ORIGINAL ARTICLE

Prevalence of Psoriasis in Korea: A Population-Based Epidemiological Study Using the Korean National Health Insurance Database

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Background: Although psoriasis is universal in its occurrence worldwide, its prevalence varies by geographic location and race. A few hospital-based surveys have reported on the demographic characteristics in Korean patients with psoriasis. However, a nation-wide study on the prevalence of psoriasis in Korea remains uncompleted. **Objective:** The purpose of this study was to determine the prevalence of psoriasis in Korea and to describe the demographic and social characteristics of afflicted individuals. **Methods:** We identified patients with psoriasis using a relevant diagnostic code from the sixth revision of the Korean Standard Classification of Disease in the 2011~2015 claims database of the Health Insurance Review and Assessment Service of Korea. We estimated the annual prevalence of psoriasis and described the age and sex distribution of the patients, type and severity of psoriasis, comorbidities, type of health insurance, type of health-care institution and residence area. Patients with moderate-to-severe psoriasis were defined as those who had been treated with phototherapy, classical systemic agents, and/or biologic agents. **Results:** The standardized prevalence of psoriasis was 453 per 100,000 individuals of the database population in 2015. We found male preponderance with a 1.3:1 male-to-female ratio, and that the largest number of patients belonged to the age group of 50s. Of the patients diagnosed with psoriasis in 2015, 83.8% had plaque psoriasis and 22.6% had moderate-to-severe psoriasis. **Conclusion:** The annual standardized prevalence of psoriasis in Korea was 453 per 100,000 of the population in 2015. (**Ann Dermatol 29(6) 761~767, 2017**)

-Keywords-
Demography, National health programs, Prevalence, Psoriasis

INTRODUCTION

Psoriasis is a skin disease with a chronic relapsing course that is clinically characterized by erythematous scaly plaque. Although it is globally universal in occurrence, its prevalence varies by geographic location and race[1]. Generally, psoriasis is more common in Caucasians than in those of African or Asian descent. In northern Europe, about 2%~3% of the population is known to be psoriasis patients. In the United States, the prevalence was reported to be 2.5% in Caucasian Americans and only 1.3% in African-Americans[2]. The prevalence in Asians is also estimated to be low, it ranges from 0.29% to 1.18% in Japan and from 0.2% to 1.5% in Chinese population[1]. However, to date, large-scale epidemiological studies of psoriatic patients have predominantly been conducted in Western countries, with few large-scale epidemiological studies on Asians in existence.

In Korea, most of the available previous studies on the clinical characteristics of psoriasis have been performed by tertiary referral hospitals at a single or multiple sites, and contain the possibility of selection bias and therefore cannot provide a clear idea on the prevalence of the disease. The lack of nation-wide research is an obstacle to estimating the exact prevalence and other epidemiological characteristics of psoriasis, including the male-to-female ratio and the age distribution of the patients. However, obtaining precise and detailed epidemiological data is essential to understand the nature of disease and develop appropriate health policies.

The purpose of this study was to investigate the prevalence of psoriasis and describe demographic and social characteristics of psoriasis patients in Korea using Health Insurance Review and Assessment Service (HIRA) data from 2011 to 2015. Since all people in Korea are obligated to join the National Health Insurance (NHI) Program and information on their visits to health institutions and insurance claims are stored in this system, HIRA data is appropriate as means to obtain a national level of epidemiological information on psoriasis.

MATERIALS AND METHODS

Data source

We used insurance claims data from 2011 to 2015 provided by the HIRA in Korea. The HIRA is Korea's NHI system's data repository, in which all residents of the country must be enrolled. Thus, the HIRA database contains the details of patient demographics, diagnoses, medications and medical services as noted in insurance claims made following patients' reception of medical services in all types of medical institutions.

Study population

In this study, the study population included all individuals who had an outpatient visit or admission history with a primary diagnostic code of psoriasis in accordance with the 6th revision of the Korean Standard Classification of Disease (KCD-6), which is modified from the 10th revision of the International Classification of Diseases (ICD-10). The primary diagnostic code is made for the disease for which the resources are consumed majorly. The study population was further classified into those with plaque psoriasis (L40.0, L40.8, and L40.9), guttate psoriasis (L40.4), palmoplantar pustulosis (L40.2 and L40.3), generalized pustular psoriasis (L40.1), and psoriatic arthritis (L40.5, M07.0~M07.3, and M09.0) according to the KCD-6. In addition, patients with mild-to-moderate psoriasis were defined as those who had been treated with phototherapy,

acitretin, cyclosporine, methotrexate and/or biologic agents such as tumor necrosis factor-alpha inhibitors and interleukin-12/23 inhibitors, while the others were defined as those with mild psoriasis. In addition, we collected on patients who had at least one claim with a diagnosis of diabetes mellitus (E11 and E11.0~E11.9), dyslipidemia (E78 and E78.0~E78.9), hypertension (I10), cardiovascular (CV) diseases (I20~I25), cerebral infarction (I63), non-alcoholic fatty liver (K76.0), Crohn's disease (K50, K50.0 and K50.9), and/or malignancy including in situ neoplasm (C00~C97 and D00~D09).

Prevalence of psoriasis

Adopting the concept of period prevalence, we calculated the annual prevalence because it is not only more easily applicable to the HIRA database, but also more suitable for the interpretation of changes in time series, as compared with point prevalence or lifetime prevalence. The standardized prevalence was obtained by adjusting to the standard population data from the Korean Statistical Information Service in Korea National Statistical Office. For the comparison with world population, it was also standardized to the standard population data of Organization for Economic Co-operation and Development (OECD) and World Health Organization (WHO) countries. Prevalence rates were presented as the annual number per 100,000 members of the population.

Demographic and social characteristics of the patients with psoriasis

Frequency analyses were performed to describe patient sex and age group, type and severity of psoriasis, comorbidities, type of health insurance (NHI or Medical Aid), type of health-care institution (office-based physician practice, hospital, general hospital or tertiary teaching hospital) and residence area (metropolitan city, city and county, or rural place). In addition, we compared the patients with moderate-to-severe psoriasis with those with mild psoriasis.

Statistical analysis

To compare clinical and socioeconomic factors between patients with moderate-to-severe and with mild psoriasis, we conducted multiple logistic regression with moderate-to-severe psoriasis as the dependent variable. The relative risks of moderate-to-severe psoriasis as compared with mild psoriasis were presented as an adjusted odds ratio (aOR) with 95% confidence interval. All analyses were performed with SAS Enterprise Guide (SAS Institute, Inc., Cary, NC, USA). All statistical tests were two-sided, and a p-value < 0.05 was considered statistically significant.

RESULTS

Prevalence of psoriasis

The crude and standardized prevalence of psoriasis, respectively, in Korea are summarized in Table 1. Notably, over the past five years, the crude prevalence for psoriasis stabilized, but with a slight increase. As of 2015, there were 233,909 Korean patients with psoriasis, which included, for crude prevalence, 459 per 100,000. After adjusting for age and sex, the standardized prevalence of psoriasis was 453 per 100,000 of the population. For the comparison with worldwide population, the standardized prevalence to OECD and WHO populations were calculated to be 443 and 391 per 100,000 in 2015, respectively.

Demographic and social characteristics of the patients with psoriasis

The annual population of psoriasis patients presented similar patterns of demographic and social characteristics over the past five years (Table 2). As of 2015, the male-to-female ratio was approximately 1.3:1 among patients with psoriasis. The largest subgroup by age was patients in their 50s, followed by those in the 40s and 30s. Of the patients with psoriasis, 77.4% were classified into the mild group, while 22.6% were placed in the moderate-to-severe group. Regarding the type of psoriasis, plaque psoriasis and palmoplantar pustulosis were seen in 83.8% and 11.2% of the patients, respectively. In addition, 27.2% of psoriasis patients had one or more comorbid diseases including diabetes mellitus, dyslipidemia, hypertension, cerebral vascular disorders, ischemic heart disease, Crohn's disease, fatty liver, and malignancies. It was also found that 24.4% of patients were treated in tertiary teaching hospital, 27.4% in general hospital, 13.7% in hospital, and 34.5% in private clinics, respectively.

Factors associated with moderate-to-severe psoriasis

To find out the clinical and social factors associated with the severity of psoriasis, we calculated the aOR for moderate-to-severe psoriasis as compared with mild psoriasis (Table 3). The aOR of male sex for moderate-to-severe psoriasis was about 1.11~1.16 with significance. Children younger than 10 (aOR, 0.22~0.26) and elders older than 60 (aOR, 0.40~0.77) years of age had significantly lower aORs than young and mid-aged adult patients (aOR, 0.91~1.08) (Fig. 1). In comparison with plaque psoriasis, generalized pustular psoriasis (aOR, 1.87~2.75), guttate psoriasis (aOR, 1.90~2.25), and psoriatic arthritis (aOR, 1.97~4.31) was significantly associated with moderate-to-severe psoriasis. In addition, our data showed that the level of health institution visited was associated with the severity of psoriasis. However, the type of insurance used did not have a significant association with the severity of psoriasis. We also did not observe consistent differences in the risks of comorbid diseases between patients with mild and those with moderate-to-severe psoriasis, either.

DISCUSSION

Psoriasis is a worldwide disease. Population-based studies in many countries have reported a prevalence of psoriasis ranging from 0.2% to 4.8%[3]. Studies in Europe and the United States have yielded prevalences around 1% to 2%[4-8]. However, the prevalence of psoriasis in Asians has been reported to be lower, specifically, the prevalence of psoriasis was only 0.19% in Taiwan[9], 0.34% in Japan[10], and 0.3% in China, respectively[11]. In our study, the standardized prevalence in the Korean population ranged from 0.44% to 0.45%, confirming the results of previous studies involving Korean populations[12,13].

The racial differences in the prevalence of psoriasis can be explained by the difference in genetic backgrounds between races. An association of psoriasis with several human leukocyte antigen (HLA) loci such as A1, B13, B17, and Cw6 have been reported[1]. In particular, HLA-Cw6 is strongly associated with psoriasis. It is believed that the lower prevalence of psoriasis in Asian populations might result from the lower frequency of HLA-Cw6 in this population[1]. In the Korean population, HLA-Cw0602 was found in 69.6% of the patients with psoriasis, but only in

Table 1. Prevalence of psoriasis in Korea between 2011 and 2015 (per 100,000 persons)

Year	Crude prevalence	Standardized prevalence (Korea)	Standardized prevalence (OECD)	Standardized prevalence (WHO)
2011	438	444	437	389
2012	440	444	435	386
2013	453	453	445	394
2014	457	454	445	394
2015	459	453	443	391

OECD: Organization for Economic Co-operation and Development, WHO: World Health Organization.

Table 2. Characteristics of Korean patients with psoriasis between 2011 and 2015

Variable	Year				
	2011	2012	2013	2014	2015
No. of psoriasis patients	219,429 (100.0)	221,704 (100.0)	228,842 (100.0)	231,888 (100.0)	233,909 (100.0)
Sex					
Male	123,213 (56.2)	124,960 (56.4)	129,278 (56.5)	131,696 (56.8)	133,954 (57.3)
Female	96,216 (43.8)	96,744 (43.6)	99,564 (43.5)	100,192 (43.2)	99,955 (42.7)
Age (yr)					
0~9	6,783 (3.1)	6,324 (2.9)	6,636 (2.9)	6,293 (2.7)	5,312 (2.3)
10~19	14,578 (6.6)	13,671 (6.2)	13,137 (5.7)	12,770 (5.5)	12,078 (5.2)
20~29	26,405 (12.0)	25,660 (11.6)	25,534 (11.2)	25,059 (10.8)	25,217 (10.8)
30~39	39,162 (17.8)	38,654 (17.4)	39,020 (17.1)	38,951 (16.8)	37,605 (16.1)
40~49	43,185 (19.7)	43,388 (19.6)	43,931 (19.2)	44,759 (19.3)	45,173 (19.3)
50~59	41,101 (18.7)	44,065 (19.9)	46,483 (20.3)	47,805 (20.6)	48,775 (20.9)
60~69	26,873 (12.2)	27,337 (12.3)	29,158 (12.7)	30,212 (13.0)	31,925 (13.6)
70~79	16,747 (7.6)	17,782 (8.0)	19,547 (8.5)	20,240 (8.7)	21,363 (9.1)
≥80	4,595 (2.1)	4,823 (2.2)	5,396 (2.4)	5,799 (2.5)	6,461 (2.8)
Severity of psoriasis					
Mild	175,400 (79.9)	174,692 (78.8)	180,350 (78.8)	180,886 (78.0)	181,079 (77.4)
Moderate-to-severe	44,029 (20.1)	47,012 (21.2)	48,492 (21.2)	51,002 (22.0)	52,830 (22.6)
Type of psoriasis					
Plaque psoriasis	186,199 (84.9)	188,700 (85.1)	193,796 (84.7)	192,529 (83.0)	196,060 (83.8)
Guttate psoriasis	4,084 (1.9)	3,764 (1.7)	3,772 (1.6)	3,877 (1.7)	3,587 (1.5)
Palmoplantar pustulosis	22,923 (10.4)	23,395 (10.6)	24,610 (10.8)	26,647 (11.5)	26,243 (11.2)
Generalized pustular psoriasis	5,158 (2.4)	4,435 (2.0)	4,760 (2.1)	6,350 (2.7)	6,252 (2.7)
Psoriatic arthritis	1,065 (0.5)	1,410 (0.6)	1,904 (0.8)	2,485 (1.1)	1,767 (0.8)
Type of health insurance					
National Health Insurance	207,326 (94.5)	209,617 (94.5)	216,531 (94.6)	219,405 (94.6)	220,423 (94.2)
Medical Aid	12,112 (5.5)	12,087 (5.5)	12,311 (5.4)	12,483 (5.4)	13,486 (5.8)
No. of comorbidity					
0	169,381 (77.2)	168,056 (75.8)	170,999 (74.7)	171,293 (73.9)	170,192 (72.8)
1	35,415 (16.1)	37,947 (17.1)	40,483 (17.7)	42,373 (18.3)	43,973 (18.8)
2	12,036 (5.5)	12,820 (5.8)	14,173 (6.2)	15,027 (6.5)	16,188 (6.9)
3	2,268 (1.0)	2,533 (1.1)	2,769 (1.2)	2,791 (1.2)	3,085 (1.3)
≥4	329 (0.1)	348 (0.2)	418 (0.2)	404 (0.2)	471 (0.2)
Comorbid disease					
Diabetes mellitus	19,637 (8.9)	20,990 (9.5)	22,529 (9.8)	23,189 (10.0)	24,437 (10.4)
Dyslipidemia	26,366 (12.0)	28,872 (13.0)	31,937 (14.0)	34,536 (14.9)	37,224 (15.9)
Hypertension	43,198 (19.7)	45,350 (20.5)	47,992 (21.0)	49,019 (21.1)	50,717 (21.7)
Cerebral vascular disorders	4,378 (2.0)	4,465 (2.0)	4,759 (2.1)	4,527 (2.0)	4,612 (2.0)
Ischemic heart disease	6,052 (2.8)	6,608 (3.0)	6,987 (3.1)	6,983 (3.0)	7,184 (3.1)
Myocardial infarction	725 (0.3)	746 (0.3)	808 (0.4)	834 (0.4)	970 (0.4)
Crohn's disease	105 (0.0)	129 (0.1)	116 (0.1)	140 (0.1)	168 (0.1)
Fat liver	3,169 (1.4)	3,283 (1.5)	3,449 (1.5)	3,284 (1.4)	3,511 (1.5)
Malignancy	6,796 (3.1)	7,047 (3.2)	7,747 (3.4)	8,393 (3.6)	8,822 (3.8)
Type of medical center					
Private clinic	82,793 (37.7)	79,751 (36.0)	80,819 (35.3)	80,005 (34.5)	80,621 (34.5)
Hospital	30,014 (13.7)	31,841 (14.4)	31,902 (13.9)	32,182 (13.9)	32,110 (13.7)
General hospital	56,116 (25.6)	57,333 (25.9)	62,059 (27.1)	65,378 (28.2)	64,165 (27.4)
Tertiary teaching hospital	50,506 (23.0)	52,779 (23.8)	54,062 (23.6)	54,323 (23.4)	57,013 (24.4)
Residence area					
Metro city	83,256 (37.9)	83,882 (37.8)	84,247 (36.8)	85,309 (36.8)	85,779 (36.7)
City and county	109,468 (49.9)	110,878 (50.0)	117,544 (51.4)	119,136 (51.4)	120,089 (51.3)
Rural place	26,704 (12.2)	26,944 (12.2)	27,051 (11.8)	27,443 (11.8)	28,041 (12.0)

Values are presented as number (%).

Table 3. Factors Associated with Moderate-to-Severe Psoriasis

Variable	Year														
	2011			2012			2013			2014			2015		
	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value
Sex															
Female	1			1			1			1			1		
Male	1.15	1.13~1.18	<0.0001	1.14	1.12~1.16	<0.0001	1.14	1.11~1.16	<0.0001	1.14	1.12~1.17	<0.0001	1.11	1.09~1.13	<0.0001
Age (yr)															
0~29	1			1			1			1			1		
30~59	1.26	1.23~1.30	<0.0001	1.24	1.2~1.27	<0.0001	1.25	1.22~1.29	<0.0001	1.20	1.16~1.23	<0.0001	1.18	1.15~1.21	<0.0001
≥60	0.85	0.81~0.88	<0.0001	0.84	0.81~0.87	<0.0001	0.86	0.83~0.89	<0.0001	0.80	0.78~0.83	<0.0001	0.80	0.78~0.83	<0.0001
Type															
Plaque psoriasis	1			1			1			1			1		
Guttate psoriasis	2.26	2.11~2.41	<0.0001	1.93	1.8~2.07	<0.0001	2.02	1.97~2.26	<0.0001	2.29	2.14~2.45	<0.0001	2.26	2.11~2.42	<0.0001
Palmoplantar pustulosis	1.05	1.01~1.09	0.0061	1.11	1.07~1.14	<0.0001	1.32	1.28~1.37	<0.0001	1.28	1.24~1.32	<0.0001	1.24	1.20~1.28	<0.0001
Generalized pustular psoriasis	1.98	1.86~2.10	<0.0001	2.63	2.47~2.80	<0.0001	2.01	1.89~2.14	<0.0001	1.83	1.73~1.93	<0.0001	1.79	1.69~1.89	<0.0001
Psoriatic arthritis	3.98	3.52~4.50	<0.0001	2.76	2.48~3.07	<0.0001	2.15	1.95~2.36	<0.0001	1.99	1.83~2.17	<0.0001	4.36	3.95~4.80	<0.0001
Type of medical center															
Clinic	1			1			1			1			1		
General hospital	1.31	1.27~1.35	<0.0001	1.35	1.31~1.39	<0.0001	1.30	1.26~1.33	<0.0001	1.35	1.31~1.38	<0.0001	1.37	1.34~1.41	<0.0001
Hospital	0.95	0.92~0.99	<0.0001	0.93	0.9~0.97	<0.0001	0.94	0.91~0.97	0.0003	1.03	1.00~1.07	0.0863	1.00	0.97~1.04	0.8819
Tertiary teaching hospital	2.04	1.99~2.10	<0.0001	2.10	2.05~2.16	<0.0001	2.12	2.06~2.18	<0.0001	2.23	2.17~2.29	<0.0001	2.15	2.09~2.21	<0.0001

aOR: adjusted odd ratio, 95% CI: 95% confidence interval.
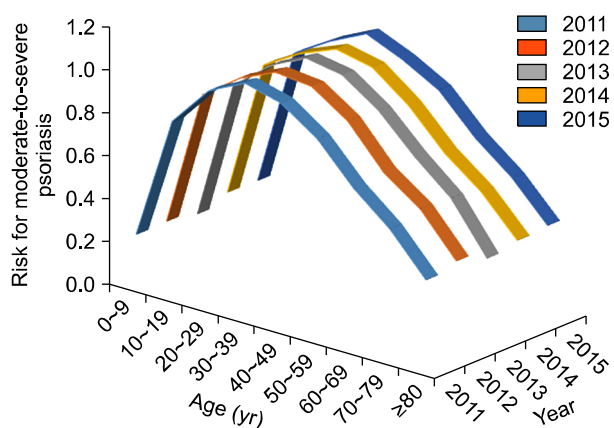
Fig. 1. Risk for moderate-to-severe psoriasis by age group between 2011 and 2015 in Korea.

9.0% of the healthy controls[14].

It is known that psoriasis is equally common in men and women[3,15]. However, several studies on Asian populations have reported a male preponderance[11-13,16-18]. In Japan, the incidence in men was twice that in women[18]. Mild male preponderance in the Korean population was also found in this study, as well as in previous studies[12,13]. However, it is unclear whether Korean men are indeed more vulnerable to psoriasis, or if this finding comes from the difference in health-related behaviors between the sexes. To confirm this, further community-based study is necessary.

The distribution of psoriasis patients by age group was reported differ in accordance with the study population. The highest prevalence was observed among 20 to 50-year-old subjects in Spain[19], while it was noted in those patients in their 50s and 60s in the United Kingdom[4]. In Taiwan, the prevalence inclines with age, and peaks in people aged 70 years and older[9]. In our study, the highest prevalence was observed among people in their 40s and 50s, which was younger than in the Taiwan population.

Consistent with previous studies[13,18,20,21], the plaque type was the most common, found in 85% of psoriasis patients in this study. The second most common type of psoriasis in this study was palmoplantar pustulosis, which was seen in more than 10% of the patients studied. However, Na et al. previously reported that palmoplantar pustulosis was found in only 3.5% of psoriasis patients who visited a tertiary teaching hospital. This difference may come from the differences in the study population between these two studies, or the potential misclassification of patients due to incorrect diagnostic codes in the HIRA database.

We found that 20% of psoriasis patients were treated with phototherapy, conventional systemic agents, and/or biologic agents. In this study, we regarded those individuals as patients with moderate-to-severe psoriasis because it is widely accepted as basic therapeutic strategy for psoriasis[22]. Consistent with the previous study[13], male sex was significantly associated with more severe psoriasis than female sex. Interestingly, the risk of moderate-to-severe psoriasis was found to decline in patients 40 years of age and older. Considering this, together with the previous study reporting that the elderly-onset psoriasis was generally milder than early-onset psoriasis[21,23-25], this finding supports the association between age and the severity of psoriasis. However, the correlation might be due to selection bias, because the elders more frequently have medical conditions that prohibit the use of systemic and biologic agents.

It has been reported that CV morbidity increases in psoriasis patients[26,27]. In particular, patients with severe psoriasis have an increased risk of CV mortality, as compared to people without psoriasis[28]. A case-control study conducted in Korea showed a higher prevalence of metabolic syndrome, CV disease, hypertension, and hyperlipidemia in psoriasis patients than in controls[29]. A study using a Korean nation-wide database reported that only the risk of dyslipidemia was significantly higher in Korean patients with psoriatic arthritis than in those with psoriasis vulgaris[12]. In this study, we did not observe the difference in the risks of comorbid diseases according to the severity of psoriasis. Further analyses by age, sex, and type of psoriasis are necessary to elucidate the association between psoriasis and CV morbidity in the Korean population.

This study has several limitations. First, the presence of psoriasis and comorbid diseases was defined by diagnostic codes from an insurance claims database and thus, bias might occur owing to the misclassification and omission of patients. Second, data of disease severity were not available in the HIRA. Instead, we used an assumption that patients treated with phototherapy or systemic agents would most like have moderate-to-severe psoriasis, as opposed to mild psoriasis. Third, the prevalence of psoriasis may be underestimated because we used the NHI claim database; if psoriasis patients did not visit clinics or hospitals, their cases were not included in calculating prevalence. Nevertheless, to yield more accurate prevalence, we used the entire Korean population database rather than sampled database and performed analyses based on period prevalence. Therefore, the current results of this study might provide the best representation for the prevalence of psoriasis in Korea.

In conclusion, we found that the standardized prevalence of psoriasis was around 450 per 100,000 of the Korean population. The prevalence peaked in the age of 50s and there was a male preponderance. This nation-wide study provides highly reliable epidemiologic information on

Korean patients with psoriasis.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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