of psoriasis severity with migraine prevalence

Table 2 shows the results of the multiple logistic regression analysis estimating the association between migraine and psoriasis. In the unadjusted model, patients with psoriasis had a significantly higher odds of prevalent migraine. This association remained significant after adjusting for age and sex in Model 1 (OR, 1.259; 95% CI, 1.186–1.338). Even after fully adjusting for comorbidities, BMI, and lifestyle factors (Model 3), psoriasis was associated with higher odds of prevalent migraine (OR, 1.172; 95% CI, 1.102–1.246).

When stratified by disease severity, both mild and moderate-to-severe psoriasis groups showed a significant association with prevalent migraine. In the fully adjusted model (Model 3), the OR for migraine was 1.167 (95% CI, 1.090–1.250) in the mild psoriasis group and 1.190 (95% CI, 1.040–1.362) in the moderate-to-severe psoriasis group.

3. Association between psoriasis and migraine subtypes

We additionally examined the association according to migraine subtype, including migraine with aura and non-au-

ra-coded migraine (Table 3). Psoriasis was significantly associated with higher odds of prevalent non-aura-coded migraine (OR, 1.171; 95% CI, 1.100–1.246). However, no statistically significant association was observed between migraine with aura and psoriasis in any of the adjusted models (Model 3: OR, 1.014; 95% CI, 0.779–1.319).

DISCUSSION

In this large-scale, population-based study using the Korean NHIS database, psoriasis was cross-sectionally associated with higher odds of prevalent migraine.

Our findings are consistent with previous epidemiological studies. A Danish cohort study reported an increased risk of migraine in patients with psoriasis, with a more pronounced risk in severe cases.[12] Similarly, a previous Korean study using the Health Insurance Review & Assessment database reported a hazard ratio of 1.16 for migraine in psoriasis patients,[11] which aligns closely with the OR of 1.172 observed in our study. A recent systematic review and meta-analysis reported an epidemiologic association in studies examining either direction.[10]

The association between psoriasis and migraine may partly reflect shared biological mechanisms, although these remain incompletely understood. Several inflammatory mediators implicated in psoriasis, including TNF-α, IL-17, and IL-23, have also been proposed to participate in migraine pathophysiology.[19,20] However, evidence supporting systemic cytokine dysregulation in migraine remains limited, and our findings do not provide mechanistic evidence for a shared inflammatory pathway. Further experimental and clinical studies are needed to clarify the biological basis of this association.

Regarding migraine subtypes, we found a significant association between psoriasis and non-aura-coded migraine, whereas the association with migraine with aura was not statistically significant. This discrepancy might be attributed to the limitations of claims data rather than a true lack of biological association. In clinical practice, the specific code for migraine with aura (G43.1) is often underutilized com-

Table 2. Multiple logistic regression analysis of the association between psoriasis severity and prevalent migraine

		Odds ratio	95% confidence interval
All psoriasis	Model 1	1.259	1.186–1.338
	Model 2	1.169	1.100–1.243
	Model 3	1.172	1.102–1.246
Mild psoriasis	Model 1	1.247	1.166–1.333
	Model 2	1.165	1.088–1.247
	Model 3	1.167	1.090–1.250
Moderate-to-severe psoriasis	Model 1	1.312	1.149–1.499
	Model 2	1.186	1.037–1.358
	Model 3	1.190	1.040–1.362

Model 1: Adjusted for age and sex. Model 2: Adjusted for age, sex, and comorbidities (hypertension, diabetes mellitus, dyslipidemia, heart failure, stroke, chronic kidney disease, and Crohn's disease). Model 3: Adjusted for age, sex, comorbidities, body mass index, alcohol consumption, smoking status, income level, and residential area.

Table 3. Multiple logistic regression analysis of the associations between psoriasis and prevalent migraine subtypes

		Odds ratio	95% confidence interval
Non-aura-coded migraine	Model 1	1.255	1.180–1.334
	Model 2	1.167	1.097–1.242
	Model 3	1.171	1.100–1.246
Migraine with aura	Model 1	1.106	0.850–1.438
	Model 2	1.012	0.778–1.317
	Model 3	1.014	0.779–1.319

Model 1: Adjusted for age and sex. Model 2: Adjusted for age, sex, and comorbidities (hypertension, diabetes mellitus, dyslipidemia, heart failure, stroke, chronic kidney disease, and Crohn's disease). Model 3: Adjusted for age, sex, comorbidities, body mass index, alcohol consumption, smoking status, income level, and residential area.

pared to the general migraine code (G43.9), leading to a potential underestimation of the migraine with aura population.[21] Consequently, the small sample size of the migraine with aura group (n=1,978) in our dataset may have lacked the statistical power to detect a significant association.

This study has several strengths, including the use of a nationwide representative sample, strict inclusion criteria (≥2 visits), and comprehensive adjustment for well-known risk factors of psoriasis, including obesity, alcohol consumption and other comorbidities. However, several limitations should be noted. First, reliance on ICD-10 codes in administrative data may introduce potential diagnostic inaccuracies or misclassification bias. Furthermore, because the validation study was conducted in secondary and tertiary hospitals, its diagnostic performance may not be fully generalizable to the nationwide NHIS population. Second, because of the cross-sectional design, the temporal sequence between psoriasis and migraine could not be determined, and causal inference was not possible. Third, although we used medication history as a proxy for psoriasis severity, this operational definition may not perfectly reflect actual clinical severity. Some patients with clinically severe psoriasis who did not receive systemic or biologic therapies, or who discontinued these treatments, may have been misclassified as having mild psoriasis. Fourth, ascertainment bias may have influenced our findings. Patients with psoriasis may have more frequent healthcare encounters, increasing the likelihood of migraine diagnosis, and vice versa. Because detailed healthcare utilization variables such as outpatient visit frequency or total medical claims were not fully adjusted for, residual detection bias cannot be excluded. Therefore, surveillance bias may have partially contributed to the observed association, although it is unlikely to fully account for the consistent association observed after adjustment for multiple demographic, lifestyle, and clinical covariates. Fifth, although age and sex were included in the multivariable models, the baseline distributions of these variables differed between the groups, and residual confounding cannot be completely excluded. Future studies using age- and sex-matched controls or propensity score–based methods may provide more balanced comparisons. Finally, as this study was conducted exclusively on the Korean population, the generalizability of our findings to other ethnic groups may be limited.

In conclusion, psoriasis was associated with higher odds of prevalent migraine after adjustment for demographic, clinical, and lifestyle factors. Clinicians managing patients with psoriasis should be aware of the increased prevalence of migraine in this population. However, these findings should be interpreted as an epidemiologic association rather than evidence of a causal or bidirectional relationship, and prospective studies are needed before screening recommendations can be made.

AVAILABILITY OF DATA AND MATERIAL

The data presented in this study are available upon reasonable request from the corresponding author. The data are not publicly available due to privacy restrictions.

AUTHOR CONTRIBUTIONS

Conceptualization: WSH, SC; Data curation: WSH; Formal analysis: WSH; Investigation: SC; Methodology: WSH, SC; Software: WSH; Validation: SC; Writing–original draft: WSH; Writing–review & editing: WSH, SC.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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None.

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