

## SPECIAL ARTICLE

# Epidemiology and Current Status of Allergic Rhinitis, Asthma, and Associated Allergic Diseases in Korea: ARIA Asia-Pacific Workshop Report

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**SUMMARY** The prevalence of allergic rhinitis and asthma has recently increased in Korea, and both conditions are recognized as major chronic respiratory diseases requiring active intervention. The prevalence of rhinitis among asthmatic patients is high, ranging from 60 to 80%, and could seriously affect asthma severity and outcome. We suggest that allergic rhinitis should be properly evaluated in asthmatic patients to achieve better asthma control.

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The ARIA 2008 report defined allergic rhinitis as a major systemic allergic disease that, along with asthma, causes major illness and disability worldwide.<sup>1</sup> Allergic rhinitis, which has high comorbidity with asthma among asthmatic patients, should be properly evaluated and treated. A government report published in 2007<sup>2</sup> stated that both asthma and rhinitis are increasing in Korea as well as in other Asian Pacific countries<sup>3</sup> and that their comorbid rate is higher, which suggests combined treatment for both conditions.<sup>1</sup> This review summarizes the prevalence of rhinitis and asthma and the impact of rhinitis on asthma in Korea.

### Epidemiology of asthma in Korea

The prevalence of major allergic diseases in Korea is increasing. Many epidemiologic studies have suggested that environmental changes-

including air pollution, the increased number of cars, industrialization, climate change, lifestyle, and diet have contributed to the increased prevalence of the allergic diseases: asthma, rhinitis, and atopic dermatitis in Korea.<sup>4</sup> The prevalence of asthma has increased steadily in recent years, with greater increases in children and the elderly (Fig. 1). The prevalence of childhood asthma (10–15%) is twice that in adults (5%). The definition of childhood asthma was taken from the ISAAC questionnaire,<sup>5</sup> and adult asthma was defined by the presence of asthma symptoms and airway hyper-responsiveness.<sup>6</sup> Clinically, asthma in the elderly is more severe and

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has a chronic course requiring long-term maintenance medication. In addition, patients commonly have other medical illnesses, such as hypertension, osteoporosis, and arthritis.<sup>7</sup> The prevalence of occupational asthma is around 10% in adult asthmatics.<sup>8,9</sup>

**Prevalence of allergic rhinitis in Korea and its impact on asthma**

The prevalence of allergic rhinitis ranges from 6 to 10%,<sup>10,11</sup> and the perennial type is more common. However, recent data<sup>12</sup> found a higher prevalence (> 20%) of allergic rhinitis in the adult population that is expected to increase, as in other Western countries<sup>3</sup> (Table 1). The severity of allergic rhinitis based on the ARIA guidelines is mild intermittent in 25.7%, moderate to severe intermittent in 16.4%, mild persistent in 16.4%, and moderate to severe persistent in 41.2%.<sup>11</sup> The prevalence of allergic rhinitis in children has also increased rapidly over the past 5 years from 22 to 29.2%.

A recent study found a very high comorbid rate of asthma and rhinitis, as 60–80% of asthma patients had rhinitis symptoms, as shown in Table 2.<sup>13</sup> Younger asthmatic patients had a higher comorbid rate of rhinitis (80%) than elderly patients (60%). Moreover, the asthmatic patients with rhinitis,

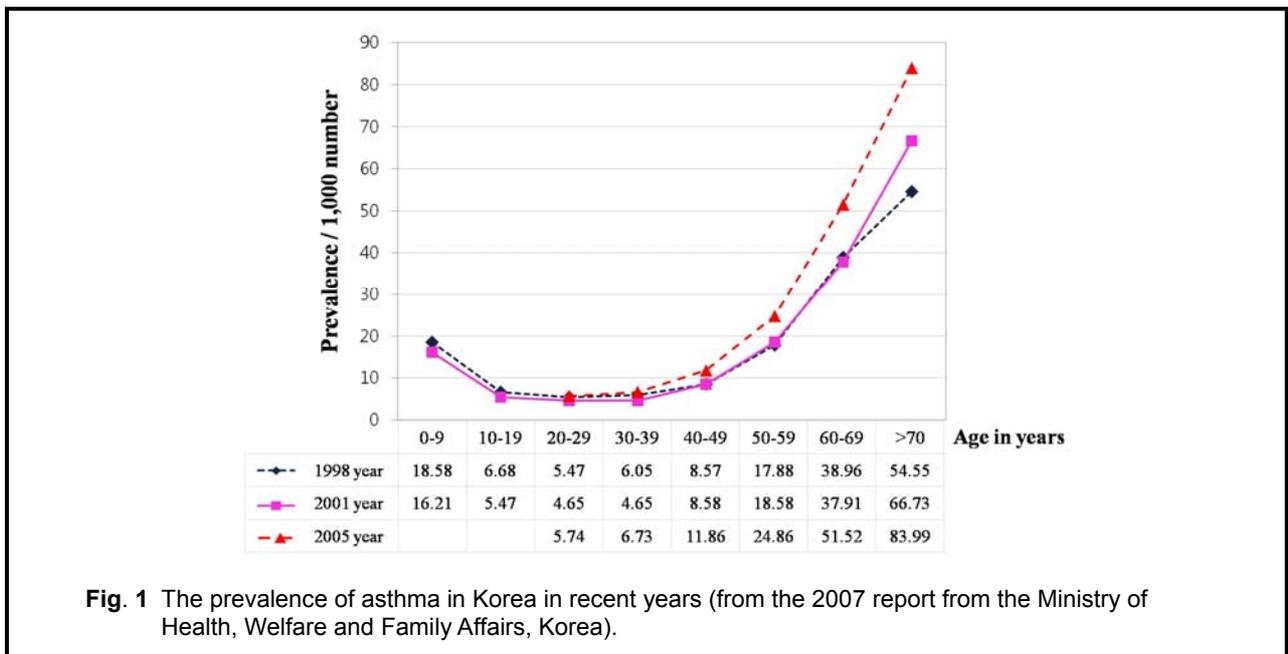
both adults and children, had more severe clinical symptoms, implying that rhinitis affects asthma severity and outcome. Outcomes and patient satisfaction may improve if both conditions are managed properly, as suggested in other prevalence studies.<sup>14,15</sup>

**Other common allergic diseases in Korea**

The mean lifetime prevalence of food allergies in 6- to 15-year-old children as diagnosed by medical doctors is 5%.<sup>16</sup> Atopic dermatitis has increased markedly in recent years in the pediatric population. Although the prevalence of atopic dermatitis was 4% in 1995 based on the ISAAC questionnaire, a study done in 2000 found that the mean lifetime prevalence of atopic dermatitis as diagnosed by medical doctors had increased markedly to 24.9% in 6- to 12-year-olds and to 12.8% in 12- to 15-year-olds.<sup>5,16</sup> However, a study done in 2006 found that the prevalence of atopic dermatitis in children was 29.2%. In light of atopic march, active intervention is essential in this group of patients.

**Diagnosing allergic diseases and caring for patients**

All of the diagnostic tests developed recently have been widely adopted in most allergy clinics in



**Fig. 1** The prevalence of asthma in Korea in recent years (from the 2007 report from the Ministry of Health, Welfare and Family Affairs, Korea).

tertiary university hospitals. After taking a detailed history and performing a physical examination, medical practitioners commonly use allergy skin tests and serum total and specific IgE detection using the Pharmacia CAP system to identify the causative allergens. Spirometry with a reversibility test, sputum cell count, and methacholine bronchial challenge testing are commonly performed in major allergy clinics to diagnose asthma. To confirm the diagnosis, experts can perform nasal, oral, and bronchial provocation tests. Because the prevalence of allergic rhinitis is increasing, most allergists commonly perform rhinoscopy and acoustic rhinomanometry.

Common allergic diseases, including allergic rhinitis, asthma, atopic dermatitis, and allergic conjunctivitis, are actively treated by primary physicians and pediatricians. However, severe and

chronic cases and critical cases, such as anaphylaxis, severe drug allergies, and occupational or food allergies, are referred to allergists working in tertiary university hospitals.

**Indoor and outdoor pollution in Korea and its impact on allergic disease**

The most important indoor allergens for pediatric and adult patients are two house dust mites: *Dermatophagoides farinae* and *D. pteronyssinus*.<sup>17,18</sup> Tree pollens, including alder, oak, birch, and hazel, are abundant in the air in spring and cause hay fever and asthma. Grass pollens, including Bermuda grass, timothy, and rye grass, are prevalent in early summer and autumn, whereas weed pollens, including mugwort, ragweed, and Hop J pollens, are prevalent in autumn.<sup>19</sup> A recent study showed that spider mites are one of the major outdoor allergens causing

**Table 1** Prevalence of allergic rhinitis and asthma in the adult population in Korea

Parameter	Age (years)			p
	≤35 (n = 709)	36–50 (n = 934)	≥51 (n = 824)	
Sex, female (%)	346 (48.8)	442 (47.3)	432 (48.7)	NS
Smoking	276 (39.3)	375 (41.4)	347 (44.1)	NS
Women	17 (5.0)	12 (2.9)	25 (9.2)	0.01
Men	259 (71.9)	363 (74.7)	312 (76.5)	NS
Family history	162 (24.0)	237 (26.7)	135 (17.7)	0.003
Atopy <sup>‡</sup>	251 (35.4)	262 (28.1)	212 (25.7)	<0.001
<i>D. pteronyssinus</i>	107 (15.5)	93 (10.2)	56 (7.0)	<0.001
Asthma (n = 2,452)	55 (7.8)	87 (9.4)	145 (17.7) ↑	<0.001
Rhinitis (n = 2,451)	115 (16.4)	223 (24.7)	175 (21.7) ↑	0.02

<sup>‡</sup>Atopy was defined as a positive reactor to more than one common allergen on skin prick test.

**Table 2** Prevalence of allergic rhinitis among asthmatic patients and its treatment status

	Age ≤ 15 years				Age > 15 years			
	n	%	95% CI	CI	n	%	95% CI	CI
Prevalence of allergic rhinitis symptoms	329	83.3	79.6	87.0	334	72.6	68.5	76.7
Diagnosis of allergic rhinitis	314	95.4	93.2	97.7	275	82.3	78.3	86.4
Treatment of allergic rhinitis	276	87.9	87.3	88.5	218	79.3	74.5	84.1

asthma and rhinitis in exposed subjects working in orchards.<sup>20</sup> Isocyanates, including toluene diisocyanate and methylene diisocyanate, are the most prevalent cause of occupational asthma, followed by wheat flour, drug powder, and reactive dyes.<sup>21</sup> A recent environmental monitoring study demonstrated that asthma symptoms are aggravated in early spring (March to May) when Asian dust comes from the western part of Korea. The result is decreased lung function and increased lower respiratory symptoms and unscheduled emergency room visits.<sup>4,22</sup>

### **Impact of asthma and rhinitis on the quality of life (QOL)**

A recent QOL study using the Nottingham Health Profile demonstrated that asthma patients suffer from serious limitations in physical activity, pain, sleep, and other vital daytime activities that are correlated with asthma severity.<sup>23</sup> We developed a new QOL scale for adult asthma based on Korean culture and found that asthma has a serious impact on QOL, which should be considered to improve asthma control.<sup>24</sup> A QOL study of allergic rhinitis patients in Korea found that patients suffered from systemic symptoms and seriously limited physical and mental activities.<sup>25</sup>

### **Treatment modalities**

All drugs for controlling asthma and rhinitis are available in Korea and are prescribed widely, including first-, second-, and third-generation oral antihistamines; anticholinergics; and inhaled forms of steroids, long-acting beta 2-agonists, and combinations thereof. Topical agents for atopic dermatitis, allergic conjunctivitis, and drug allergy, including various steroids and immunosuppressive agents, are also available.

The Korean government recommends stepwise treatment for asthma and rhinitis according to international and local treatment guidelines.<sup>26</sup> Most primary physicians and pediatricians prescribe according to these guidelines. The daily cost of first-generation antihistamines is less than US \$0.10. Second- and third-generation antihistamines are widely prescribed in Korea, and the daily costs range from US \$0.30–1.00. The daily cost of a leukotriene

receptor antagonist is US \$1.10, and one tube of topical steroid costs US \$10 to \$20. National insurance covers 45% of the cost of medication for all patients visiting outpatient clinics; for hospitalized patients, 80% of the drug costs and diagnostic test fees are covered by national insurance. Most patients are not limited when it comes to purchasing needed drugs.

Allergen immunotherapy has also been prescribed for patients with insect allergies, asthma, and rhinitis after a proper evaluation in a tertiary hospital under the supervision of an allergist.<sup>26</sup> Doctors emphasize the importance of educating the patients and family, focusing on environmental control, how to use the drugs, and how to manage the asthma when it is aggravated.

## **DISCUSSION**

The prevalence of allergic diseases in Korea has increased markedly in the past 20 years and will increase further in the coming years due to environmental, climate, and lifestyle changes if one considers Korea to be a developing country.<sup>2</sup> The increasing prevalence of asthma in children and the elderly requires active intervention.<sup>2,6,7</sup> The prevalence of rhinitis among asthmatic patients is very high and could seriously affect the severity and outcome of asthma.<sup>3</sup> Therefore, allergic rhinitis should be evaluated properly in asthmatics; moreover, in asthmatics who also have rhinitis, both conditions should be managed to improve asthma control.<sup>13</sup> Because allergic disease is a chronic life-long disease, the socioeconomic burden will increase. The Korean government recognizes the increasing national financial burden of allergic diseases and the need for strategies to prevent, and provide optimal care for, allergic diseases. Leaders in Korea will continue to develop and modify the guidelines for optimal management, which will be delivered by primary doctors qualified to care for all patients suffering from allergic diseases.

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## REFERENCES

- Bousquet J, Khaltaev N, Cruz AA, *et al.* Allergic rhinitis and its impact on asthma (ARIA) 2008. *Allergy* 2008; 63: 2-160.
- The 2007 annual report of Center for Diseases Control, Ministry for Health, Welfare and Family Affairs, Korea.
- Asher MI, Montefort S, Björkstén B, *et al.* ISAAC Phase Three Study Group. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC phases one and three repeat multicountry cross-sectional surveys. *Lancet* 2006; 368: 733-43.
- Jang AS, Kim BY, Lee CH, *et al.* Hospital visits and admissions in patients with asthma, COPD, and cardiovascular diseases according to air pollutants. *Korean J Asthma Allergy Clin Immunol* 2006; 26: 233-8.
- ISAAC Steering Committee: Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 1998; 351: 1225-32.
- Kim YY, Cho SH, Kim WK, Kim YK. Prevalence of childhood asthma based on questionnaires and methacholine bronchial provocation test in Korea. *Clin Exp Allergy* 1997; 27: 761-8.
- Kim YK, Kim SH, Tak YJ, *et al.* High prevalence of current asthma and active smoking effect among the elderly. *Clin Exp Allergy* 2002; 32: 1706-12.
- Park HS, Cho SH, Hong CS, Kim YY. Isocyanate-induced occupational asthma in far-east Asia: pathogenesis to prognosis. *Clin Exp Allergy* 2002; 32: 198-204.
- Park HS. Occupational asthma. *Korean J Asthma Allergy Clin Immunol* 1993; 13: 265-78.
- Cho SH, Kim YK, Sohn JW, *et al.* Prevalence of chronic rhinitis in Korean children and adolescents. *Korean J Asthma Allergy Clin Immunol* 1999; 19:452-8.
- Kim YM, Lee CH, Kim JH, *et al.* Prevalence of allergic rhinitis on the basis of ARIA classification. *Korean J Otolaryngol - Head Neck Surg* 2006; 49: 623-8.
- Kim TB, Kim YK, Chang YS, *et al.* Association between sensitization to outdoor spider mites and clinical manifestations of asthma and rhinitis in the general population of adults. *J Korean Med Sci* 2006; 21: 247-52.
- Kim CW, Lee CW, Hur GY, Ye YM, Park HS, CARINA Study Group. Evaluation and control of allergic rhinitis in adult patients with asthma (CARINA) in Korea. *Korean J Asthma Allergy Clin Immunol* 2007; 27: 248-56.
- Ponte EV, Franco R, Nascimento HF, *et al.* Lack of control of severe asthma is associated with co-existence of moderate-to-severe rhinitis. *Allergy* 2008; 63: 564-9.
- Bousquet J, Gaugris S, Kocevar VS, *et al.* Increased risk of asthma attacks and emergency visits among asthma patients with allergic rhinitis: a subgroup analysis of the investigation of montelukast as a partner agent for complementary therapy [corrected]. *Clin Exp Allergy* 2005; 35: 723-7.
- Oh JW, Pyun BY, Choung JT, Lee HR, Lee SI. Epidemiological change of atopic dermatitis and food allergy in school-aged children in Korea between 1995 and 2000. *J Korean Med Sci* 2004; 19: 716-23.
- Ree HI, Jeon SH, Lee IY, Hong CS, Lee DK. Fauna and geographical distribution of house dust mites in Korea. *Korean J Parasitol* 1997; 35: 9-17.
- Park JW, Ko SH, Yong TS, Ree HI, Jeoung BJ, Hong CS. Cross-reactivity of *Tyrophagus putrescentiae* with *Dermatophagoides farinae* and *Dermatophagoides pteronyssinus* in urban areas. *Ann Allergy Asthma Immunol* 1999; 83: 533-9.
- Park HS, Chung DH, Joo YJ. Survey of airborne pollens in Seoul, Korea. *J Korean Med Sci* 1994; 9: 42-6.
- Kim YK, Kim YY. Spider-mite allergy and asthma in fruit growers. *Curr Opin Allergy Clin Immunol* 2002; 2: 103-7.
- Kang SK, Jee YK, Nahm DH, *et al.* A status of occupational asthma in Korea through the cases reported to the occupational asthma surveillance center. *Korean J Asthma Allergy Clin Immunol* 2000; 20: 906-15.
- Park JW, Lim YH, Kyung SY, *et al.* Effects of ambient particulate matter on peak expiratory flow rates and respiratory symptoms of asthmatics during Asian dust periods in Korea. *Respirology* 2005; 10: 470-6.
- Kim CH, Chung HW, Shin JI, *et al.* Generic health-related quality of life in patients with bronchial asthma. *Korean J Asthma Allergy Clin Immunol* 2002; 22: 558-66.
- Lee EH, Kim SH, Choi JH, *et al.* Development and psychometric evaluation of asthma specific quality of life scale for Korean patients. *Korean J Asthma Allergy Clin Immunol* 2007; 27: S146.
- Park KH, Cho JS, Lee KH, Shin SY, Moon JH, Cha CI. Rhinoconjunctivitis quality of life questionnaire (RQLQ) as an evaluator of perennial allergic rhinitis patients. *Korean J Otolaryngol* 2002; 45: 254-62.
- Korean Academy of Asthma Allergy and Clinical Immunology. GINA guideline for asthma management. 2006; pp. 23-33.