



Health Care Utilization and Direct Costs in Mild, Moderate, and Severe Adult Asthma: A Descriptive Study Using the 2014 South Korean Health Insurance Database

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ABSTRACT

Purpose: Although asthma exacerbation comprises a large burden of the total asthma-related costs, few studies have examined the frequency and cost of acute exacerbation according to asthma severity. This study investigated asthma-related health care utilization and costs according to the severity of asthma.

Methods: We conducted a descriptive study using the national health insurance claims database between January 1 and December 31, 2014. We included adult patients with asthma (18 years of age and older) who had ≥ 2 claims with for an asthma diagnosis and were prescribed ≥ 1 asthma medications. They were classified into 3 asthma severity levels (level 1 = mild, level 2 = moderate, and level 3 = severe), based on individual medication prescriptions. Acute exacerbation was defined as having a corticosteroid burst, an emergency department visit, or hospitalization. Health care utilization, acute exacerbation, and direct costs associated with asthma were compared according to asthma severity levels.

Findings: Of the 36,687 adult asthma patients, level 1 had the largest proportion of patients (81.2%), followed by level 2 (18.2%), and level 3 (0.6%). The average number of asthma-related outpatient visits was 4.5 for level 1, 7.2 for level 2, and 11.9 for level 3 ($P < 0.01$). The estimated asthma-related direct cost per patient was \$174 for level 1, \$634 for level 2, and \$1635 for level 3 ($P < 0.01$). The number of patients who experienced acute exacerbation increased as asthma severity increased: level 1, 22.6%; level 2, 26.0%; and level 3, 48.7% ($P < 0.01$). Direct costs

associated with asthma exacerbation dramatically increased and accounted for 15.1% of the total cost in level 1 patients, 19.5% in level 2 patients, and 40.8% in level 3 patients ($P < 0.01$).

Implications: The direct costs of acute exacerbation increased as asthma severity increased. In patients with severe asthma, acute exacerbation and the relative cost ratio in South Korea were higher than those in other countries. Proper management is required to avoid acute exacerbations and to reduce the burden of asthma, particularly in patients with severe asthma. (*Clin Ther.* 2017;39:527–536) © 2017 Elsevier HS Journals, Inc. All rights reserved.

Key words: acute exacerbation, asthma, cost, health care utilization, severity.

INTRODUCTION

Asthma is a chronic disease with a prevalence of 4.3% in adults, which was estimated in the cross-sectional world health survey administered in 70 countries.¹ Asthma affects 300 million individuals worldwide.^{1,2} This increasing prevalence has been paralleled by a corresponding increase in the number of deaths caused by asthma. Asthma is now responsible for 1 in every 250 deaths worldwide, although many of them may be preventable.^{2,3} As the asthma-related morbidity and mortality rates increase, the economic burden of asthma has also been concurrently increasing.^{3–5}

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A systematic review,⁴ including 68 studies worldwide, found that the cost of asthma has increased due to an increase in the severity of asthma and the presence of exacerbations. Although routine management is essential in asthma patients, acute exacerbations can occur that can trigger unpredictable health care utilization and costs. Urgent care costs attributed to acute exacerbations were responsible for 62% of total costs (range, 18%–90%) across the Asia Pacific countries.⁶ Asthma exacerbations are also associated with increased health care utilization and costs due to increased hospitalizations.^{7,8} In South Korea, 3% of all asthma patients were hospitalized, and ~2.4% of patients visited an emergency department because of acute exacerbation of asthma.⁹ These rates were 2 to 3 times higher than the Organization for Economic Co-operation and Development (OECD) average.¹⁰

Despite previous reports of asthma-related health care utilization and costs,^{11,12} only limited populations using small samples or surveys were examined.⁴ Few studies have investigated the economic burden of asthma in South Korea. One study investigated this issue, but the database was restricted to the tertiary hospital setting.¹¹ To our knowledge, previous studies examined acute exacerbations only in patients with severe asthma. There are few studies on acute exacerbation of asthma with varying severity of asthma, although exacerbations can occur in patients, without severe asthma, having only mild or well-controlled asthma.^{13,14} The costs for urgent care may be the majority of the financial burden of the disease, an estimation of costs attributed to acute exacerbation is required for asthma patients with varying severity of asthma. The objective of our study was to assess asthma-related health care utilization, costs, and acute exacerbation in adult asthma patients depending on asthma severity using a nationwide South Korean health care database.

METHODS

Database

This study used the National Patient Sample data, provided by the South Korean Health Insurance Review and Assessment Service. The data were extracted from national health insurance claims data, covering ~98% of the South Korean population, by using a stratified, randomized sampling method. The data that we used contain the claims data for 3% of the total population

and represent the claims of the whole South Korean population.¹⁵ Our data included demographic information, diagnostics, medical treatments, medication prescriptions, and total costs for 1.4 million patients from January 1, 2014 to December 31, 2014.

Study Population

We included all patients meeting the following inclusion criteria: (1) having received at least 2 diagnoses of asthma (*International Classification of Diseases, Tenth Revision, Clinical Modification*: J45–J46) between January 1, 2014 and December 31, 2014; (2) 18 years of age or older; (3) having at least 1 prescription for ≥ 1 of the following asthma medications: inhaled corticosteroids (ICSs); inhaled long-acting β_2 -agonists (LABAs); an ICS and LABA combined in a fixed-dose inhaler (ICS/LABA); inhaled short-acting β_2 -agonists (SABAs), oral leukotriene antagonists, xanthine derivatives, and systemic corticosteroids (CSs). The Global Initiative for Asthma (GINA) suggests a stepwise approach in the management of asthma depending on age: children 5 years of age and younger, children 6 years of age and older, adolescents, and adults.¹⁶ Therefore, we included only patients 18 years of age and older in our study. Our exclusion criteria were (1) patients with a diagnosis of cancer, hematodyscrasia, congenital malformation, pregnancy, injury, fracture, fall, or traffic accident to prevent the huge cost of these diseases from influencing the true asthma-related costs and (2) patients with missing cost-related information to avoid the underestimation of asthma-related costs. A study flow chart is presented in [Figure 1](#).

Assessment of Asthma Severity Level

The degree of severity was based on an individual's medication use, recommended by GINA.¹⁶ Study subjects were categorized into 3 mutually exclusive levels indicating asthma severity. Level 1 (mild) defined patients using at least 1 asthma medication, except for the combination of an ICS and an LABA. Level 2 (moderate) defined patients who were prescribed the combination therapy of an ICS and an LABA. Level 3 (severe) defined the patients who had taken the combination of an ICS, LABA, and low-dose oral CSs (OCSs) for ≥ 2 weeks. A low-dose OCS was defined as < 7.5 mg/d of prednisolone.¹⁶ The prescribed dose of other OCSs was converted to the equivalent prednisolone dose.

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