

Healthcare utilization and medical expenditure of Korean psoriasis patients

A descriptive result using a health insurance database

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Abstract

Background: Epidemiological evidence regarding healthcare utilization and medical expenditure of patients with psoriasis in Korea is needed. To analyze the differences in healthcare utilization and financial burdens between patients with and without psoriasis and compare these patterns according to the disease severity.

Methods: We conducted a descriptive cross-sectional study using a sample of the National Health Insurance database between January 1, 2012 and December 31, 2013. We included patients diagnosed with psoriasis and those with nonpsoriasis skin diseases, matched for age, sex, income, and geographical region. The patients with psoriasis were further divided into mild and moderate-to-severe psoriasis groups. Each patient was followed up for 1 year to estimate their healthcare utilization and medical expenditure since their initial diagnosis. Healthcare utilization was defined as the sum of outpatient visits and inpatient stays per person. We conducted McNemar test or Bowker test of symmetry to compare the baseline characteristics and used the Wilcoxon matched-pair signed-rank test to compare the healthcare utilization and direct costs with a 5% significance level.

Results: Our study subjects were 4016 patients with psoriasis and equally matched 4016 patients with nonpsoriasis skin diseases. Compared with patients without psoriasis, those with psoriasis had more days of healthcare service use (5.26 vs 4.19, $P < .001$) and higher medical expenditures within 1 year per person (209,320 vs 117,968 won, $P < .001$). Patients with moderate-to-severe psoriasis had more days of healthcare service use (12.71 vs 3.25, $P < .001$) and higher medical expenditures within 1 year per person (611,688 vs 107,445 won, $P < .001$) than those with mild psoriasis.

Conclusion: Patients with psoriasis had higher burdens of healthcare utilization than those without psoriasis, and patients with moderate-to-severe psoriasis had the greatest burdens.

Abbreviations: ICD = International Classification of Diseases, NHIS = National Health Insurance Scheme, SD = standard deviation.

Keywords: database, medical expenditure, psoriasis, severity

1. Introduction

Psoriasis is a chronic relapsing skin disorder with a reported prevalence ranging from 0.09% to 11.4% in 20 countries and usually occurs limited to the skin but can be associated with several comorbidities, such as psoriatic arthritis, cardiovascular disease, diabetes, and fatty liver.^[1] Psoriasis is seldom life threatening, but in a modern society that cares greatly about physical appearance, patients with psoriasis may stress over their

appearance. In this sense, psoriasis can cause psychological problems, including poor self-esteem, frustration, anger, helplessness, anxiety, and depression.^[2] A systemic immune response is the main cause of psoriasis^[3]; due to such etiological factors, patients with psoriasis have an increased likelihood of high blood pressure and diabetes.^[4] Mortality associated with psoriasis may increase due to aggravated comorbidities when patients with psoriasis are not adequately treated.^[5] There are about 1.5 million patients with psoriasis in Korea, but only about 230,000 are estimated to have received proper treatment in the hospital, which corresponds to less than 15% of all patients.^[6] According to a survey of members of the Korean Society for Psoriasis, an increasing number of patients with psoriasis (15%) are abandoning treatment, with 66% of respondents indicating that they discontinued treatment due to its high costs.^[7]

Despite the importance of psoriasis management, to our knowledge, there have only been a small number of descriptive epidemiological studies on this issue throughout the world. Previous studies have determined the prevalence of psoriasis in Korea and Brazil and described the demographic and social characteristics of affected individuals.^[8,9] A nationwide population-based study in France extended the investigation to include other skin diseases and reported the incidence and prevalence rates of systemic lupus erythematosus.^[10] Other studies from Taiwan^[11] and the United States^[12] analyzed the differences in healthcare service use between patients with and

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without psoriasis using data from healthcare databases. In particular, a study from the United States evaluated the healthcare utilization and medical expenditure of patients with psoriasis based on the severity of disease.^[12] However, the US study did not consider the impact of psoriasis severity on healthcare utilization and expenditure patterns between pre- and postpsoriasis diagnosis. Thus, we investigated the financial burdens of patients, among those with diverse skin diseases, and the impact of psoriasis severity on medical expenditure burdens.

2. Methods

2.1. Database

We used data from a nationwide sampled National Health Insurance database between 2012 and 2013. The cohort sample data refers to a standardized set of data that can be exported for easier researcher access and utilization.^[13] It is based on the National Health Care database of all insurance enrollees and medical aid beneficiaries in Korea and includes electronic bills for medical treatments, as well as details on the medical treatment, disease, and prescriptions.^[14] Since the compulsory National Health Insurance program was introduced in Korea in 1977, over 97% of Koreans have been covered by the National Health Insurance Scheme (NHIS). In addition, all data on the use of medical institutions and pharmacies are collected and managed by the NHIS. Using the above database, data on the healthcare utilization of 2% ($n=1,011,123$) of the total population were randomly extracted for stratified sampling within 1476 strata, which were constructed by age group, sex, eligibility status, and income level. Specifically, strata were defined by 18 age groups (infants under 1 year, 1–4 years, 5-year age groups between 5 and 79 years, and 80 years and above), 2 groups according to sex (male and female), and 41 groups based on participant's income level (upper 20th percentiles for insured employees, lower 20th percentiles for insured self-employed individuals, and the lowest level of income for medical aid beneficiaries).^[15]

2.2. Study subjects

Our study subjects were patients who had a diagnosis of psoriasis in at least one claim from the outpatient, inpatient, and emergency departments of hospitals and clinics between January 1, 2012 and December 31, 2012. We only considered the disease code regarding psoriasis, recorded as primary or secondary from the claims in the NHIS sample cohort data. The diagnosis codes are based on the 10th revision of the International Classification of Diseases (ICD-10) (see Appendix 1, Supplemental Digital Content, <http://links.lww.com/MD/C290>), which has been used for claims of prescriptions in Korea since 1995. Likewise, for comparison, we retrieved data from patients with skin diseases from the cohort sample data, and patients who had a diagnosis of psoriasis in one claim were excluded among the patients with skin diseases. We identified patients who received ambulatory visit care and a main or sub-diagnosis (first-listed secondary diagnosis only) of nonpsoriasis skin diseases (ICD-10: L00-L99) between January 1, 2012 and December 31, 2012 as a comparison group. We excluded patients who were diagnosed with cancers ($n=14$), pediatric patients under 19 years of age ($n=345$), and patients who died in 2012 ($n=17$) from each patient group in cohort samples ($n=4016$). As our study intended to explore the impact of psoriasis severity in healthcare utilization and medical expenditures of patients with psoriasis, we only included adults as our study subjects. An equal number of patients with

nonpsoriasis skin diseases were matched with the group of patients with psoriasis according to sex, age, income level, and geographical region. The socioeconomic components, other than these 4 components, of healthcare services were analyzed for each group.

2.3. Categorization of disease severity

We categorized patients with psoriasis into “mild” and “moderate-to-severe” groups according to disease severity, based on the record of reimbursed medications between 2012 and 2013 (see Appendix 2, Supplemental Digital Content, <http://links.lww.com/MD/C290>). The classification of the disease severity were based on the types of psoriasis treatments and drugs, such as topical agents, phototherapy, systemic immunosuppressant agents, and biologics.^[16,17]

The current treatment guidelines for psoriasis recommend topical therapies for mild disease, either as monotherapy or in combination with phototherapy, and traditional oral systemic agents, such as methotrexate or biologic agents like antitumor necrosis factor inhibitors for moderate-to-severe disease.^[18,19] Phototherapy is also recommended in cases of moderate-to-severe psoriasis.^[18,20] If a patient with psoriasis received combination treatment, we also classified the patient into the moderate-to-severe group. For instance, if one patient received both phototherapy and biologics for 1 year, the patient was classified in the moderate-to-severe group.

2.4. Medical utilization and direct costs

We compared socioeconomic components, including patient sex, age, income level, and geographical region, as well as types of disability, between those with and without psoriasis and according to the severity of psoriasis. The grades of disability were defined as “None-disabled,” “Disabled, Grades 3–6,” and “Disabled, Grades 1–2” based on the “Guideline for disability grading of act on welfare of persons with disabilities,” which was composed of 6 scales (1–6 from severe to mild) depending on the degree of disability according to 15 types of disabilities.^[21] To investigate the healthcare utilization within 1 year per person, we calculated the average number of days of utilization of healthcare institutions per patient for 1 year and the average total medical expenditure for 1 year per person. The mean number of days of healthcare utilization included the number of outpatient visits including emergency visits and days of inpatient treatments. Medical expenditures included both medical and prescription costs of patients with and without psoriasis. All costs were converted to US dollars using the average 2017 exchange rate: US \$=1127.4 KRW (South Korean won). The same analysis was performed for the groups of patients with psoriasis according to the disease severity.

2.5. Statistical analysis

The patient characteristics, healthcare utilization, and estimated costs were summarized as counts with proportions for categorical data and means with standard deviations (SDs) for continuous data as necessary. The preindex period was defined as the year before the index date. The index date of patients with psoriasis was the diagnosis date of psoriasis, and that of patients without psoriasis was the diagnosis date of other skin diseases in the same year. We presented and compared healthcare utilization and medical expenditure in both the pre- and postindex periods. To compare the characteristics between patients with psoriasis and

those with nonpsoriasis skin diseases, categorical and continuous variables were analyzed using McNemar tests or Bowker test of symmetry, as our study subjects were matched data. To compare healthcare utilization and direct cost, we conducted the Wilcoxon matched-pair signed-rank test to produce *P* values. We also presented median and interquartile range. All statistical analyses were performed using SAS (Release 9.4, SAS Institute, Inc., Cary, NC). The study protocol was approved by the Sungkyunkwan University Institutional Review Board (IRB No. 2016-10-012).

3. Results

3.1. Comparison of patients with psoriasis and those with other skin diseases

Data from patients (*n*=4016) diagnosed with psoriasis and an equal number of matched patients with nonpsoriasis skin diseases excluding patients (*n*=376) who were diagnosed with cancers, pediatric patients under 19 years of age, and patients who died in 2012 from each patient group were extracted (Fig. 1). Overall, there were more male (56.4%) than female Korean patients with psoriasis, and the number of patients with psoriasis was highest among those aged 40 to 60 years. Income and area distributions of patients were similar to those of the total Korean population based on the statistical data of Korea National Statistical Office.^[22] With regard to types of medical services, both patients with psoriasis (86.8%) and those with other skin diseases (61.8%) availed more dermatology services than other types of medical services. Patients with psoriasis (86.8%) received more dermatology services than those without (61.8%) (Table 1). Significance of healthcare utilization and medical expenditure was observed between patients with psoriasis and matched patients, in both the pre- and postindex periods (*P*<.05).

Compared with the preindex period, healthcare utilization, and medical expenditure of patients with psoriasis increased by 1.29 days and 47,390 won, respectively, and those of patients with nonpsoriasis skin diseases increased by 1.4 days and 40,009 won, respectively, in the postindex period (Table 2). Patients with psoriasis had greater healthcare utilization within 1 year per person, higher number of days of healthcare service use within 1 year per person (5.26 vs 4.19, *P*<.001), and higher medical expenditures within 1 year per person (209,320 vs 117,968 won, *P*<.001) than those with nonpsoriasis skin diseases (Table 2).

3.2. Differences in patients according to the severity of psoriasis

Analysis of the severity of psoriasis revealed that 78.8% (*n*=3163) and 21.2% (*n*=853) of patients had mild and moderate-to-severe psoriasis, respectively. Patients with mild and moderate-to-severe psoriasis showed distributions similar to that of all patients with psoriasis (Table 3). From ages 20 to 60 years, age ratios of patients with mild psoriasis and those with moderate-to-severe psoriasis were similar, but the ratio difference between the 2 groups was around 2 times (*P*<.001) in patients aged over 70 years (Table 3).

Significance of healthcare utilization and medical expenditure was observed between patients with psoriasis and matched patients, in both the pre- and postindex periods (*P*<.05). Compared with the preindex period, healthcare utilization and medical expenditure of patients with mild psoriasis increased by 0.62 days and 10,240 won, respectively, and those of patients with moderate-to-severe psoriasis increased by 3.74 days and 209,754 won, respectively, in the postindex period (Table 4). The medical service use per patient for each group in the 1-year study period was 3.25 and 12.71 days for the mild and moderate-

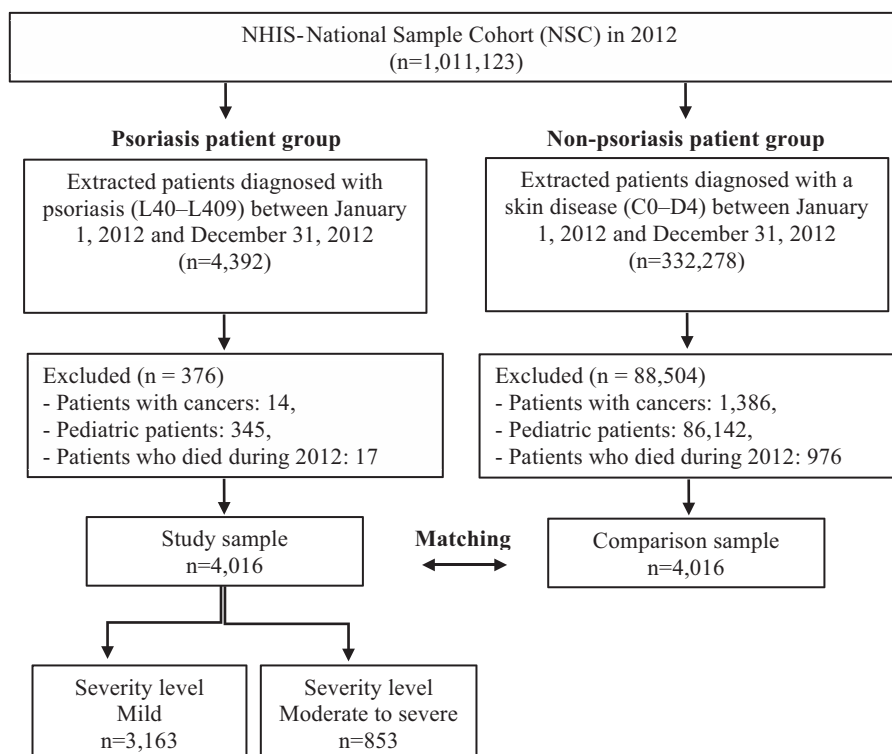


Figure 1. Study flowchart.

Table 1**Comparisons of the general characteristics between patients with and without psoriasis.**

Variable	Patients with psoriasis (n = 4016)	Patients with nonpsoriasis skin diseases (n = 4016)	P
Age—no. (%), y			
20–29	469 (11.68)	469 (11.68)	1.000
30–39	721 (17.95)	721 (17.95)	
40–49	878 (21.86)	878 (21.86)	
50–59	885 (22.04)	885 (22.04)	
60–69	559 (13.92)	559 (13.92)	
70–79	377 (9.39)	377 (9.39)	
Over 80	127 (3.16)	127 (3.16)	
Sex—no. (%)			
Male	2266 (56.42)	2266 (56.42)	1.000
Female	1750 (43.58)	1750 (43.58)	
Income classification*—no. (%)			
Over 90%	693 (17.26)	691 (17.21)	1.000
61–90%	1389 (34.59)	1472 (36.65)	
31–60%	991 (24.68)	947 (23.58)	
0–30%	943 (23.48)	906 (22.56)	
Distribution of area—no. (%)			
Seoul	893 (21.49)	807 (20.09)	1.000
Gyeonggi, Incheon	1144 (28.49)	1165 (29.01)	
Chungcheong, Gangwon	479 (11.93)	574 (14.29)	
Jeolla	431 (10.73)	373 (9.29)	
Gyeongsang	1048 (26.1)	1049 (26.12)	
Jeju	51 (1.27)	48 (1.2)	
Specialty—no. (%)			
Dermatology	18,276 (86.78)	9687 (61.81)	<.001
Nondermatology	2783 (13.22)	5985 (38.19)	
Disability†—no. (%)			
Disabled, Grades 1–2	76 (1.89)	56 (1.39)	.6266
Disabled, Grades 3–6	269 (6.70)	238 (5.93)	
Nondisabled	3671 (91.41)	3722 (92.68)	

* Higher numbers indicate a higher proportion of income occupied.

† The grades of disability were defined according to the "Act on welfare of persons with disabilities" by the Korean government. Even though the grades are determined separately by disease, patients with lower grades have a more serious disease status.

to-severe groups, respectively. The 1-year healthcare utilization per patient was highest in patients with moderate-to-severe psoriasis. These patients had higher healthcare utilization, higher number of days of healthcare service use (12.71 vs 3.25, $P < .001$), and higher medical expenditure (611,688 vs 107,445 won, $P < .001$) within 1 year per person than those with mild psoriasis (Table 4).

4. Discussion

This study analyzed the demographic and socioeconomic characteristics of Korean patients with psoriasis based on the NHIS cohort sample data. To investigate the severity of psoriasis among skin diseases, we analyzed healthcare utilization and medical expenditures of patients with psoriasis compared to those with nonpsoriasis skin diseases. Some reports have

Table 2**Comparisons of days of healthcare utilization and direct cost between patients with and without psoriasis.**

Variable	Preindex period		P	Postindex period		P
	Patients with psoriasis (n = 4016)	Patients with skin disease other than psoriasis (n = 4016)		Patients with psoriasis (n = 4016)	Patients with nonpsoriasis skin diseases (n = 4016)	
Days of healthcare utilization within 1 y per person			<.0001			.004
Mean (SD)	3.97 (8.91)	2.79 (5.94)		5.26 (8.85)	4.19 (8.81)	
Median (interquartile range)	1.00 (2.00)	1.00 (1.00)		2.00 (4.00)	2.00 (4.00)	
Cost of total medical expenditure within 1 y per person (KRW)			<.0001			<.0001
Mean (SD)	161,930 (416,939)	77,959 (265,728)		209,320 (539,845)	117,968 (554,017)	
Median (interquartile range)	42,050 (100,109)	26,407 (40,921)		64,359 (167,804)	48,148 (82,482)	
Cost of total medical expenditure within 1 y per person (USD)*			<.0001			<.0001
Mean (SD)	143.63 (369.82)	69.15 (235.70)		185.67 (478.84)	104.64 (491.41)	
Median (interquartile range)	37.30 (88.80)	23.42 (36.30)		57.25 (148.84)	42.71 (73.16)	

SD = standard deviation.

* 1 USD = 1127.4 KRW as of February 28, 2017.

Table 3**General patient characteristics according to disease severity.**

Variable	Mild psoriasis (n = 3163)	Moderate to severe psoriasis (n = 853)	P
Age—no. (%), y			
20–29	370 (11.7)	99 (11.61)	<.0001
30–39	564 (17.83)	157 (18.41)	
40–49	673 (21.28)	205 (24.03)	
50–59	666 (21.06)	219 (25.67)	
60–69	453 (14.32)	106 (12.43)	
70–79	324 (10.24)	53 (6.21)	
Over 80	113 (3.57)	14 (1.64)	
Sex—no. (%)			
Male	1776 (56.15)	490 (57.44)	.4984
Female	1387 (43.85)	363 (42.56)	
Income classification*—no. (%)			
Over 90%	553 (17.48)	140 (16.41)	.6814
61–90%	1102 (34.84)	287 (33.65)	
31–60%	775 (24.5)	216 (25.32)	
0–30%	733 (23.17)	210 (24.62)	
Distribution of area—no. (%)			
Seoul	688 (21.75)	175 (20.52)	.1925
Gyeonggi, Incheon	890 (28.14)	254 (29.78)	
Chungcheong, Gangwon	378 (11.95)	101 (11.84)	
Jeolla	358 (11.32)	73 (8.56)	
Gyeongsang	810 (25.61)	238 (27.90)	
Jeju	39 (1.23)	12 (1.41)	
Specialty—no. (%)			
Dermatology	8105 (79.07)	10,235 (94.07)	<.0001
Nondermatology	2146 (20.93)	645 (5.93)	
Disability†—no. (%)			
Disabled, Grades 1–2	66 (2.09)	10 (1.17)	<.0001
Disabled, Grades 3–6	209 (6.61)	60 (7.03)	
Nondisabled	2888 (91.31)	783 (91.79)	

* Higher numbers indicate a higher proportion of patient income that is occupied.

† The grades of disability were defined according to the "Act on the welfare of persons with disabilities" from the Korean government. The grades are determined separately according to the type of disabled status. Patients with lower grades have a more serious disabled status.

indicated that an increasing number of patients with psoriasis discontinue treatment due to high medical expenditure.^[23,24] However, to our knowledge, no previous study has assessed the healthcare utilization and expenditures of patients with psoriasis in Korea. In this regard, this study is of great significance. In addition, this study also analyzed demographic and socioeconomic components according to disease severity in order to identify the patterns of healthcare utilization and medical expenditure in each group. By doing so, we investigated the

financial burdens of patients with psoriasis among skin diseases and identified differences in the burden of medical expenditure depending on the disease severity. The results provide guidance for policy makers to develop national psoriasis policies for the treatment of patients with psoriasis.

We selected 4016 patients with psoriasis and equally matched 4016 patients with nonpsoriasis skin disease between January 1, 2012 and December 31, 2012. We analyzed the demographic distribution, healthcare utilization, and medical expenditures of

Table 4**Healthcare utilization and medical expenditure according to disease severity.**

Variable	Preindex period		P	Postindex period		P
	Mild psoriasis (n = 3163)	Moderate to severe psoriasis (n = 853)		Mild psoriasis (n = 3163)	Moderate to severe psoriasis (n = 853)	
Days of healthcare utilization within 1 y per person			<.0001			<.0001
Mean (SD)	2.63 (5.83)	8.97 (14.70)		3.25 (4.87)	12.71 (14.50)	
Median (interquartile range)	1.00 (1.00)	2.00 (9.00)	2.00 (2.00)	8.00 (13.00)		
Cost of total medical expenditure within 1 y per person (KRW)			<.0001			<.0001
Mean (SD)	97,205 (306,262)	401,934 (630,776)		107,445 (208,706)	611,688 (1,307,585)	
Median (interquartile range)	32,410 (61,672)	151,840 (441,779)	45,514 (88,478)	360,430 (627,682)		
Cost of total medical expenditure within 1 y per person (USD)*			<.0001			<.0001
Mean (SD)	86.22 (271.65)	356.51 (559.50)		95.30 (185.12)	542.57 (1159.82)	
Median (interquartile range)	28.75 (54.78)	134.68 (391.86)	40.37 (78.48)	319.70 (556.75)		

SD = standard deviation.

* 1 USD = 1127.4 KRW as of February 28, 2017.

the 2 groups. The demographic distribution of patients with psoriasis was similar to that of the total population released by Statistics Korea in 2002.^[25] That is, the socioeconomic variables of patients with psoriasis were similar to those without psoriasis.

Analysis of healthcare utilization and medical expenditures revealed 5.26 and 4.19 days of medical service utilization in the 1-year study period in patients with psoriasis and those with other skin diseases, respectively. In terms of the types of medical services, patients with psoriasis required dermatology services approximately twice as often as those without. This might be due to the characteristics of psoriasis, which require follow-up after treatment; thus, patients with psoriasis had more outpatient visits for dermatology services. The results of this study are similar to the findings of a previous Taiwanese study^[11] that investigated the differences of outpatient visits and costs in healthcare service use between patients with and without psoriasis based on data from the Taiwan Longitudinal Health Insurance Database. The Taiwanese study showed that patients with psoriasis had more outpatient visits (24.8 vs 18.5; $P < .01$), although the number of outpatient visits per patient was higher in Taiwan than in Korea.

The number of days of healthcare utilization in patients with and without psoriasis during the 1-year study period was similar. The total medical costs of these patients were approximately 1.77-fold greater than those without. Accordingly, our study found that patients with psoriasis had more healthcare utilization and greater financial burden for medical expenditures than those without. This result is also similar to that of the Taiwanese study,^[11] which showed that patients with psoriasis had greater total medical expenditure (US\$ 1917.10 vs US\$ 1345.60; $P < .01$) than those without. Furthermore, previous findings,^[26–28] indicating that patients with psoriasis had significantly more comorbidities and incurred higher total annual medical expenditure than those without psoriasis, might explain the increased use of healthcare services among patients with psoriasis.

The patients with psoriasis were further divided into mild ($n = 3163$, 78.8%) and moderate-to-severe ($n = 853$, 21.2%) groups according to the prescribed medications and treatments. This distribution of psoriasis severity is similar to that in a study in Switzerland,^[29] in which the mild and moderate-to-severe groups comprised 79.0% and 21.0% of the patients, respectively. Of the 2 groups, the mild and moderate-to-severe groups showed similar results to those of the total group of patients with psoriasis in terms of the distributions of sex, age, and income level.

In our study, only eight patients used biologic therapy. We assume that such a small number of patients may be due to the high costs of biologic therapy (ustekinumab 45 mg, \$2215.3; adalimumab 40 mg, \$368.0; infliximab 100 mg, \$322.4; etanercept 50 mg, \$125.9 in 2012) that was introduced in Korea in 2012 and thus may be affected by the income level.^[30] Moreover, our reimbursement guideline limits the prescription of biologic therapy to the patients who failed the treatment with phototherapy and oral therapeutic agent (cyclosporine or methotrexate). We could, thus, assume that the group of patients with severe disease might have greater economic burdens than patients with mild to moderate psoriasis.

Our findings on healthcare utilization and expenditures showed that patients with moderate to severe psoriasis had more medical service use per patient and a higher number of days of healthcare service use than those with mild psoriasis. Comparison of the total medical expenditure revealed that the moderate-to-severe group had 5.69-fold higher medical expenditure than the mild groups in 1 year, indicating that patients with moderate-to-severe psoriasis had

greater burdens of healthcare utilization and medical expenditure than those with mild psoriasis. Similarly, previous studies suggest that patients with moderate-to-severe psoriasis had significantly more outpatient visits, higher outpatient costs, more inpatient days, and higher total medical expenditure compared with patients with mild psoriasis.^[31,32]

However, our study had several limitations. First, our results should be interpreted with caution. This study is a cross-sectional study, and we categorized the status of psoriasis according to the type of medication; thus, the relationship between disease severity and medical expenditure cost should not be interpreted as a causal relationship but should be used to determine the descriptive economic medical expenditure in “mild” and “moderate-to-severe” patients with psoriasis. Further research is warranted with application of the new methodology to categorize the disease severity and ensure a longer follow-up duration and advanced study design. Second, the latest trends were not reflected in the medical expenditure of patients with moderate-to-severe psoriasis. Health insurance coverage for ustekinumab, one of the most used biologics for severe patients, started on June 1, 2012.^[33] Biologics were first used in earnest for the treatment of psoriasis in 2013; thus, there is a time gap in the analysis period (2012) of our study. Lastly, as the number of patients with psoriasis using biologics is small, it would be desirable to interpret the analysis result according to the sample of this study. In spite of these limitations, our study offers increased understanding of the general trends in healthcare utilization and medical expenditure of patients with psoriasis. Further studies using the latest NHIS cohort sample data and more samples with sufficient analysis period will result in more accurate results considering that the introduction of biologics for treatment of patients with psoriasis has increased recently in Korea.

In conclusion, our study result suggests that patients with psoriasis have higher burdens of healthcare utilization and medical expenditure than those without psoriasis. Patients with moderate-to-severe psoriasis who require continuous treatment and management have greater levels of healthcare utilization and medical expenditures than those with mild psoriasis. Thus, increased awareness is necessary regarding the increased healthcare utilization and higher medical expenditure associated with psoriasis compared to other skin diseases. The government should also develop policies to support continuous treatment and medication for the improvement of healthcare services of patients with psoriasis.

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Writing – review & editing: Eui-Kyung Lee, Ju-Young Shin.

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