

# A Population-Based Cross-Sectional Study of Alcohol Consumption and Risk of Benign Laryngeal Disease in Korean Adults

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**Summary: Objective.** Studies on alcohol consumption and benign laryngeal disease (BLD) in the general population are rare. The aim of this study was to investigate the relationship between alcohol consumption and BLD in the Korean general population.

**Study Design.** This was a cross-sectional study of a national health survey.

**Materials and Methods.** Subjects were 3141 noninstitutionalized civilian adults older than 19 years (1313 men and 1828 women) who completed the laryngeal examination of the Korea National Health and Nutrition Examination Survey of 2008. Frequency of drinking was classified into less than once per week, two to three times per week, and more than four times per week. Binge drinking was defined as five or more drinks ( $\geq 61$  g of alcohol) per episode for men and as four or more drinks ( $\geq 41$  g of alcohol) per episode for women. Poisson regression analyses were conducted to examine the relationship between alcohol drinking and BLD.

**Results.** Adjusting for covariates (age, sex, income, level of education, occupation, and cigarette smoking), it was found that those who drank more than four times a week, compared with those who drank less than once per week, were more likely to have BLD (risk ratio = 2.15, 95% confidence interval: 1.01–4.59,  $P < 0.05$ ). However, the amount of alcohol consumed was not associated with BLD.

**Conclusions.** Frequent drinking (ie, more than four times a week) was found to be a risk factor for BLD.

**Key Words:** Dysphonia–Benign laryngeal disease–Alcohol consumption–Binge drinking–Voice disorder.

## INTRODUCTION

Alcohol consumption is very common in Korea. As of 2008, the annual drinking rate of Korean adults older than 19 years was 75.5%, and the high-risk drinking rate was 20.2%, having grown more than 5% over the last 3 years.<sup>1</sup> It is estimated that the socioeconomic cost of drinking amounts to approximately 3% of Korea's Gross National Product, more than twice that of Japan, Canada, and France.<sup>2</sup>

Excessive drinking is known to be a risk factor for benign laryngeal diseases (BLDs), such as vocal nodules, vocal polyps, and intracordal cysts.<sup>3,4</sup> This is because alcohol expands the blood vessels and induces edema in the laryngeal membrane, exerting a harmful effect on the larynx.<sup>5,6</sup> Voice disorders have a high risk of relapse without the elimination of these risk factors.<sup>7</sup> Therefore, the elucidation of risk factors and early management are important for the prevention of voice disorders. Although many studies have reported on the relationship between drinking and laryngeal disorders, they have focused on patients visiting medical institutions,<sup>8–10</sup> and there have been few epidemiologic studies on the relationship between health behaviors and voice disorders in the general population.<sup>11,12</sup> In addition, because there are differences in health behaviors among ethnicities and countries, epidemiologic studies that consider the characteristics of Koreans are required for the

prevention of voice disorders in Korea. Thus far, no study has reported on the relationship between drinking behaviors and BLD in the Korean general population.

This study investigated the relationship between drinking behaviors and BLD using a nationwide representative survey of the Korean population.

## METHODS

### Data resource and subjects

The subjects of this study were adults aged 19 years and older who participated in the Korea National Health and Nutrition Examination Survey 2008 (KNHANES), a nationwide representative survey of the population in the Republic of Korea, and who then participated in an otolaryngology examination. The KNHANES is a nationwide cross-sectional survey conducted annually, and the survey was approved by the Institutional Review Board of the Korea Centers for Disease Control and Prevention (approval no. 2011–02CON-06). The target population of KNHANES comprises noninstitutionalized Korean citizens residing in Korea. The sampling plan follows a multistage clustered probability design based on the National Census Data. For example, in the 2008 survey, 100 primary sampling units were drawn from approximately 200 000 geographically defined primary sampling units for the whole country. The 2008 KNHANES response rate was 74.3% for the health interview and examination survey. The sampling of the KNHANES is described in detail elsewhere.<sup>1</sup>

This study targeted 3632 persons who completed both the health survey and the laryngoscope examination. Among them, 481 persons whose laryngoscopic findings could not be determined were excluded from the research, and 3141 persons (1313 men and 1828 women) were analyzed.

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## Measurement

Along with the questionnaire on health, we performed a survey on level of education and economic activity via individual interviews. Moreover, we carried out a survey on health behaviors (eg, smoking and drinking) via self-administered questionnaires from January to December of 2008. A total of 45 otolaryngologists from 43 general hospitals conducted endoscopic laryngeal examinations for laryngeal lesions using a 70° endoscope that was attached to a charge-coupled device camera on male and female adults aged 19 years and older.<sup>13</sup>

The laryngeal examinations were collaborating with Korean Society of Otorhinolaryngology-Head and Neck Surgery providing technical advice and highly trained otolaryngologists. Before the research, otolaryngologists were trained three times, and common criterion errors were examined through theory education, pretraining, and mock surveys. The index of coincidence was evaluated twice, and the quality improvement committee reevaluated the examined pictures and videos (640 × 480-sized audio video interleave files, which were compressed by DivX 4.12 codec using a compression rate of 6 Mb/second) by otolaryngologists and computed results. The laryngoscope examination index of coincidence was 75%.

**Drinking.** Because the percentage of those who replied “I have never drank” was only 4.1% among adults older than 19 years, this study analyzed drinking frequency and drinking amount (binge drinking) separately. Frequency of drinking was classified as less than once per week, two to three times per week, and more than four times per week. Binge drinking was defined as five or more drinks ( $\geq 61$  g of alcohol) per episode for men and as four or more drinks per episode ( $\geq 41$  g of alcohol) for women, with reference to the International Center for Alcohol Policies.<sup>14</sup>

**Benign laryngeal diseases.** BLDs were defined as vocal nodules, laryngeal polyps, intracordal cysts, Reinke’s edema, laryngeal granuloma, glottic sulcus, and laryngeal keratosis.<sup>15,16</sup>

**Covariates.** Age, sex, income, level of education, occupation, and cigarette smoking were considered. Age was classified into groups of 19–39, 40–59, and 60 years and older. Level of income for households was classified into four quartiles. Occupations were surveyed based on the Korean Standard Classification of Occupations sixth revision<sup>17</sup> and classified into unemployed persons, managers, clerical workers, service and sales workers, skilled agricultural and forestry and fishery workers, craft and related trades workers, and elementary occupations. Level of education was classified as elementary school graduates and lower, middle school graduates, high school graduates, and college graduates and over. Smoking was classified into current smokers, past smokers, and nonsmokers.

## Statistical analysis

The general characteristics of the participants according to BLD were presented in the form of percentages, and differences among the groups were identified using a chi-square test. To compare the relationship between alcohol consumption and BLD, the risks ratio (RR) and 95% confidence intervals (CIs) were presented using Poisson regression analysis. Effects

with  $P < 0.05$  were considered statistically significant. Model 1 in this study was adjusted for sociodemographic factors (age, gender, income, education level, and occupation), model 2 was additionally adjusted for smoking, and all confounding variables including drinking habits were adjusted for Model 3.

All analyses were performed using IBM SPSS, version 21.0 (IBM, Inc., Chicago, Illinois).

## RESULTS

### Characteristics of subjects based on benign laryngeal diseases

The characteristics of subjects based on BLDs are presented in Table 1. Among the 3141 subjects, 90 subjects (2.9%) suffered from one or more BLD. The chi-square test revealed that there were significant differences between the normal group and the BLD group in terms of occupation, smoking, frequency of drinking, and subjective perception of voice disorders. The normal group had high rates of unemployed persons (40.2%), service and sales workers (12.3%), and skilled agricultural and forestry and fishery workers (12.2%), whereas the BLD group had high rates of unemployed persons (28.9%), managers (18.9%), and craft and related trades workers (14.4%;  $P < 0.05$ ). The BLD group contained a higher percentage of participants than the normal group who currently smoked (33.3%), and drank more than four times a week (12.2%;  $P < 0.05$ ).

### Relationship between drinking habits and benign laryngeal diseases

The relationship between drinking amount and BLD is presented in Table 2. In all models of this study, drinking amount had no significant relationship with BLD.

The relationship between drinking frequency and BLD is presented in Table 3. The model that adjusted for sociodemographic variables (model 1) indicated that those who drank more than four times a week had 2.1 times (RR = 2.06, 95% CI: 1.01–4.23) more risk of BLD than those who drank less than once a week ( $P < 0.05$ ). The model that also adjusted for smoking (model 2) showed that those who drank more than four times a week had 2.1 times (RR = 2.11, 95% CI: 1.04–4.32) more risk of BLD than those who drank less than once a week ( $P < 0.05$ ). Even after the adjustment for all confounding variables including amount of alcohol drinking (model 3), it was shown that those who drank more than four times a week had 2.2 times (RR = 2.15, 95% CI: 1.01–4.59) more risk of BLD than those who drank less than once a week ( $P < 0.05$ ).

## DISCUSSION

Drinking is known to be a typical risk factor for laryngeal disorders. This study analyzed the relationship between the drinking of normal adults and BLD by using epidemiologic data representing general Koreans.

In this study, drinking frequency had a significant relationship with BLD, whereas drinking amount did not. The relationship between drinking and laryngeal diseases has been mainly reported in case-control studies. In hospital-based case-control

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