

School Absenteeism Associated with Asthma and Allergic Diseases in Korean School-Aged Children

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Background: Asthma and allergic diseases account for school absenteeism and may limit academic and social opportunities for a substantial number of students, because they are common chronic disorders affecting school-aged children. We evaluated the prevalence of asthma and allergic diseases in Korean children, as well as associated school absenteeism.

Methods: We administered a questionnaire-based survey to 148 asthma-friendly schools from 14 counties or cities in Gyeonggi province in South Korea. The questionnaire was modified from the ISAAC questionnaire, which consists of 13 questions regarding prevalence of asthma, allergic rhinitis, and atopic dermatitis, and the impact of these conditions on school attendance.

Results: A total of 41,062 subjects (aged 7–12 years) were enrolled in this study. The overall lifetime prevalence of asthma, allergic rhinitis, and atopic dermatitis was 5.3%, 38.4%, and 25.0%, respectively. Among subjects who had ever been diagnosed with asthma, 9.1% missed school due to asthmatic complaints. Many subjects with allergic rhinitis (3.2%) or atopic dermatitis (1.8%) also responded that they had missed school because of their diseases. Subjects with current symptoms or having undergone a recent treatment for allergic rhinitis or atopic dermatitis had a significantly increased risk of missing school due to asthma.

Conclusion: Asthma and allergic diseases present a substantial health and socioeconomic burden, as demonstrated by the prevalence and related school absenteeism among school-aged children in Korea. Coexisting symptomatic allergic rhinitis and atopic dermatitis are associated with increased risk of school absenteeism due to asthma.

Keywords: absenteeism, allergic disease, asthma

Introduction

ASTHMA AND ALLERGIC DISEASES are among the most common chronic diseases affecting school-aged children. Approximately 11%–14% of children are reported to experience asthmatic symptoms worldwide, although there are large regional variations globally.¹⁻³ The overall prevalence of rhinoconjunctivitis symptoms was found to be 8.5% for children aged 6–7 years and 14.6% for those aged 13–14 years, in phase 3 of the International Study of Asthma and Allergies in Childhood (ISAAC), a questionnaire-based study was conducted throughout the world.⁴ Atopic dermatitis, also called atopic eczema, affects 15%–20% of children worldwide.¹ Global trends show a rise in asthma and allergies over the past decades.^{1,2} There has been an increase in prevalence of allergic diseases in most areas of the Asia Pacific region,

but their prevalence is stable in some developed countries in the region.^{5,6} In Korea, many epidemiologic studies to evaluate prevalence and risk factors of allergic disease have been conducted on school-aged children since 1995, including nationwide surveys using the ISAAC questionnaire,⁷⁻⁹ and studies using data from the Korean National Health and Nutrition Survey.^{10,11} However, studies specifically on the prevalence of childhood asthma and allergic diseases have not been updated recently.

Asthma and allergic diseases impose a substantial socioeconomic burden on individuals, families, and society.^{12,13} Allergic diseases reduce the quality of life, emotional well-being, cognitive functioning, and productivity.^{12,13} In children, asthma and allergies account for a large number of school days lost and present a barrier to academic and social opportunities and achievements. Children with asthma are absent

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more often than their nonasthmatic peers.^{14,15} Up to 35% of school absences were attributed to asthma among school-aged children in the United States.¹⁶ Compared with those due to asthma, the rates of school absenteeism due to allergic rhinitis and atopic dermatitis are less known and under-recognized. In this study, we evaluated the prevalence of asthma and allergic diseases in Korean children, and associated school absenteeism, using the survey data collected by atopy- and asthma-friendly schools in Gyeonggi province.

Methods

Subjects

This study enrolled 7–12-year-old elementary school children who participated in the asthma-friendly school questionnaire survey on the prevalence of asthma and allergic diseases and their impact on school attendance. In Korea, national plans for prevention and control of asthma and allergic diseases were launched in 2007, and many programs have been implemented to reduce the burden of allergic diseases. Designation of atopy- and asthma-friendly schools was one of the main school-centered programs to provide appropriate educational services and school healthcare. Atopy- and asthma-friendly schools have performed surveys on the prevalence and status of disease in their respective provinces annually. This survey was conducted in 148 asthma-friendly schools in 14 counties or cities in Gyeonggi province in South Korea from March to September 2015. Informed consent was obtained from each participant including parents or guardians responding to questionnaire in the survey. We analyzed the survey data with permission to use for the study from the Korean Centers for Disease Control and Prevention (KCDC). This study was approved by the Institutional Review Board of the Seoul National University Bundang Hospital with the waiver of additional informed consent.

Questionnaire

The questionnaire was mailed to the parents or guardians of each student, who answered the questionnaires and returned them to the school. The KCDC collected all data through the community health center of each council or city. The questionnaire was modified from the ISAAC questionnaire, which consists of 13 questions about prevalence of asthma, allergic rhinitis, and atopic dermatitis, and their impact on school attendance. For the burden of asthma, the following questions were included in the survey: (1) Has your child been diagnosed with asthma ever? (2) Has your child experienced any wheezing during the past 12 months? (3) Has your child received any treatment for asthma during the past 12 months? (4) Has your child missed school because of asthma during the past 12 months? and (5) Has your child visited the emergency room because of asthma during the past 12 months? The lifetime prevalence of asthma diagnosis was defined as the prevalence of population who had ever diagnosis of asthma in their lifetime up to the point of survey. Regarding allergic rhinitis, the questions included were (1) Has your child been diagnosed with allergic rhinitis ever? (2) Has your child had a problem with sneezing or a runny or blocked nose when he/she did not have a cold or the flu during the past 12 months? (3) Has your child received any treatment for allergic rhinitis during the past 12 months? and (4) Has your child missed school because of allergic rhinitis during the past 12 months?

Lastly, regarding atopic dermatitis, the questions included were (1) Has your child been diagnosed with eczema, also called atopic dermatitis, ever? (2) Has your child experienced an itchy rash during the past 12 months? (3) Has your child received any treatment for eczema, also called atopic dermatitis, during the past 12 months? and (4) Has your child missed school because of eczema, also called atopic dermatitis, during the past 12 months?

Statistical analysis

Prevalence of asthma, allergic rhinitis, and atopic dermatitis, and the rate at which students missed school were calculated from the survey responses descriptively. The Pearson chi-squared test was used to compare the prevalence and rate at which students missed school between 2 groups according to year in school. Multiple logistic regression analysis was performed to compare the asthma-related school absenteeism according to comorbid conditions of allergic rhinitis and atopic dermatitis after adjusting other factors of subjects' grades and residential regions. Statistical analyses were performed using SPSS version 18.0 (SPSS, Inc., Chicago, IL); $P < 0.05$ indicated statistical significance.

Results

Prevalence of asthma and allergic diseases

A total of 41,062 subjects were enrolled in this study. Students in the first grade accounted for the largest group of subjects, by grade, enrolled in the study (32.0% of subjects); the other grades each accounted for between 12.5% and 14.1% of subjects. Fourteen regions in Gyeonggi province participated in the study: Ansan, Anseong, Anyang, Bucheon, Euiwang, Gapyeong, Goyang, Namyangju, Pyeongtaek, Seongnam, Suwon, Yangpyeong, Yeosu, and Yongin (Table 1).

TABLE 1. STUDY SUBJECTS

Characteristics	N = 41,062 (%)
Grade	
1st	13,130 (32.0)
2nd	5,787 (14.1)
3rd	5,341 (13.0)
4th	5,174 (12.6)
5th	5,134 (12.5)
6th	5,159 (12.6)
Unidentified	1,337 (3.3)
Region	
Ansan	1,322 (3.2)
Anseong	2,865 (7.0)
Anyang	2,342 (5.7)
Bucheon	2,599 (6.3)
Euiwang	1,022 (2.5)
Gapyeong	206 (0.5)
Goyang	1,358 (3.3)
Namyangju	3,056 (7.4)
Pyeongtaek	2,088 (5.1)
Seongnam	4,045 (9.9)
Suwon	3,910 (9.5)
Yangpyeong	2,201 (5.4)
Yeosu	2,906 (7.1)
Yongin	11,142 (27.1)

TABLE 2. PREVALENCE OF ASTHMA, ALLERGIC RHINITIS, AND ATOPIC DERMATITIS

	<i>Prevalence (total)</i>	<i>Prevalence (1st–3rd grades)</i>	<i>Prevalence (4th–6th grades)</i>	<i>P-value^a</i>
Asthma				
Diagnosis, ever	2,183/41,026 (5.3%)	1,149/24,241 (4.7%)	944/15,449 (6.1%)	<0.001
Wheezing, past 12 months	1,426/34,484 (4.1%)	877/20,544 (4.3%)	512/12,662 (4.0%)	0.319
Treatment, past 12 months	804/41,015 (2.0%)	459/23,771 (1.9%)	321/15,449 (2.1%)	0.199
Allergic rhinitis				
Diagnosis, ever	15,731/41,013 (38.4%)	9,249/24,232 (38.2%)	5,926/15,445 (38.4%)	0.690
Symptom, past 12 months	17,004/36,116 (47.1%)	10,227/21,457 (47.7%)	6,244/13,365 (46.7%)	0.086
Treatment, past 12 months	12,475/41,016 (30.4%)	7,567/24,233 (31.2%)	4,494/15,447 (29.1%)	<0.001
Atopic dermatitis				
Diagnosis, ever	10,252/41,035 (25.0%)	6,088/24,245 (25.1%)	3,884/15,454 (25.1%)	0.096
Itchy rash, past 12 months	8,070/34,704 (23.3%)	5,151/20,651 (24.9%)	2,678/12,772 (21.0%)	<0.001
Treatment, past 12 months	4,632/41,031 (11.3%)	2,856/24,241 (11.8%)	1,656/15,454 (10.7%)	<0.001

^aComparison between upper grades (1st–3rd) and lower grades (4th–6th).

The lifetime prevalence of asthma diagnosis was 5.3%. The prevalence was significantly higher in the upper grade students (6.1%) than in the lower grade students (4.7%; $P < 0.001$). Symptom prevalence of current wheezing was 4.1% of the total population. Prevalence of current wheezing was slightly lower in the upper grade students (4.0%) than in lower grade students (4.3%). However, this difference was not significant. Two percent of subjects reported they had recently received treatment for asthma in the past 12 months (Table 2).

Prevalence of allergic rhinitis and atopic dermatitis was reported at a much higher rate than asthma. The overall lifetime prevalence of allergic rhinitis and atopic dermatitis was 38.4% and 25.0%, respectively. No significant difference was found between upper and lower grade students in lifetime prevalence of either disease. Symptom prevalence of allergic rhinitis in the past 12 months was 47.1% and prevalence of atopic dermatitis was 23.3%. Symptom prevalence of allergic rhinitis was not significantly different according to year in school, but symptom prevalence of itchy rash was higher in the lower grades (24.8% vs. 21.0%; $P < 0.001$). Prevalence of subjects with recent treatment for allergic rhinitis or atopic dermatitis during the past 12 months was slightly higher in the lower grade students than in the upper grade students ($P < 0.001$; Table 2).

School absenteeism due to asthma and allergic diseases

Among subjects who had ever been diagnosed with asthma, those who missed school due to asthmatic complaints accounted for 9.1%. Surprisingly, many subjects with allergic rhinitis and atopic dermatitis also responded that they had missed school during the past 12 months because of their allergic diseases. The percent of subjects who missed school due to allergic rhinitis and atopic dermatitis was 3.2% and 1.8%, respectively. No significant difference was found between students of lower and upper grades for all 3 diseases (Table 3).

Effect of comorbid allergic diseases on school absenteeism due to asthma

To evaluate the effect of comorbid allergic diseases on school absenteeism due to asthma, we compared the rate of missing school due to asthma according to the comorbid conditions of allergic rhinitis and atopic dermatitis after adjusting for cofactors of subjects' grades and residential regions in subjects with a lifetime diagnosis of asthma. Multiple logistic regression analysis was performed for the statistical analysis, and the model was a good fit in the Hosmer and Lemeshow test. Lifetime diagnosis of allergic

TABLE 3. SCHOOL ABSENTEEISM DUE TO ASTHMA, ALLERGIC RHINITIS, AND ATOPIC DERMATITIS

	<i>School missing rate (total)</i>	<i>School missing rate (1st–3rd grades)</i>	<i>School missing rate (4th–6th grades)</i>	<i>P-value^a</i>
Asthma				
Among total subjects	228/40,811 (0.6%)	126/24,086 (0.5%)	98/15,450 (0.6%)	0.151
Among subjects with ever diagnosis of asthma	198/2,180 (9.1%)	109/1,147 (9.5%)	86/944 (9.1%)	0.759
Allergic rhinitis				
Among total subjects	472/36,854 (1.3%)	263/21,844 (1.2%)	195/13,757 (1.4%)	0.082
Among subjects with ever diagnosis of AR	454/14,096 (3.2%)	256/8,324 (3.1%)	185/5,241 (3.5%)	0.146
Atopic dermatitis				
Among total subjects	179/36,729 (0.5%)	105/21,732 (0.5%)	70/13,744 (0.5%)	0.732
Among subjects with ever diagnosis of AD	162/9,165 (1.8%)	97/5,442 (1.8%)	62/3,454 (1.8%)	0.965

^aComparison between upper grades (1st–3rd) and lower grades (4th–6th).

AD, atopic dermatitis; AR, allergic rhinitis.

TABLE 4. EFFECTS OF COMORBIDITY OF ALLERGIC RHINITIS AND ATOPIC DERMATITIS ON SCHOOL ABSENTEEISM DUE TO ASTHMA IN SUBJECTS WITH EVER DIAGNOSIS OF ASTHMA

	<i>School missing rate in subjects with comorbidity</i>	<i>School missing rate in subjects without comorbidity</i>	<i>Adjusted OR (95% CI)^a</i>	<i>P-value^a</i>
Allergic rhinitis				
Diagnosis, ever	138/1,506 (9.2%)	60/673 (8.9%)	1.03 (0.75–1.42)	0.859
Symptoms in the past 12 months	149/1,510 (9.9%)	34/544 (6.3%)	1.58 (1.07–2.34)	0.022
Treatment in the past 12 months	127/1,231 (10.3%)	70/984 (7.4%)	1.41 (1.04–1.92)	0.028
Atopic dermatitis				
Diagnosis, ever	98/998 (9.8%)	100/1,180 (8.5%)	1.19 (0.88–1.60)	0.255
Symptom in the past 12 months	80/736 (10.9%)	88/1,208 (7.3%)	1.51 (1.09–2.09)	0.013
Treatment in the past 12 months	64/453 (14.1%)	134/1,724 (7.8%)	1.94 (1.40–2.67)	<0.001

^aMultiple logistic regression analysis was performed adjusting other factors of subjects' grades and residential regions for the statistical analysis and estimation of odds ratio and 95% confidence interval.

CI, confidence interval; OR, odds ratio.

rhinitis was not related to the rate of missing school due to asthma ($P=0.859$). However, subjects with lifetime diagnosis of asthma had a significantly higher odds of missing school when they had recently experienced rhinoconjunctivitis symptoms [adjusted odds ratio (OR)=1.58; 95% confidence interval (CI)=1.07–2.34; $P=0.022$] or ever received treatment for rhinitis in the past 12 months (adjusted OR=1.41; 95% CI=1.04–1.92; $P=0.028$). Similar to allergic rhinitis, comorbidity of atopic dermatitis also affected school absenteeism due to asthma. Diagnosis of atopic dermatitis itself was not related to school absenteeism significantly. However, symptoms of atopic dermatitis in the past 12 months increased odds of missing school due to asthma (adjusted OR=1.51; 95% CI=1.09–2.09; $P=0.013$). History of receiving treatment for atopic dermatitis recently was also associated with a higher odds of missing school due to asthma (adjusted OR=1.94; 95% CI=1.40–2.67; $P<0.001$; Table 4).

Discussion

Asthma and allergic diseases constitute a global health problem that affects the personal and social life of patients and their families. These diseases present a high socioeconomic burden, which includes not only direct costs but also indirect costs, including absenteeism (missed days at work or school) and presenteeism (decreased productivity at work or school).^{12,13,17} School attendance and performance are the most important part of daily life for children. However, the impact of asthma and allergic diseases on school attendance has been rarely reported in previous epidemiologic studies of Korea and the Asian region. Our study indicates that substantial number of children experience asthma, allergic rhinitis, and atopic eczema, and miss school due to their allergic disease symptoms. Furthermore, our data suggest that comorbid conditions of allergic rhinitis and atopic dermatitis are closely linked to absenteeism due to asthma.

Asthma is a well-known leading cause of school absenteeism in school-aged children. In the United States, asthma-related school absenteeism affects more than half of children with current asthma.¹⁸ Children with asthma are absent from schools on average 1.5–2 days more per year than those without asthma.^{15,18,19} Missing school because of asthma is primarily associated with the underlying severity of the disease, suboptimal control, and urgent or emergent asthma-

related healthcare utilization.^{15,18} In our study, 9.1% of children with a lifetime diagnosis of asthma reported one or more episodes of missing school in the past 12 months. Although our study reveals a lower rate of school absenteeism due to asthma than previous studies in other countries, the rate of absenteeism can differ among regions and countries according to local culture, school atmosphere, understanding about absenteeism, and perception of disease. Considering the unique Korean culture that values missing school as little as possible, this absenteeism rate needs to be recognized as having a meaningful impact on the learning performance of students, and may reflect that current asthma control status in Korean children is not at optimal levels. In the recent phase 2 of the Asthma Insight and Reality in Asia Pacific (AIRIAP 2) survey, ~40% of Korean children diagnosed with asthma reported that their asthma was uncontrollable.²⁰ Poor control of asthma can lead to asthma exacerbation, urgent healthcare utilization, and school absenteeism. Other socioenvironmental factors, such as home environment, health status of parents, and financial barriers to asthma-related healthcare, were indicated as risk factors related to school absenteeism due to asthma.^{18,21} Air pollution was also found to have an impact on asthma-related school absenteeism in primary school children.²² School absenteeism due to asthma needs to be monitored regularly, and risk factors should be controlled adequately to improve healthcare and school attendance.

Allergic rhinitis and atopic dermatitis are also important causes of missing school, although they are often regarded as nonserious conditions as compared with asthma.^{17,23,24} Symptoms of allergic rhinitis, such as nasal obstruction, itching, and runny nose, disturb school performance and cognitive ability, inducing sleep impairment, headache, and poor concentration.^{23,25} In the United States, allergic rhinitis accounted for ~824,000 missed school days in children.²⁶ The results of the Work Productivity and Activity Impairment Questionnaire showed significant impairment in classroom and work functioning in patients with allergic rhinitis, resulting in 25% of affected individuals missing time from school or work.²⁷ Allergic rhinitis alone is associated with an increased risk of absence from work due to sickness according to a study from Finland.²⁸ Allergic eczema/dermatitis can negatively affect children in terms of school performance and attendance.^{12,24} School-aged children with atopic dermatitis are very concerned about their appearance, which can

have a tremendous effect on peer relationships. The child's lifestyle is often limited across all aspects of life, particularly clothing, owning pets, talking with friends, playing, and studying. Embarrassment, comments, teasing, and bullying frequently cause social isolation, and may lead to lowered self-esteem and school avoidance.^{12,24} Families caring for children with atopic eczema undergo considerable emotional and psychosocial stress.²⁹ Previous quality-of-life studies have found that atopic dermatitis has a bigger impact on a family than diabetes.³⁰ One study performed in the Middle East showed that 9.7% of children with atopic dermatitis miss school because of the condition.³¹ In our study, school absenteeism in children with allergic rhinitis and atopic dermatitis was 3.2% and 1.8%, respectively. Considering the high prevalence of these diseases in this age group, substantial number of children are missing school because of allergic rhinitis or atopic dermatitis in Korea. Allergic rhinitis and atopic dermatitis were not previously well recognized as reasons for missing school since they are not life-threatening or fatal conditions. However, these diseases may have a profound impact on the daily life and performance of school-going children. More attention and social awareness about allergic rhinitis and atopic dermatitis as potential causes of absenteeism in schools are needed.

Coexistence of asthma, allergic rhinitis, and atopic dermatitis is commonly observed in children.^{32,33} However, few studies have reported the influence of allergic rhinitis and atopic dermatitis on asthma-related school absenteeism. Our study revealed that coexisting symptomatic allergic rhinitis and atopic dermatitis is associated with an increased risk of asthma-related school absenteeism. To the best of our knowledge, this is the first report showing the association between comorbidity of allergic rhinitis or atopic dermatitis and asthma-related school absenteeism. A possible explanation for this association is that comorbidity of allergic rhinitis or atopic dermatitis might affect asthma control or be related to higher severity of asthma or atopic phenotypes. In a cross-sectional study performed by de Groot et al.,³⁴ children with a diagnosis of asthma who also had allergic rhinitis showed a higher fraction of nitric oxide (FeNO), higher serum IgE levels, and more poorly control asthma than those without allergic rhinitis. Cross-talk between nasal and lower airway mucosa has been demonstrated, and nasal inflammation is linked with lower airway responsiveness.^{35,36} Another cross-sectional study of children using asthma medication demonstrated that having more than 1 atopic condition (hay fever, food allergy, and eczema) is associated with an increased risk of more severe asthma, as characterized by higher oral steroid use or frequent emergency department visits.³⁷ The concept of allergic march, which describes the progression of atopic disorders from atopic dermatitis to allergic respiratory diseases in children, supports the possible association between atopic dermatitis and asthma pathogenesis.³⁸ Atopic predisposition, Th2 immune response, and skin barrier dysfunction have been suggested as mechanisms involved in allergic march.³⁸ Patients who have more than 1 allergic disease might have a genetic or acquired susceptibility to develop more severe forms of atopic disease easily. Comorbidity of allergic rhinitis and atopic dermatitis could be a novel risk factor for asthma-related school absenteeism, because these diseases may be a proxy for poor control and higher disease severity of asthma.

Prevalence of asthma and allergic diseases has been reported to increase correspondingly with the Westernizing of life style, urbanization, and industrialization over the past few decades in Korea.³⁹ In this study, asthma, allergic rhinitis, and atopic dermatitis were found to be highly prevalent in Korean school-aged children, similar to the findings of previous studies. However, compared with a nation-wide study using the ISAAC questionnaire, performed in 2006,⁹ this study showed that prevalence of asthma showed a decreasing pattern, prevalence of allergic rhinitis increased, and prevalence of atopic dermatitis appeared not to change significantly. Life-time prevalence of asthma and prevalence of current wheezing were 7.6% and 4.8%, respectively, in 2006,⁹ but they decreased to 5.3% and 4.1%, respectively, in our study performed in 2015. Life-time prevalence of allergic rhinitis and current rhinitis symptoms increased from 27.8% and 32.9% to 38.4% and 47.1%, respectively. In addition, compared with another study performed in Seoul in 2010,³² symptom prevalence of asthma in the past 12 months decreased from 5.4% to 4.0%, whereas that of allergic rhinitis increased from 35.9% to 46.7% in upper grade of primary school-aged children. Caution needs to be taken when comparing our data with those of other studies because of regional differences. However, comparing prevalence data from large-scale population studies would be useful in recognizing trend and current status of allergic diseases in Korea. Similar patterns of change in prevalence have also been observed in other studies. A recent prevalence study of allergic diseases in Korea using the National Health Insurance database indicated the same pattern of change (decrease in asthma, increase in allergic rhinitis, and slight decrease in atopic dermatitis) among children between 2009 and 2014.⁴⁰ Considering these findings, although there is a high prevalence of asthma and atopic dermatitis, prevalence of asthma and atopic dermatitis in children has not been observed to have increased recently in Korea. However, the prevalence of allergic rhinitis continues to increase in Korean school-aged children.

Our study has several limitations. First, our data are limited in representing nation-wide prevalence of allergic diseases in children because the questionnaire survey was conducted in a single region of Korea and the participants were recruited from atopy- and asthma-friendly schools. Second, data for school absenteeism were obtained based only on questionnaire surveys, and responses were dependent on the memory of parents or guardians. Recall bias, therefore, may have occurred, and obtaining data for days of school missed may have been limited because of inaccuracy in recall. Collecting school attendance data would be more informative to evaluate disease-related school absenteeism in future studies. Third, demographic information of study subjects was lacking since the survey questionnaire did not collect detailed personal information such as age or gender. Nonetheless, our data acquired from a large study population of children would be expected to provide valuable information about the current burden of asthma and allergic diseases in Korean children. A substantial rate of school absenteeism was observed not only for children with asthma but also for children with allergic rhinitis and atopic dermatitis. Moreover, we demonstrated the association between comorbidity associated with allergic rhinitis or atopic dermatitis and asthma-related absenteeism for the first time. This novel information is a useful contribution to school-

centered asthma programs for improving control of asthma and allergic diseases.

In conclusion, a substantial burden of asthma and allergic diseases exists as demonstrated by the reported prevalence and school absenteeism in primary school children in Korea. Coexisting symptomatic allergic rhinitis and atopic dermatitis is associated with increased risk of school absenteeism due to asthma. Control of asthma and allergic diseases is needed to improve school performance and health in children.

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Author Disclosure Statement

No competing financial interests exist.

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