ORIGINAL RESEARCH LETTER

# Incidence of bronchiectasis concerning tuberculosis epidemiology and other ecological factors: A Korean National Cohort Study

*To the Editor:*

Understanding regional differences in the aetiology of bronchiectasis will be crucial to make a strategy to control the disease burden related to bronchiectasis. In Asia, where the prevalence of bronchiectasis is substantially higher than in Western countries [1], previous tuberculosis (TB) is one of the leading causes of bronchiectasis [2, 3]. Accordingly, the successful national TB control programme may be an effective strategy to reduce the disease burden of bronchiectasis in many Asian countries. However, to date, no data have supported this assumption. In South Korea, the incidence of TB has declined following government-led TB control programmes, which have changed the country's status from a high-TB burden nation to an intermediate-TB burden country [4]. Thus, the relationship between the incidences of TB and bronchiectasis in South Korea probably provides an answer to this research question. In this study, we aimed to investigate whether TB control was associated with a reduced incidence of bronchiectasis in South Korea, with consideration of other potential factors that can influence the incidence of bronchiectasis.

To identify the incidence of bronchiectasis, the National Health Insurance Service-National Sample Cohort (NHIS-NSC), a population-based retrospective cohort based on a 2.2% representative sample of Korean citizens, was used [5]. Sampling consisted of a systematic stratified random sample with proportional allocation within each stratum. The sampling procedures and representativeness of the cohort are described elsewhere [5, 6]. We used person-level longitudinal NHIS-NSC registration and claimed data obtained between 1 January 2002 and 31 December 2013 [5]. The Institutional Review Board of the Hallym University Kangnam Sacred Heart Hospital (Seoul, Korea) approved this study and waived the requirement for informed consent because we used only de-identified data (application no. 2020-02-018).

Bronchiectasis was defined as the presence of the International Classification of Diseases (ICD)-10 diagnosis code J47. Patients with cystic fibrosis (ICD-10 diagnosis code E84) were excluded. We defined the incidence period as the time span between 1 January 2005 and 31 December 2013; the index event was defined as the first diagnosis of the disease with no diagnosis code more than 3 years before the first index event after the sensitivity test. Hence, the washout period of this study was the 3 years between 1 January 2002 and 31 December 2004. The age-adjusted incidence was calculated, and all analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC, USA).

The prevalence and incidence rates of TB were extracted from the Annual Report on Notified Tuberculosis in South Korea, which is publicly published by the Korean Centres for Disease Control and Prevention [7]. The report provides the annual age-adjusted incidence of TB since 2001. Because the report does not provide information on TB prevalence and incidence before 2011, we collected TB prevalence and incidence data in 1990 and 1995, respectively, from data published for research purposes [4, 8].

Figure 1 depicts the incidence of bronchiectasis in South Korea from 2005–2013. The graph shows a decreasing incidence of bronchiectasis during the study period: 229 cases per 100 000 population in 2005,

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**In South Korea, the estimated incidences of bronchiectasis were 147–229 cases per 100000 with a decreasing trend. It may follow the concurrent decrease in the TB prevalence and incidence, and favourable personal and socioeconomic conditions.** https://bit.ly/32UA8xH

**Cite this article as:** Choi H, Ryu J, Kim Y, *et al.* Incidence of bronchiectasis concerning tuberculosis epidemiology and other ecological factors: A Korean National Cohort Study. *ERJ Open Res* 2020; 6: 00097-2020 [https://doi.org/10.1183/23120541.00097-2020].

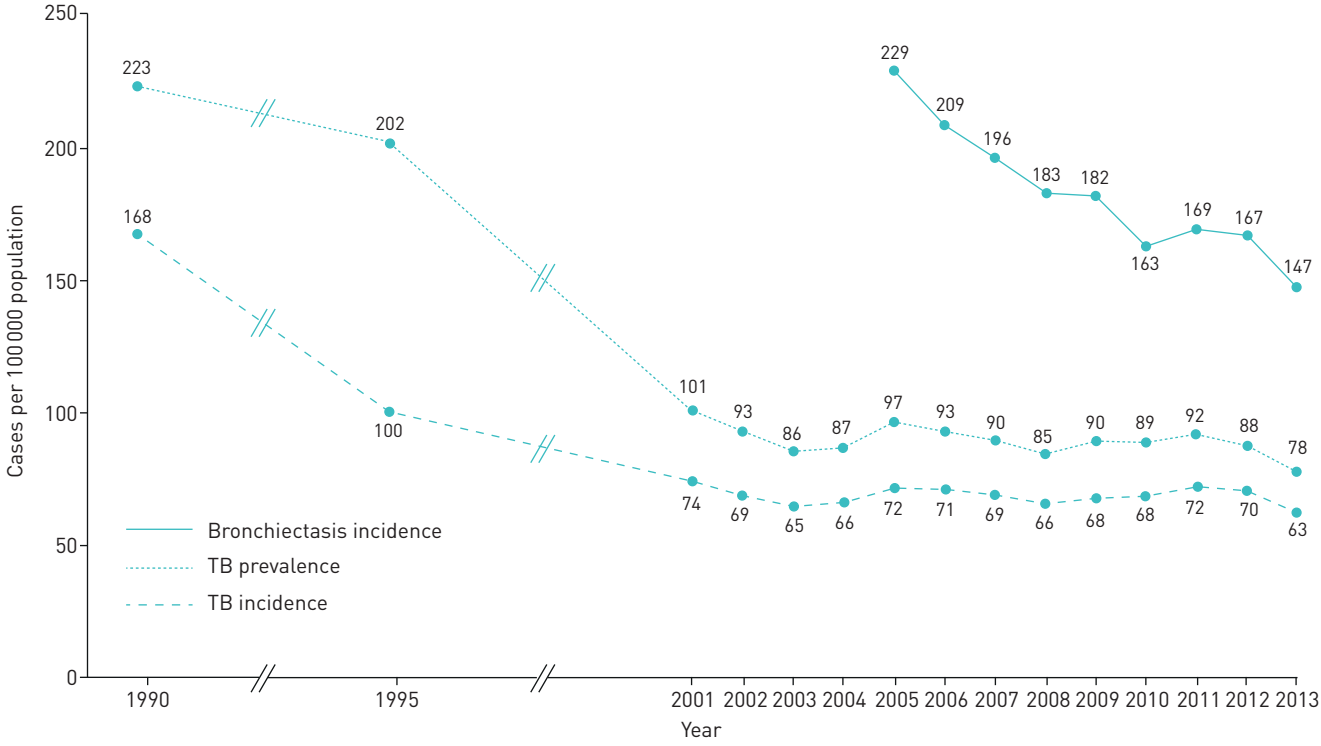


FIGURE 1 Incidence of bronchiectasis, prevalence of tuberculosis (TB), and incidence of TB in South Korea. TB prevalence and incidence data in 1990 and 1995 were not age-adjusted.

209 in 2006, 196 in 2007, 183 in 2008, 182 in 2009, 163 in 2010, 169 in 2011, 167 in 2012, and 147 in 2013. Figure 1 also depicts TB prevalence and incidence in South Korea since 1990. The graph shows a decreasing TB prevalence and incidence over the study period: a steep decline in incidence (168 cases per 100 000 population in 1990, 100 in 1995, and 74 in 2001) was followed by a gradual decline (74 cases per 100 000 population in 2001, 69 in 2007, and 63 in 2013).

We previously reported that the prevalence of bronchiectasis in South Korea was 464 cases per 100 000 population, which was higher than that reported in Western countries [1]. This study showed that the annual incidences of bronchiectasis were 147–229 cases per 100 000 population, which was a higher rate than the 29 cases per 100 000 population recorded in the USA [9], 21 cases per 100 000 population observed in Germany [10], and 16 cases per 100 000 population observed in Italy [11]. Despite a relatively higher incidence of bronchiectasis in South Korea compared with Western countries, we showed that the incidence of bronchiectasis in South Korea decreased annually along with the incidence of TB. These results are surprising considering the increasing incidence of bronchiectasis in Western countries, in which the TB prevalence has remained continuously low [10, 11]. We further evaluated common aetiologies of bronchiectasis other than TB. According to an analysis of the Korean Multicentre Bronchiectasis Audit and Research Collaboration cohort data, pulmonary TB is the most common non-idiopathic cause of bronchiectasis, followed by pulmonary infection, asthma, non-tuberculosis mycobacterial (NTM) infection, and COPD (unpublished data). Interestingly, the prevalence of these diseases tended to increase during the study period, except for COPD. The prevalence of COPD showed an initial decreasing trend from 2005 to 2010 (22.5% in 2007 to 17.1% in 2009) and increased thereafter until 2012 (23.1% in 2012) [12]. In contrast, the prevalence of pneumonia (547 cases per 100 000 population in 2002 increasing to 725 in 2013), asthma [13], and NTM infection were steadily increasing [14]. In addition, the number of patients who received their first chest computed tomography scan increased gradually (339 cases per 100 000 population in 2005 increasing to 1188 in 2013), which was different from the tendency of bronchiectasis incidence change. Accordingly, taken together, this information suggests that effective TB control might be related to a decreased trend in bronchiectasis incidence.

However, beyond the comorbidities, we also need to consider other personal and socioeconomic factors in the ecological model in explaining the decreased incidence of bronchiectasis in Korea. During the study period, the rate of smoking (28.8% in 2005 decreasing to 24.1% in 2013), antibiotic use (32.4% in 2005

decreasing to 24.5% in 2013), and level of particulate matter <10 µm (57 µg·m$^{-3}$ in 2005 decreasing to 49 µg·m$^{-3}$ in 2013) gradually declined. In addition, socioeconomic status measured by the gross domestic product increased in Korea (USD 898 billion in 2005 to USD 1305 billion in 2013). Regarding changes in industrial structure in Korea, while the proportion of primary and secondary industries (agriculture, forestry, fishing, mining, manufacturing, *etc.*) decreased, the proportion of tertiary industries (public utilities, services, *etc.*) increased (59.4% in 2005 to 60.2% in 2013). The source of the data mentioned above was Statistics Korea (kostat.go.kr/portal/eng/index.action). The changes in these factors may have also contributed to a favourable environment for reducing bronchiectasis.

To the best of our knowledge, this is the first study to investigate the population-based incidence of bronchiectasis longitudinally in relation to the incidence of TB and other ecological factors. Our study has the strength of providing insight that effective TB control may be very important in reducing the disease burden related to bronchiectasis in countries with an intermediate-to-high TB burden, as shown in South Korea. However, the present study also had several limitations that should be acknowledged. First, the incidence of bronchiectasis was estimated using ICD-10 diagnosis codes from health insurance claim data. Second, we could not provide the annual incidence of TB-related bronchiectasis. We also could not identify the aetiologies of bronchiectasis as the NHIS-NSC data did not contain detailed information on this subject. Third, since the data sourced from Statistics Korea were not included in our original cohort, we were not able to adjust the potential confounders statistically.

In conclusion, the estimated incidences of bronchiectasis between 2005 and 2013 were 147–229 cases per 100 000 population in South Korea. The annual incidence of bronchiectasis showed a decreasing trend, which may follow the concurrent decrease in the TB prevalence and incidence, and favourable personal and socioeconomic conditions in South Korea. These results suggest that health promotion policy, including TB control, would help decrease the incidence and disease burden of bronchiectasis in countries with an intermediate-to-high TB burden. We also hope that future prospective bronchiectasis cohort studies will provide more concrete evidence on the epidemiology and underlying aetiologies of bronchiectasis in Asia [2, 15].

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Received: 27 Feb 2020 | Accepted after revision: 26 June 2020

Conflict of interest: None declared.

Support statement: This research was supported by the Basic Science Research Programme through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, Information and Communications Technologies (2020R1F1A1070468 to H. Lee and 2019R1G1A1008692 to H. Choi); and grants from the Korean Ministry of Health and Welfare (1520240 to S-Y. Kong). The funders had no role in the design of the study, the collection and analysis of the data, or the preparation of the manuscript. Funding information for this article has been deposited with the Crossref Funder Registry.

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