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Early View

Research letter

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# Population-based prevalence of bronchiectasis and associated comorbidities in South Korea

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*To the Editors:*

Bronchiectasis is a chronic respiratory disease characterized by abnormal dilatation of bronchi and clinically presents with cough, sputum production, and recurrent infection [1].

Although bronchiectasis had been regarded as an “orphan” disease [2], recent studies have shown the prevalence of bronchiectasis is increasing, and this disease causes a significant burden on public health including increased healthcare costs, hospital admission, and mortality [3-5].

Data on the prevalence of bronchiectasis and bronchiectasis-related comorbidities are relevant since comorbidities are important factors for predicting the risk of mortality in patients with bronchiectasis [6]. However, epidemiologic data on the prevalence of bronchiectasis remain limited, especially in Asian populations. Furthermore, only a few studies have included a comprehensive evaluation of the prevalence of bronchiectasis-related comorbidities among Asians [1, 7]. Thus, in the present study, the overall prevalence of bronchiectasis and associated comorbidities were investigated using a representative sample of national health insurance claims data in South Korea.

To identify patients with bronchiectasis and investigate their comorbidities, data from the 2012–2017 Health Insurance Review and Assessment Service-National Patient Sample (HIRA-NPS), which is nationally representative and open to the public for research purposes, were used [8]. The HIRA-NPS data are cross-sectional and composed of health insurance claim records during the year. The database includes approximately 1,400,000 individuals each year drawn by 3% stratified random sampling by age and gender from the entire population who had claims records during the year. It also provides information on healthcare costs composed of payer’s amounts and patient’s out-of-pocket costs. South Korea has a government-run mandatory national health security system; 97% of the population is enrolled in the National Health Insurance and 3% in Medical Aid programs [9]. Data were extracted using the ICD-10 diagnosis code J47 (bronchiectasis). Subjects with cystic fibrosis (ICD-10 diagnosis code E84) were excluded (n = 6). Bronchiectasis-associated comorbidities were also defined using the ICD-10 codes (Figure 1b). Acute exacerbation of bronchiectasis

requiring an emergency room (ER) visit or hospitalization was defined as when a bronchiectasis patient visited the ER or was hospitalized under the following conditions diagnostic codes: 1) main diagnostic code for bronchiectasis and antibiotic administration or 2) diagnostic codes J12.x-J17.x (pneumonia), J20 (acute bronchitis), J21 (acute bronchiolitis), R060 (dyspnea), or R042 (blood-tinged sputum) and antibiotic administration. Healthcare costs for a given disease and the cause of in-hospital mortality were determined based on the main ICD-10 code at the time of hospitalization. Because this study was based on anonymous health claims data, institutional review board approval and patient consent were not required.

Among the 6,626,435 subjects aged 20 years or older from the 2012–2017 HIRA-NPS database, this study included 30,732 patients diagnosed with bronchiectasis. The mean ± standard deviation (SD) age was 63.8 ± 13.1 years. During the study period, the estimated overall prevalence of bronchiectasis was 464 cases/100,000 population in South Korea (95% confidence interval, 459–467) which is higher than the 67 cases/100,000 population observed in Germany [10] and 138 cases/100,000 population recorded in the United States [11]. The estimated prevalence of bronchiectasis in South Korea each year was 464 cases/100,000 population in 2012, 441 in 2013, 455 in 2014, 474 in 2015, 468 in 2016, and 480 in 2017. Among patients with bronchiectasis, 44.7% were male and 55.3% were female. Approximately 82.0% of the patients received outpatient care, and 18.0% received both inpatient care and outpatient care. The prevalence of bronchiectasis increased as age increased (Figure 1a).

The average healthcare cost/person/year was EUR218 in bronchiectasis patients. Overall, 88.9% of bronchiectasis patients received antibiotics (any type). The average number of prescriptions for any type of antibiotics/patient/year was 1.4 and the average medical cost for prescribing antibiotics/patient/year was EUR117. Acute exacerbations requiring an ER

visit or hospitalization occurred in 7.0% of bronchiectasis patients. The overall in-hospital mortality was 2.9% (878/30,732), of which 1.4% (12/878) died of bronchiectasis itself.

In terms of comorbidities, asthma was diagnosed in 17.2% of subjects with bronchiectasis and of those, chronic obstructive pulmonary disease (COPD) was diagnosed in 19.3% of subjects (the ratio of COPD was calculated among the subjects ≥ 40 years of age), which was relatively lower than the prevalence in other studies evaluating Western populations: in a United Kingdom study, the respective prevalence of asthma and COPD was 42.5% and 36.1% [12]; in a German study, the prevalence of COPD was 58% [10]; in a United States study, the prevalence of asthma and COPD were 29% and 20%, respectively [13]. Pulmonary tuberculosis and non-tuberculous mycobacterial infection were diagnosed in 2.4% of South Korean patients with bronchiectasis, respectively (Figure 1b). Other common bronchiectasis-related comorbidities included hypertension (25.7%), gastroesophageal reflux disease (19.4%), diabetes mellitus (13.2%), and malignancy (8.2%). The prevalence of cardiovascular diseases such as myocardial infarction (MI), angina pectoris, and cerebrovascular disease was less than 8%, which was lower than the rate reported in a European population study [6].

The average healthcare cost/person/year was highest in bronchiectasis patients with malignancy (EUR4,190), followed by MI (EUR2,142), cerebrovascular disease (EUR1,515), and tuberculosis (EUR1,055). The average number of ER visits/person/year was highest in bronchiectasis patients with MI (0.27), followed by those with malignancy (0.22), cerebrovascular disease (0.12), or congestive heart failure (0.10). The average number of admissions/person/year was highest in bronchiectasis patients with malignancy (1.07), MI (0.39), pneumonia (0.37), and tuberculosis (0.34). The common causes of in-hospital death included malignancy (13.7%), pneumonia (4.0%), cerebrovascular disease (3.3%), and COPD (3.3%).

The reason for the relatively lower prevalence of cardiovascular diseases in Korean bronchiectasis patients compared with Western bronchiectasis patients remains unclear. Differences in ethnicity, socioeconomic status, lifestyle, and cardiovascular disease-related comorbidity profiles (e.g., the lower COPD prevalence in this study) might explain this phenomenon. However, it should be emphasized that the cardiovascular disease burden in this study was substantial; specifically, it was associated with increased healthcare costs and was one of the leading causes of ER visit, hospitalization, and mortality. Thus, the management of cardiovascular conditions should be emphasized despite their relatively lower prevalence in Korean bronchiectasis patients than in Western patients.

The present study had several limitations that should be acknowledged. First, the prevalence of subjects with bronchiectasis was estimated using ICD-10 diagnosis codes from health insurance claims data; therefore, the data are subject to potential errors. Second, we could not estimate overall mortality in patients with bronchiectasis since the HIRA-NPS database only provides in-hospital mortality data. Third, the prevalence of pulmonary comorbidities such as COPD or asthma might have been underestimated if attending physicians failed to list diagnostic codes for concomitant pulmonary comorbidities. Fourth, medical history data were not available in the Korean HIRA-NPS database for pulmonary tuberculosis, although it is an important cause of bronchiectasis in the Asian population.

In conclusion, the estimated prevalence of bronchiectasis is 464 cases per 100,000 population in South Korea, implying bronchiectasis is not a rare disease. The common comorbidities were COPD, asthma, hypertension, gastroesophageal reflux disease, and diabetes mellitus. The prevalence of cardiovascular diseases was relatively low. A well-designed prospective cohort study, such as the collaboration of the recently-organized Korean Multicentre Bronchiectasis Audit and Research Collaboration (KMBARC), Asian Obstructive Lung Disease Bronchiectasis (ANOLD-BE), and European Multicentre

Bronchiectasis Audit and Research Collaboration (EMBARC), is necessary to determine ethnic differences in the epidemiology of bronchiectasis.

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## CONFLICT OF INTERESTS

None to declare.

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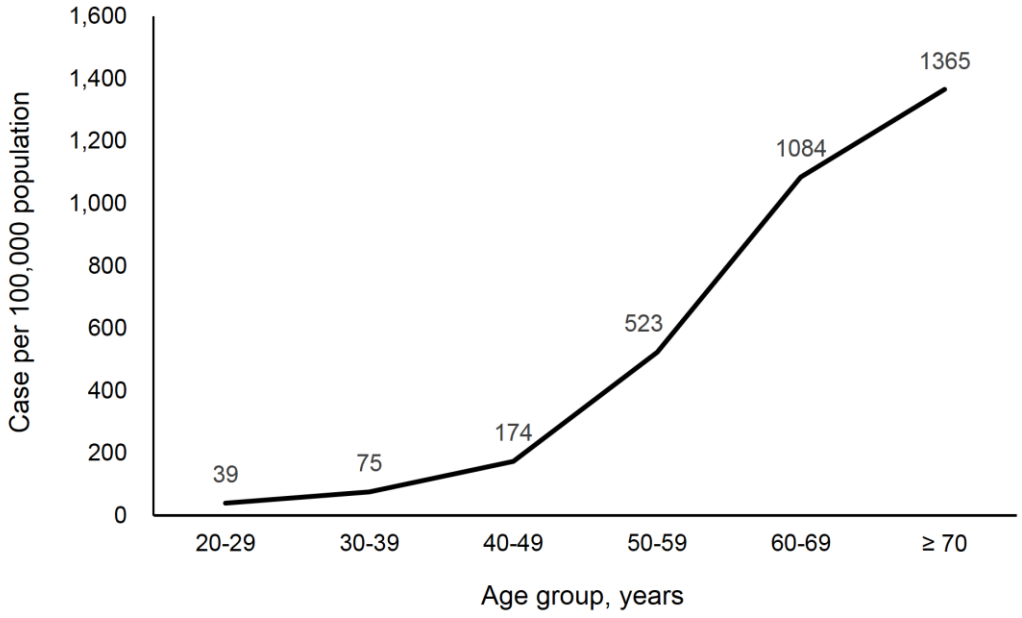
## FIGURE LEGENDS

**Figure 1.** a) Prevalence of bronchiectasis based on age group in South Korea. b) Frequency of bronchiectasis-associated comorbidities.

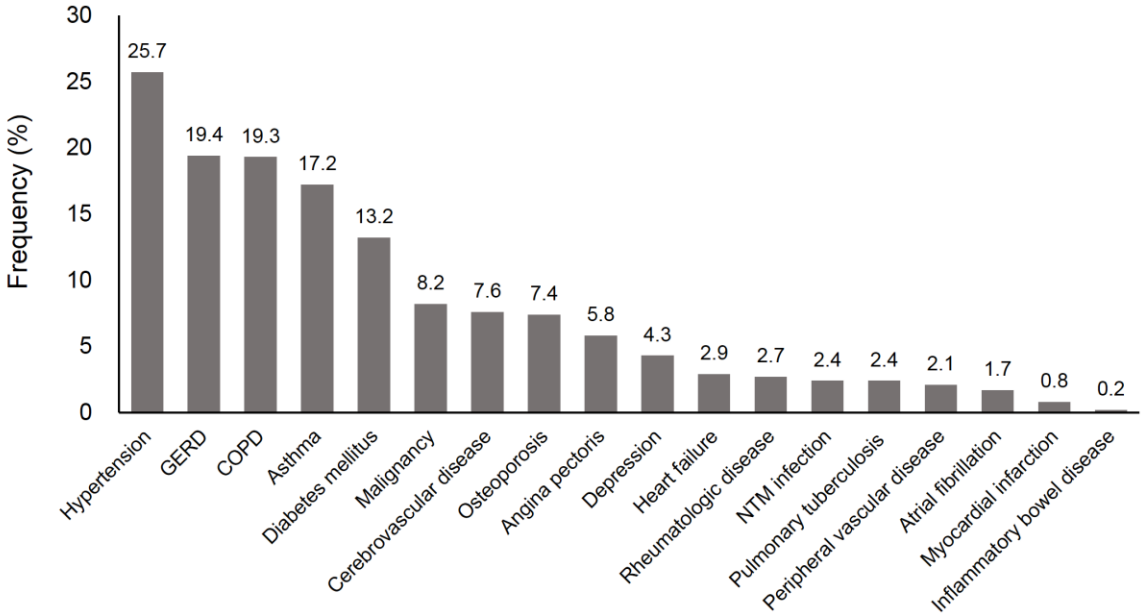
GERD: gastroesophageal reflux disease; COPD: chronic obstructive pulmonary disease; NTM: non-tuberculous mycobacterium.

The prevalence of COPD was calculated among the subjects ≥ 40 years of age. Bronchiectasis-associated comorbidities were also defined using the following ICD-10 diagnosis codes; angina pectoris (I20.x), asthma (J45.x-J46.x), atrial fibrillation (I48.x), chronic obstructive pulmonary disease (J42.x-J44.x except for J43.0 [unilateral emphysema]), cerebrovascular disease (G45.x-G46.x, I60.x-I69.x, or H34.0), depression (F32.x-F34.x), diabetes mellitus (E10.x-E14.x), gastroesophageal reflux disease (K21.x), hypertension (I10.x-I15.x), heart failure (I43.x, I50.x, I09.9, I11.0, I25.5, I13.0, I13.2, I42.0, I42.5-I42.9, or P29.0), inflammatory bowel disease (K50.x-K51.x), malignancy (C00.x-C97.x), myocardial infarction (I21.x, I22.x, or I25.2), non-tuberculous mycobacterial infection (A31.x), osteoporosis (M80.x-M81.x), peripheral vascular disease (I70.x-I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, or Z95.9), liver disease (K70.3, K71.7, K73.x, K74.3-K74.6, K72.1, K72.9, K76.6, or K76.7), and rheumatologic disease (M05.x, M06.x, M31.5, M32.x, M33.x, M34.x, M35.1, M35.3, or M36.0).

a)


1,600
1,400
1,200
1,000
800
600
400
200
0
Case per 100,000 population
39
75
174
523
1084
1365
20-29
30-39
40-49
50-59
60-69
≥ 70
Age group, years

b)


30
25
20
15
10
5
0
Frequency (%)
25.7
19.4
19.3
17.2
13.2
8.2
7.6
7.4
5.8
4.3
2.9
2.7
2.4
2.4
2.1
1.7
0.8
0.2
Hypertension
GERD
COPD
Asthma
Diabetes mellitus
Malignancy
Cerebrovascular disease
Osteoporosis
Angina pectoris
Depression
Heart failure
Rheumatologic disease
NTM infection
Pulmonary tuberculosis
Peripheral vascular disease
Atrial fibrillation
Myocardial infarction
Inflammatory bowel disease