



## Original article

## Allergies are still on the rise? A 6-year nationwide population-based study in Korea



Byung-Keun Kim <sup>a, b</sup>, Ju-Young Kim <sup>a, b</sup>, Min-Koo Kang <sup>a, b</sup>, Min-Suk Yang <sup>b, c</sup>,  
Heung-Woo Park <sup>a, b</sup>, Kyung-Up Min <sup>a, b</sup>, Sang-Heon Cho <sup>a, b</sup>, Hye-Ryun Kang <sup>a, b, \*</sup>

<sup>a</sup> Department of Internal Medicine, Seoul National University College of Medicine, Seoul, South Korea

<sup>b</sup> Institute of Allergy and Clinical Immunology, Seoul National University Medical Research Center, Seoul, South Korea

<sup>c</sup> Department of Internal Medicine, SMG-SNU Boramae Medical Center, Seoul, South Korea

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## Abbreviations:

NHI	National Health Insurance
HIRA	Health Insurance Review and Assessment Service
KOSIS	Korean Statistical Information Service
ICD	International Classification of Diseases
ISAAC	International Study of Asthma and Allergies in Childhood

## ABSTRACT

**Background:** Some western countries recently have shown a slowdown in the incidence of allergic diseases after worldwide increasing trends, but there are few data from Asian populations concerning changing trend of allergic diseases. We evaluated the recent trends in the prevalence of asthma and other allergic diseases in Korea.

**Methods:** From the database of Korean National Health Insurance, a nationwide diagnostic data from 2009 to 2014 were extracted and the national prevalence was analyzed.

**Results:** The prevalence per 1000 people of atopic dermatitis, allergic rhinitis, and asthma in 2014 was 19.0, 133.1, and 36.3, respectively. The prevalence of three diseases was highest in the age group under 10 as, 95.0, 384.1, and 132.1 per 1000 people, while the prevalence in the over-10-year-group was only 11.6, 109.5, and 27.3, respectively. The prevalence of atopic dermatitis and allergic rhinitis gradually decreased with older age, but the prevalence of asthma showed a re-increasing pattern from the age group 30–39 and reached another peak for the age group 70–79. During the study period, the prevalence of asthma and atopic dermatitis showed decreasing tendency. In contrast, the prevalence of allergic rhinitis steadily increased until 2013, especially in the age group under 10.

**Conclusions:** The national prevalence of atopic dermatitis, and asthma did not show noticeable increase any more in Korea. However, the prevalence of allergic rhinitis still on the rise until recently, especially in the age group under 10. This is the first report in Asia suggesting a slowdown of the incidence of allergic diseases.

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## Introduction

The burden of chronic allergic diseases was on the rise worldwide for the past several decades, the so-called ‘allergic epidemic’.<sup>1,2</sup> However, whether this trend is still ongoing is questionable. Some recent reports in Western developed countries have already shown a stationary or even decreasing prevalence of childhood allergic disease whereas there was still an increase in prevalence in developing countries where the prevalence had been

very low in the past.<sup>3</sup> In Asia, there is no data showing changing trend in the prevalence of chronic allergic disease until recently.<sup>4,5</sup>

Epidemiologic data is important to establish a long-term health care plan for chronic diseases. The heterogeneity and changes of study methods makes it difficult to integrate the epidemiologic results of previous studies to assess changes over time. Therefore, a longitudinal study based on a large standardized population is ideal in order to obtain precise epidemiologic data. However, these studies are costly as well as difficult to perform.

Korea has a nationwide disease database that includes the people of the entire country since a single mandatory government-established nationwide insurance system was established in 1989.<sup>6</sup> This database is optimized to evaluate serial trend of national prevalence because it contains data of the entire national population with the same method. We evaluated the recent trends of the

\* Corresponding author. Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, Seoul 110-744, South Korea.

E-mail address: [helenmed@snu.ac.kr](mailto:helenmed@snu.ac.kr) (H.-R. Kang).

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prevalence and the medical cost in atopic dermatitis, allergic rhinitis, and asthma in Korea by analyzing data of nationwide insurance system.

## Methods

### Subjects

We performed a retrospective, population-based study to assess the prevalence and its changing trend of atopic dermatitis, allergic rhinitis, and asthma in Korea. All patients who ever visited any medical facilities in Korea were included using nationwide claim data from 2009 to 2014.

This study was exempted from full review by the institutional review board of Seoul National University Hospital (number 1506-009-676).

### Data source

Korea has adopted the National Health Insurance (NHI) program, which is a nationwide health insurance system providing healthcare coverage to the residents in Korea. Although there are several private medical insurances, the NHI program is the only mandatory health insurance system regulated by the law covering 97.9% of the total population. At the same time, all physicians in the country submit billing claims to the NHI program with diagnostic codes.<sup>6</sup> Health Insurance Review and Assessment Service (HIRA) reviews and assesses medical fees paid by the NHI program and provides a summary of nationwide annual statistical data on its homepage ([www.hira.or.kr](http://www.hira.or.kr)) for the recent years. Age data was available as 10-year age groups. Medical cost data from the HIRA included whole expenses paid to clinics and hospitals except expenses paid to pharmacies for medicines prescribed in outpatient clinics. Demographic data including annual total and 10-year age group population numbers registered in the NHI were extracted from the Korean Statistical Information Service (KOSIS) homepage ([www.kosis.kr](http://www.kosis.kr)).

### Data analysis

The data did not include any identification information from the individual patients. We used diagnostic codes from the International Classification of Diseases-10 (ICD-10) to extract specific data about atopic dermatitis, allergic rhinitis and asthma. The diagnostic codes are L20 for atopic dermatitis, J301, J302, J303, and J304 for allergic rhinitis, J45 and J46 for asthma.

The prevalence was determined by the number of patients with each diagnostic code divided by the total registered number of patients by the NHI. Means with standard error were used but we did not present standard error because the study subjects accounted for the total population of Korea. With the same reason,

other statistical values such as confidence interval or p-value were not presented either.

## Results

### Recent changes in the prevalence of three major allergic diseases

Table 1 shows the annual number of patients and costs spent at medical facilities for atopic dermatitis, allergic rhinitis, and asthma in Korea. The prevalence of the three diseases in 2014 was 19.0, 133.1, and 36.3 per 1000 people, respectively. The prevalence was higher in women than in men, especially for allergic rhinitis (Atopic dermatitis: 17.83 vs. 20.10; Allergic rhinitis: 123.15 vs. 143.18; Asthma: 33.17 vs. 39.49 in 2014). For the past six years, the prevalence of allergic rhinitis continuously increased (yearly by 3.2% on average) while that of atopic dermatitis and asthma slightly decreased during the same period (yearly by −2.6% and −5.8% on average) (Fig. 1).

### Recent changes in the prevalence of allergic diseases in 10-year age groups

For atopic dermatitis, the age group under 10 years old showed the highest prevalence among the 10-year age groups. In 2014, the prevalence of atopic dermatitis per 1000 people was 95.0 in the age group under 10 years old but decreased to 11.6 in the age group over 10 years old. Especially in people over 30 years old, the prevalence of atopic dermatitis was below 10 per 1000 people. The temporal trend in the prevalence of atopic dermatitis was stationary on average −2.6% yearly change in general (yearly −4.1% for under 10 years old and 0.5% over 10 years old) (Fig. 2a).

The prevalence of allergic rhinitis was also the highest in the age group under 10 years old. In 2014, the prevalence in the under 10 years old was 384.1 per 1000 people and was cut down to 109.0 per 1000 people in over 10 years old. In contrast to atopic dermatitis, the prevalence of allergic rhinitis remained above 100 per 1000 people in people over 30 years old groups (Fig. 2b). For the recent 6 years, prevalence increase was yearly 3.2% on average especially with the yearly 8.2% increase in the age group under 10 years while the age group over 10 years showed relatively modest change (yearly 2.1%).

In 2014, the prevalence of asthma per 1000 people was the highest as 132.1 and 27.3 in the under and over 10 years old group, respectively. Unlike atopic dermatitis and allergic rhinitis, the prevalence of asthma showed two peaks. It reached the lowest in the 20–29 years old group as 13.5 per 1000 people, the 50–59 years old group showed a distinct re-increase in the asthma prevalence, and the 70–79 years old group revealed another epidemiologic peak as 66.3 per 1000 people. Regarding the trend in the past six years, the prevalence of asthma decreased by yearly 5.8% on average. In the under 10 years old group, there was more noticeable

**Table 1**

Annual number of patients and costs at medical institutions for atopic dermatitis, allergic rhinitis and asthma in Korea from 2009 to 2014.

	2009	2010	2011	2012	2013	2014
Number of patients						
Atopic dermatitis	1,051,747	1,049,290	1,010,527	981,028	1,015,186	954,000
Allergic rhinitis	5,529,050	5,830,136	5,852,544	6,331,813	6,429,755	6,697,490
Asthma	2,377,683	2,245,778	2,264,275	2,181,144	1,969,078	1,827,068
Costs at medical institution <sup>†</sup>						
Atopic dermatitis	29,692,819	30,813,452	30,508,568	29,760,316	32,231,457	35,033,840
Allergic rhinitis	147,251,127	158,200,596	162,763,497	176,711,206	185,180,071	207,205,833
Asthma	175,184,735	168,862,394	170,053,219	156,244,052	146,268,832	146,939,214

<sup>†</sup> Expressed in U.S. dollar.

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