



# Achalasia in Korea: An Epidemiologic Study Using a National Healthcare Database

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Owing to the rarity of the disease, epidemiologic information on achalasia is limited. This study aimed to investigate the epidemiology and treatment patterns of achalasia in the population of Korea using a national healthcare database. The diagnostic code K22.0 of the International Classification of Diseases was used to identify cases of achalasia between 2007 and 2011. Treatment modalities for achalasia were identified using the electronic data interchange codes Q7642 or Q7641 for balloon dilation and QA421 or QA422 for esophago-cardiomyotomy. A total of 3,105 patients with achalasia (1,447 men; mean age, 52.5 yr) were identified between 2007 and 2011, indicating a prevalence of 6.29/100,000 (95% confidence interval [CI], 4.94-7.66) during this 5-yr period. A total of 191 incident cases of achalasia (82 men; mean age, 49.5 yr), which were not diagnosed as achalasia in the previous 4 yr, were detected in 2011, indicating an incidence of 0.39/100,000 (95% CI, 0.15-0.63) for that year. During the study period, balloon dilation therapy was performed a total of 975 times in 719 patients, and surgical esophago-cardiomyotomy was performed once per patient in 17 patients. This is the first population-based epidemiologic study of achalasia in Korea.

**Keywords:** Achalasia; Epidemiology; Incidence; Prevalence

## INTRODUCTION

Achalasia is a rare esophageal motility disorder characterized by an absence of esophageal peristalsis and impaired lower esophageal sphincter (LES) relaxation in response to swallowing (1). While the etiology of achalasia is not completely understood, the disorder features a loss of ganglion cells in the myenteric plexus of the esophagus, which is speculated to be caused by an inflammatory or neurodegenerative process. It has also been suggested that a viral infection or an autoimmune response may be responsible for the development of achalasia (1, 2). The global prevalence of achalasia is approximately 10/100,000 and its incidence is less than 1/100,000/yr (2). There is scant information worldwide on the epidemiology of achalasia owing to the rarity of the disease. The available epidemiologic studies of the disorder were mostly conducted in Western countries, and estimated its incidence using local hospital records (3). Data concerning the epidemiology of achalasia in Asia are lacking (4), and the epidemiology of achalasia in Korea in particular has never been studied. Korea is well-suited for nationwide epidemiologic studies, because it has a relatively genetically homogenous population, a national healthcare system that covers nearly the entire country's population, a well-controlled, computerized medical record system, and medical institutions that

are easily accessible to patients. In addition, all physicians in Korea submit billing claims to the Health Insurance Review and Assessment Service, a national institution, using the diagnostic and procedure codes of the International Classification of Diseases, 10th Revision (ICD-10). The currently available therapeutic options for treating esophageal achalasia involve loosening the LES and relieving the patient's symptoms (5). Treatment is generally accomplished by means of pneumatic balloon dilation or surgical esophagomyotomy.

In the present study, we aimed to investigate the epidemiology of achalasia of Korea using a national healthcare database. Furthermore, we compared the preferences of pneumatic balloon dilation or surgical esophagomyotomy in the treatment of achalasia.

## MATERIALS AND METHODS

### Identification of subjects

The Korea government provides a universally available national healthcare system, and the overwhelming majority of the nation's population receives its coverage. In 2011, the National Health Insurance (NHI) covered 49,299,165 enrollees, which represents 97% of the population of Republic of Korea. All Korean physicians have to submit billing claims to the national

Health Insurance Review & Assessment Service using the diagnostic and procedure codes of the ICD-10. The present study used the data generated by these claims to identify all patients diagnosed with achalasia between 2007 and 2011. Esophageal achalasia is an esophageal motility disorder diagnosed by esophageal manometry.

### Data analysis

The data extracted were stratified by categorical variables pertaining to patient demographics and treatment modalities. The prevalence of achalasia during the 5-yr period of the study was determined by the number of subjects bearing a diagnostic code (K22.0) for achalasia divided by the total number of NHI enrollees. The incident cases of achalasia were defined as cases of achalasia that were identified in 2011 and had not been diagnosed as achalasia in the previous 4 yr. The incidence of achalasia in 2011 was determined by the number of incident cases of achalasia divided by the total number of NHI enrollees. Treatment modalities for achalasia were investigated using the electronic data interchange codes Q7642 or Q7641 for balloon dilation, and QA421 or QA422 for esophago-cardiomyotomy. Data are expressed as means with standard deviations.

### Ethics statement

This study's protocol was approved by the institutional review board of Ajou University Hospital (IRB No. MED-SMP-12-179). Informed consent was waived by the board.

## RESULTS

Of the 49,299,165 enrollees in the NHI, 3,105 patients with an ICD-10 code for achalasia were identified during the study period of 2007 to 2011. Among these patients with achalasia, 1,447 were male (46.6%). The mean subject age was 52.5 yr. Fig. 1 shows the age distribution of patients with achalasia during the study

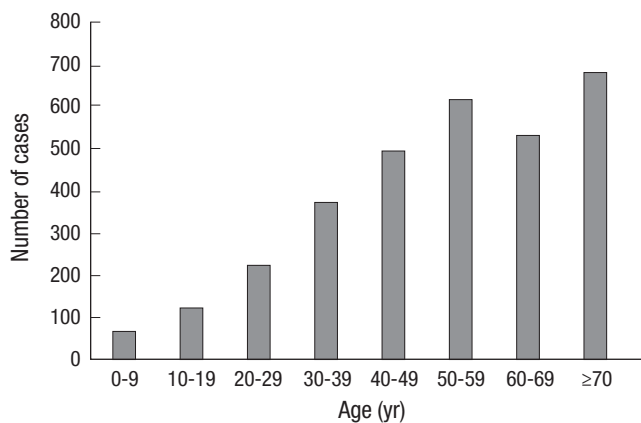


Fig. 1. Age distribution of patients with achalasia identified between 2007 and 2011 (n = 3,105).

period, revealing that achalasia can occur during any period of life, from childhood to old age, though the disease was most prevalent in patients over the age of 50 yr. The prevalence of achalasia cases identified during the 5-yr period was 6.29/100,000 persons (3,105/49,299,165). The prevalences of achalasia in male and female subjects were 5.86/100,000 persons and 6.74/100,000 persons, respectively.

### Incidence and estimated prevalence

A total of 191 incident achalasia cases (82 males and 109 females; mean age, 49.5 yr) were identified in 2011, yielding an incidence of 0.39/100,000 persons (191/49,299,165) for that year. The age distribution of incident cases identified in 2011 is shown in Table 1. The incidences of achalasia in male and female subjects were 0.33/100,000 persons and 0.44/100,000 persons, respectively. Although the number of incident cases aged 30-39 yr was the highest, the incidence per 100,000 persons was the highest in the seventies. The incidence in each age group is shown in Table 1. Assuming the duration of disease for achalasia is 20 yr and its incidence is 0.39/100,000/yr, the prevalence of achalasia in Korea is estimated to be 7.8/100,000 persons.

### Treatment patterns

During the study period, 975 treatments of balloon dilation therapy were performed on 719 patients, and esophago-cardiomyotomy was performed on each of 17 patients (Table 2). An esophageal perforation occurred in 6 patients in the balloon dilation group.

Table 1. Age distribution of newly diagnosed patients with achalasia in 2011 and incidences of achalasia in each age group (per 100,000 persons)

Age group (yr)	No. of incident cases	Incidence
0-9	4	0.09
10-19	16	0.23
20-29	16	0.24
30-39	34	0.42
40-49	33	0.34
50-59	27	0.34
60-69	32	0.69
≥ 70	29	0.43

Table 2. Age distribution of achalasia cases according to treatment modalities

Age group (yr)	Balloon dilation	Myotomy
0-9	3	1
10-19	28	4
20-29	87	0
30-39	109	4
40-49	128	0
50-59	156	1
60-69	101	3
≥ 70	107	4
Total no.	719	17

**Table 3.** Published studies addressing the incidence and prevalence of achalasia

Study population	No. of cases	Study period	Incidence (cases/100,000/yr)	Prevalence (cases/100,000)
USA				
Rochester (28)	11		0.6	
Virginia (8)	30		0.6	
UK				
Scotland (17)	699		1.1/1.2*	11.2
Oxford (17)	216		0.9/0.9*	9.99
Cardiff (29)	48	1926-1977	0.4	
Nottingham (30)	53	1966-1983	0.5	8
Edinburgh (7)	25	1986-1991	0.8	
Leicester (31)	14	1986-2005	0.89	
Israel (32)	162	1973-1978	0.8	7.9-12.6
New Zealand (6)	152	1980-1984	1.0	
Zimbabwe (33)	25	1974-1983	0.03	
Singapore (4)	49	1989-1996	0.3	1.8
Iceland (9)	62	1952-2002	0.55	8.7
Canada (3)	463	1995-2008	1.63	10.82

\*Male/Female. Number in parenthesis means the reference number.

## DISCUSSION

The epidemiologic studies reported are based on hospital records from local areas, and most of the studies were from Western countries (Table 3). The present study is the first epidemiologic study of achalasia in the general population of Korea, revealing the incidence of achalasia in Korea to be 0.39/100,000/yr. This figure is slightly higher than that of Singapore (0.3/100,000/yr) (4), but lower than the incidence in the Western populations (0.8 to 1.63/100,000/yr) (3, 6-9). We identified 3,105 cases of achalasia during the 5-yr period of the study, leading to a prevalence of 6.29/100,000 persons. The actual prevalence is presumed to be higher than 6.29/100,000 persons, considering the chronic nature of the disease and the duration of treatment effects. Assuming the duration of disease for achalasia is 20 yr and its incidence is 0.39/100,000/yr, the prevalence of this disease in Korea is calculated to be 7.8/100,000 persons.

Geographic differences in the incidence of achalasia appear to be attributable to genetically determined susceptibility and to environmental factors (10). Some investigators have proposed the existence of a genetic predisposition, noting the disease's associations with human leukocyte antigens (11, 12). An autoimmune mechanism that leads to inflammatory changes and damage to the myenteric plexus is presumed to play an important role in the development of achalasia (13). Although the event that triggers this autoimmune reaction remains unknown, plausible hypotheses include viral infections such as varicella zoster and measles (14-16). There is at present not enough data to elucidate the causes of the relatively low incidence and prevalence of achalasia in Korea and Singapore, compared with the Western reports. While achalasia can occur at any age, its peak incidence was shown to occur in middle age, with both sexes equally affected. Only 2% of the 3,105 cases of achalasia were aged

below 10 yr-old, and only 2% of the incident achalasia cases in 2011 occurred in the first decade of life. The mean age of patients with achalasia in the present study was comparable to the mean ages in previous studies (17, 18). Previous studies have shown that an incidence of achalasia is increased with age and the highest beyond the seventh decade of life (17, 18). Our study confirmed a higher incidence of achalasia in the elderly. In the present study, the incidence was the highest in the seventh decade of life. This age-dependent behavior is not yet understood, though the loss of ganglion cells in the LES could result from age-related neuronal degeneration or the accumulated effects of repeated exposure to noxious environmental influences over the course of a long life (19).

Current treatments of achalasia focus on the relaxation or mechanical disruption of the LES. Since achalasia is rare, it is difficult to conduct comparative clinical trials that could reveal an optimal treatment strategy. In the last 30 yr, there have been only 3 controlled and randomized prospective trials comparing esophago-cardiomyotomy with pneumatic balloon dilation (20-23). These studies showed equivalent results for the treatments' initial effectiveness in symptom relief. However, long-term follow-up studies showed that patients who underwent esophagomyotomy had fewer recurrent symptoms than those who underwent balloon dilation. In a recently published guideline, either graded pneumatic dilation or laparoscopic surgical myotomy with a partial fundoplication are recommended as the initial therapy of achalasia (24). So, we compared the preferences of pneumatic balloon dilation and surgical myotomy in the treatment of achalasia. Cases which underwent boogie were not investigated in the present study. The present study showed that balloon dilation therapy was chosen for most patients with achalasia in Korea. Very few patients received surgical myotomy. These results suggest that the treatment strategy of achalasia in Korea is different from that of the West. Korean endoscopists are well trained and experienced in balloon dilation therapy. Of the 719 patients in our study who had undergone balloon dilation, 256 of them received more than 2 treatments of balloon dilation therapy during the 5-yr period, indicating that 35% of patients treated with balloon dilation had a symptom recurrence within 5 yr. The most severe complication of balloon dilation is perforation of the esophagus. In recent studies, the perforation rate associated with balloon dilation is reported to be 1%-3% (25, 26). In the current study, 6 cases of esophageal perforation were identified, yielding an estimated perforation rate of approximately 0.6%.

The source of the current study's data, Korea's accessible, well-organized national health insurance system's database, conferred several advantages. Because this national database includes all medical claims for more than 49 million Korean enrollees, representing 97% of the population of Korea, this study was able to accurately represent the country's general popula-

tion. Additionally, because the database was not modified for an academic purpose, selection bias was avoided. While the study benefitted from these advantages, there were a few disadvantages as well. The national law regarding the protection of personal information prevented validation of the data using hospital records. Hence, some important clinical information, such as patients' clinical characteristics and presenting symptoms, laboratory data, details of manometric findings, and the clinical courses of the disease, could not be obtained. The manometric data of the achalasia patients identified were not reviewed because of the national law regarding the protection of personal information. However, it is unlikely that esophageal achalasia was diagnosed without the compatible findings of esophageal manometry, because esophageal achalasia is an esophageal motility disorder diagnosed by esophageal manometry. Another of the study's limitations was its inability to identify those who had been diagnosed with achalasia before the study period and never visited hospital during the study period. However, since balloon dilation therapy was the most common treatment for achalasia in our subjects, and since the duration of its effects is limited, the degree of underestimation is not likely to be large. There is no known cure for esophageal achalasia, so even when the initial balloon dilation treatment is successful, relapses are common. In a prospective study conducted by Eckardt et al. (27), only 40% of the patients treated with balloon dilation remained in remission after 5 yr. Patients whose symptoms recurred during the 5-yr period were likely to visit the hospital again, and in almost all areas of Korea, medical care and services, including those provided by secondary and tertiary hospitals, are very accessible. It is also unlikely that many patients with this condition were misdiagnosed, since this disease is a rare condition of which identification requires manometric testing. Overestimation of the number of achalasia cases owing to secondary achalasia is also unlikely to have occurred, since upper gastrointestinal endoscopy is inexpensive and widely available in Korea, even in the primary care clinics. Since endoscopy is available in almost every region of Korea, other gastrointestinal diseases such as esophageal cancer can be excluded by endoscopy. Most patients who present with dysphagia initially undergo an endoscopic examination. Accordingly, it is unlikely that other gastrointestinal diseases are misdiagnosed as achalasia.

In conclusion, this is the first population-based epidemiologic study of achalasia in Korea, revealing its incidence, estimated prevalence, demographic features, and treatment patterns. Further investigation regarding the epidemiological differences between countries is warranted.

## DISCLOSURE

The authors have no conflicts of interest to disclose.

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