

INVESTIGATIVE REPORT

Epidemiological Study of Psoriasis in the National Health Insurance Database in Taiwan

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The aim of this study was to determine the prevalence, treatment modalities and comorbidity of psoriasis in Taiwan. A nationally representative cohort of 1,000,000 individuals from the National Health Insurance database was followed up for the years 2000 to 2006. Their claims data was used for an epidemiological study. The mean one-year prevalence of psoriasis was 0.23% for men and 0.16% for women, respectively. The prevalence of psoriasis increased more rapidly in male patients aged 30 years and over and reached its peak in patients aged 70 years and over, regardless of sex. Overall, 98.4% of patients received treatment with topical corticosteroids, while 13.1% used Chinese herbal medicines and 13.6% received systemic treatment. Patients with psoriasis had a higher comorbidity of diabetes, hyperlipidaemia, and hypertension. In conclusion, in contrast to Caucasians, the prevalence of psoriasis in Taiwanese people is higher in men than in women and the prevalence increases significantly in patients over 70 years of age. *Key words: comorbidity; epidemiology; health insurance; psoriasis; Taiwanese.*

(Accepted January 13, 2009.)

Acta Derm Venereol 2009; 89: 262–266.

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The prevalence of psoriasis in Caucasians is 2–11% (1). Studies in the UK and Spain have demonstrated that the prevalence of psoriasis declines significantly in patients older than 70 years (2, 3). However, psoriasis is less frequent in Mongoloid people (4). Until now, no documented, large-scale studies of the prevalence of psoriasis have been available in Taiwan.

It is generally believed that psoriasis is equally common in males and females (1). Previous studies in Taiwan, however, have suggested that psoriasis is less frequent in females (5–7). In order to clarify that the preponderance of male psoriasis patients in these studies is not due to selection bias, a large-scale population-based study is warranted.

Patients with psoriasis have an increased risk of comorbidity with some diseases and mortality compared with the general population. Recently, the positive associations between psoriasis, diabetes mellitus (DM), hyperlipidaemia, hypertension, and cardiovascular diseases have drawn much attention (8–10). Moreover, the occurrence of occlusive vascular events, including ischaemic heart disease and cerebral infarction, is also significantly higher in patients with psoriasis than in the general population (11). Although the comorbid diseases of psoriasis have been studied extensively in other populations, no such study has been conducted in Chinese patients with psoriasis.

In Taiwan, the National Health Insurance (NHI) programme covers most of the population. A majority of medical institutions (93%) have been contracted to the Bureau of NHI and more than 96% of the population covered by NHI have utilized health services through contracted medical institutions. People in Taiwan are free to choose treatment with Western medicine or traditional Chinese medicine, and are allowed to visit either public or private medical facilities of their choice (12, 13). Therefore, information from the NHI database is considered to be an appropriate resource for the assessment of accurate prevalence estimates for chronic diseases such as psoriasis. The objectives of this study were to investigate the prevalence, treatment modalities, and comorbidity of psoriasis in Taiwan, based on the NHI data during the period 2000 to 2006.

MATERIALS AND METHODS

Data sources

The NHI programme was initiated in Taiwan in 1995 and covers almost the entire population (21,653,555 beneficiaries at the end of 2001, equivalent to 96.6% coverage). In 1999, the Bureau of NHI began to release all claims data in electronic format to the public under the National Health Insurance Research Database (NHIRD) project (14). So far, the NHIRD has been used extensively in many epidemiological studies (15–17).

In the present study, a total of 1,000,000 persons, approximately 5% of Taiwan's population, were selected randomly from Taiwan's NHIRD. The data contained information about 495,816 men (49.5%) and 504,184 women (50.4%). Attrition of the study cohort was observed due to various reasons, such as mortality

and emigration. In order to protect the privacy of insured individuals, the data on patient identities and institutions had been scrambled cryptographically. We defined psoriasis cases as those with a diagnostic code of psoriasis present in either an inpatient or outpatient service claim, and those having been diagnosed and cared for by either dermatologists or rheumatologists. We used their claims data for the years 2000 to 2006 to investigate the prevalence of psoriasis, demographic characteristics, treatment modalities and comorbidity with other diseases. Patients were further classified into a severe psoriasis group if they received a code for psoriasis as well as systemic therapy. The remaining patients were classified into a mild psoriasis group if they only received a psoriasis code but no systemic therapy.

The study was approved by the institutional review board of the university.

Statistical analysis

The statistical significance of differences in prevalence between sex and different age groups was evaluated with a χ^2 test. Multiple logistic regression analysis was performed to evaluate the independent association of individual comorbid disease with psoriasis by adjusting age and sex. Odds ratios and 95% confidence interval (ORs \pm 95% CI) from the logistic regression model after controlling for other covariates in the model were used to estimate the magnitude of the association between individual comorbid disease and psoriasis. SAS statistical package (version 8.2; SAS Institute Inc, Cary, NC, USA) and Microsoft SQL Server 2005 (Microsoft Corp., Redmond, WA, USA) were used for data linkage and processing. A *p*-value less than 0.05 was considered statistically significant.

RESULTS

Patient characteristics

The study cohort comprised 8388 patients (4691 males and 3697 females) with claims of a primary diagnosis of psoriasis during the 7-year study period. In order to minimize the possibility of misdiagnosis, only 5864 patients (3243 males and 2621 females) cared for by dermatologists and rheumatologists were included as patients with psoriasis in the present study. The mean one-year prevalence rate of psoriasis was 0.19%; 0.23% for men and 0.16% for women, respectively (Fig. 1). There was a significant gender difference in the prevalence of psoriasis in Taiwan (odds ratio = 1.26, *p* < 0.0001). The prevalence in patients younger than 30 years was similar in both genders, but increased more rapidly in male patients aged 30 years or older (Fig. 1). In contrast to previous reports in Caucasians, the mean one-year prevalence reached its peak in Taiwanese patients aged 70 years and older, regardless of sex (Fig. 1). The prevalence of psoriasis increased more than 50% in patients aged 70 years and older, compared with patients aged 60–69 years.

In this study cohort, a total of 3,444,188 ambulatory visits to dermatologists from 526,025 enrollees were found during the 7-year study period. Among them, 54,953 (1.6%) ambulatory visits were from patients with psoriasis. Overall, 436 (7.7%) of these patients were also diagnosed with psoriatic arthritis. The frequencies of psoriatic arthritis in patients with psoriasis were higher in patients younger than 10 years and aged 30–59 years.

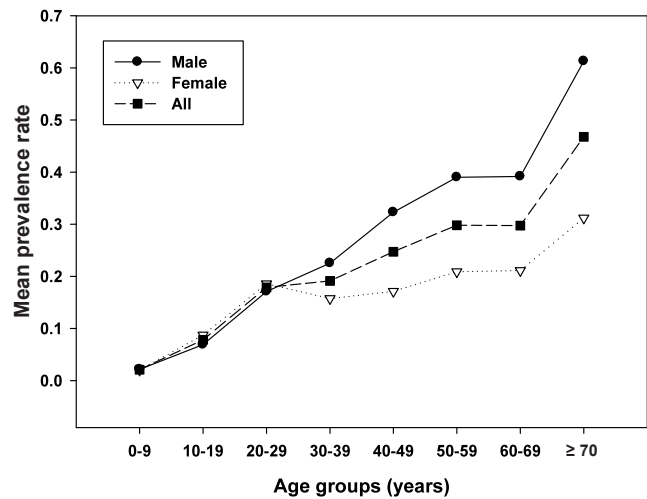


Fig. 1. Age- and sex-specific mean 1-year prevalence of psoriasis during the period 2000 to 2006 in Taiwan.

Treatment modalities

The treatment modalities of these 5864 patients are shown in Table I. Topical corticosteroids were the most frequently prescribed medications and were used by 98.4% of patients. The other common treatments included tar, topical vitamin D3 analogue, ultraviolet B (UVB) phototherapy, topical retinoids, and anthralin. A minority (13.1%) of patients also took Chinese herbal medicines. A total of 796 (13.6%) patients (528 males and 268 females) received systemic agents and were grouped as severe psoriasis (Fig. 2). The frequencies of patients using systemic agents were higher in men than women (16.3% vs. 10.2%).

Comorbidity and risk factors of psoriasis

A total of 5068 patients with mild psoriasis and 796 patients with severe psoriasis were compared with their counterparts, including 991,612 subjects without psoriasis. After adjusting for sex and age, patients with

Table I. Treatment modalities in Taiwanese patients with psoriasis vulgaris (PV)

Treatment modalities	PV patients (%)
Topical corticosteroids	98.4
Topical tar	47.8
Topical vitamin D3 analogues	25.1
Chinese herbal medicine	13.1
Ultraviolet B phototherapy	12.7
Topical retinoids	9.3
Topical anthralin	0.8
Systemic treatments	13.6
Methotrexate	7.3
Retinoid	6.2
Psoralen	3.9
Cyclosporine	1.2
Azathioprine	0.6
Etanercept	0.07
Tacrolimus	0.03

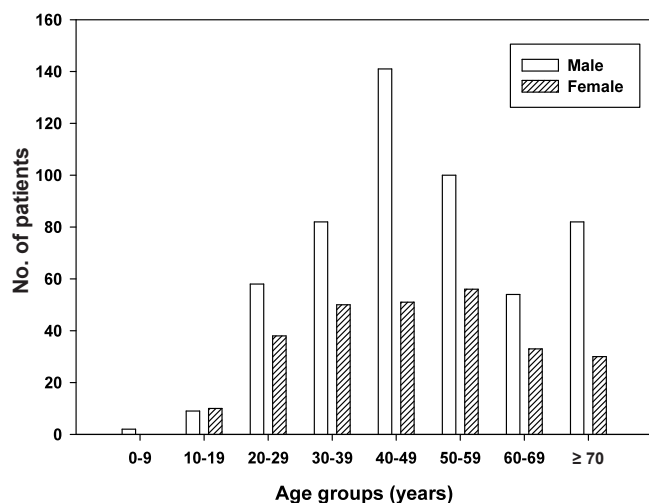


Fig. 2. Age and sex distribution of patients with severe psoriasis ($n=796$).

mild and severe psoriasis were more likely to have diabetes, hyperlipidaemia, hypertension, coronary artery disease, myocardial infarction, and cerebral infarction (Table II). A multivariate logistic regression model demonstrated that DM, hyperlipidaemia, and hypertension were associated with mild and severe psoriasis even after controlling for confounders, including age, sex, and other cardiovascular risk factors (Table II). Moreover, sex was an independent risk factor for both mild and severe psoriasis in Taiwan. Taking into account the number of comorbid diseases and evaluating their association with psoriasis, a significant increase in the risk of psoriasis was observed as the number of comorbid diseases increased (Table III).

DISCUSSION

With a large nationally representative sample, this study estimated mean one-year prevalence, treatment modality, and comorbidities for psoriasis. The mean one-year prevalence rate of psoriasis was 0.19%, which is similar to the prevalence in other Mongoloid races, but lower than that reported in Caucasians. One pos-

sible explanation for the relatively lower occurrence of psoriasis might be the lower frequency of HLA-Cw6 in the Taiwanese population (1, 18).

Although previous reports suggested that psoriasis did not have a gender bias, the mean one-year prevalence of psoriasis in Taiwan was higher in men than women. A recent study from Taiwan reported that males use healthcare services less frequently than do females (19). This provides supportive evidence to rule out the possibility that the male preponderance in Taiwan might be due to selection bias. In fact, previous skin clinic-based surveys from mainland China also show that psoriasis is more common in men than in women (4). Previous studies conducted in Caucasian populations have demonstrated that the prevalence of psoriasis declines significantly in patients over 70 years of age (2, 3). However, our data showed that psoriasis increased more than 50% in Taiwanese patients aged 70 years and older, compared with patients aged 60–69 years. In contrast, the frequencies of Taiwanese patients visiting dermatologists during the 7-year study period increased by only 5.4% in Taiwanese patients aged 70 years and older, compared with patients aged 60–69 years. Although the elevated prevalence figures in older age might be explained in part by higher utilization of the NHI at older ages, these results suggest that elderly Taiwanese patients with psoriasis are less likely to go into remission, than Caucasians. Alternatively, elderly individuals in Taiwan may be at higher risk for developing new-onset psoriasis.

Our study showed that the majority (98.4%) of patients received topical corticosteroid treatment. Other common topical therapy included tar, topical vitamin D3 analogue, and retinoids. Compared with the common usage of Western medicine, a small proportion (13.1%) of our patients took Chinese herbal medicines. However, as the use of topical Chinese herb medication is not covered by the NHI programme, information about its use was not available in the NHI database.

Consistent with the reports in Caucasians, DM, hyperlipidaemia, and hypertension were significantly

Table II. Association between individual comorbid diseases and mild or severe psoriasis, and multivariate analysis for the comorbid diseases and factors in patients with psoriasis

Comorbid diseases/factors	Univariate analysis ^a		Multivariate analysis ^b	
	Mild psoriasis OR (95% CI)	Severe psoriasis OR (95% CI)	Mild psoriasis OR (95% CI)	Severe psoriasis OR (95% CI)
Diabetes	1.34 (1.24–1.46)	1.99 (1.67–2.37)	1.16 (1.06–1.27)	1.70 (1.40–2.05)
Hyperlipidaemia	1.37 (1.28–1.47)	1.59 (1.35–1.87)	1.21 (1.12–1.31)	1.24 (1.03–1.49)
Hypertension	1.37 (1.26–1.48)	1.53 (1.29–1.82)	1.19 (1.10–1.30)	1.23 (1.02–1.49)
CAD	1.36 (1.24–1.49)	1.33 (1.08–1.63)	1.18 (1.07–1.30)	1.01 (0.81–1.26)
MI	1.38 (1.07–1.78)	2.17 (1.35–3.48)	1.14 (0.88–1.48)	1.76 (1.08–2.87)
Cerebral infarction	1.23 (1.08–1.40)	1.40 (1.04–1.88)	1.07 (0.94–1.23)	1.13 (0.83–1.53)
Sex			1.20 (1.13–1.26)	2.04 (1.76–2.37)

^aModel adjusted for age and sex.

^bModel adjusted for age, sex, diabetes mellitus, hyperlipidaemia, hypertension, CAD, MI and cerebral infarction.

OR: odds ratio; CI: confidence interval; CAD: coronary artery disease; MI: myocardial infarction.

Table III. Association results between the number of associated comorbid diseases and patients with psoriasis

No. of associated comorbid diseases ^a	Mild psoriasis OR (95% CI) ^b	Severe psoriasis OR (95% CI) ^b
1	1.35 (1.24–1.47)	1.50 (1.22–1.85)
2	1.54 (1.39–1.70)	2.27 (1.82–2.82)
3	1.72 (1.53–1.93)	1.84 (1.40–2.43)
4	1.87 (1.61–2.17)	2.71 (1.95–3.76)
≥5	2.03 (1.57–2.62)	4.07 (2.49–6.64)

^aAssociated comorbid diseases include diabetes mellitus, hyperlipidaemia, hypertension, coronary artery disease, myocardial infarction and cerebral infarction.

^bModel adjusted for age, sex and the number of associated comorbid diseases. OR: odds ratio; CI: confidence interval.

independently associated factors in Taiwanese patients with psoriasis. Recent reports have demonstrated that the risk of psoriasis is directly related to body mass index (BMI) and smoking, and obese patients are more likely to have severe psoriasis (20–22). A recent study also revealed that psoriasis was independently associated with hyperleptinaemia (23). As the data for BMI and smoking habits were not available in the NHI database, we cannot clarify the relationship between obesity, smoking and psoriasis.

Previous studies using a health insurance database in the UK were based on psoriasis patients cared for by outpatient practices of general practitioners. In Taiwan, patients may visit specialists freely without referral by the general practitioner. Therefore, to improve diagnostic accuracy and avoid overestimation of the prevalence of psoriasis, the present study focused on psoriasis patients treated by dermatologists and rheumatologists. As patients with mild psoriasis may not have visited a doctor or a specialist during the 7-year study period, it is probable that the prevalence of mild psoriasis may be underestimated.

In conclusion, this is the first report of a large-scale epidemiological study of psoriasis in Taiwan. Additional studies are required to identify the determinants of the increased prevalence of psoriasis in male patients aged 30 years or older, as well as the cause of the increase in psoriasis prevalence seen in older individuals. Physicians should also be aware of the increased frequency of cardiovascular diseases in patients with psoriasis.

ACKNOWLEDGEMENTS

We thank Professor S. F. Tsai for encouragement and insightful comments. This study is based in part on data from the National Health Insurance Research Database provided by the Bureau of National Health Insurance, Department of Health and managed by National Health Research Institutes in Taiwan. The interpretation and conclusions contained herein do not represent those of the Bureau of National Health Insurance, Department of Health or National Health Research Institutes.

This study was supported by a grant from The Ministry of Education, Aim for the Top University Plan and a grant from National Science Council, Executive Yuan, Taiwan (NSC 96-2314-B-010-022).

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