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Prevalence and Risk Factors of Chronic Obstructive Pulmonary Disease among Nonsmokers: Fifth Korea National Health and Nutrition Examination Survey (2010−2012)

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Abstract

Objectives: The purpose of this study was to determine the prevalence of COPD among non-smoking adults, and to investigate the risk factors that affect disease occurrence.

Methods: The data from the 5th Korea national health and nutrition examination survey (KNHNES) has been used, and 5,489 non-smoking adults aged between 40 to 79 years with diagnosable FEV1/FVC were selected therefrom as the subjects of this study.

Results: The prevalence of COPD in non-smokers was observed to be 6.9%. The development of the COPD showed statistically significant difference among groups; males showed about 2.54 times (95% CI: 1.410∼146.612) higher rates compared to females, subjects aged 70−79 showed about 3.08 times (95% CI: 1.823∼11.437) higher rates compared to those aged 40−49, subjects whose education level was elementary school or less showed about 5.36 times (95% CI: 1.341∼21.393) higher rates compared to those who are college or more, and subjects who are middle school showed about 4.72 times (95% CI: 1.374∼16.217) higher rates compared to the college or more.

Conclusion: It is confirmed that development of the COPD in non-smokers reach significance. For the prevention of the disease, there is a need to identify COPD-related risk factors in males and the elderly and provide appropriate nursing intervention, and to develop health-related education programs for those with low educational background to take in order to promote the improvement of lung health.

1. Introduction

1.1. Background

Chronic obstructive pulmonary disease (COPD) is a common respiratory disease in adults, and is diagnosed on the basis of a forced expiratory volume in 1 second of < 0.07 ($FEV_1/FVC < 0.07$) in the pulmonary function test (PFT). COPD is characterized by dyspnea due to limited airflow. According to the Statistics Korea, COPD is the fourth leading cause of death among the elderly (age ≥ 65 years) in South Korea [1], and is likely to become the third leading cause of death in the world by 2020 [2]. Advanced COPD is associated with severe dyspnea accompanied by coughing, sputum, and fatigue,

as well as cardiovascular complications such as cardiac insufficiency, which require constant oxygen supply and limit daily activities, ultimately resulting in depression or decreased quality of life [3–5].

The main risk factor for COPD is smoking, with a long smoking period leading to a proportionately high prevalence [6–8]. However, the occurrence of COPD has recently increased among nonsmokers who have never smoked in their lives [9]. There are approximately 50 million nonsmoking COPD patients worldwide [6], and recent reports have revealed that the prevalence of COPD among nonsmoking South Koreans is 7.1–8.2% [10,11].

Even though there are many COPD patients among nonsmokers, the main cause of the disease has not been yet defined. Some of the pathophysiologic changes, personal, and environmental risk factors relate to air flow restriction have been addressed in previous studies.

Exposure to cigarette smoke from secondhand smoking can affect the bronchus and limit airflow [11]. The risks of respiratory infection also vary depending on the rate of practicing health-related activities or the level of occupational exposure to hazardous substances [10,12]. A decreased level of immunity or pulmonary compliance due to increased age may also lead to increased risk of respiratory infections or deterioration of respiratory function [13]. Educational and financial status affect acquisition of health-related knowledge and information, as well as access to health services and nutritional intake; hence, these factors may also affect the occurrence of pulmonary infection for those living in an environment exposed to exhaust gas [2,14–17]. Dust [18,19], coal, and heavy metals such as cadmium, aluminum, mercury, and lead [20,21] may cause airflow restriction [22]. Poor nutritional intake and stress affect energy balance and deteriorate immunity, thereby reducing muscle strength and causing dyspnea [16,22,23]. Differences in physical activities lead to changes in respiratory muscle strength, intramuscular protein, and weight, and may cause dyspnea in daily life as well [24]. Anemia increases muscle fatigue due to oxygen deficiency in the blood, and causes difficulties in physical activities and dyspnea [25]. A medical history of lung disease [26,27] or pulmonary tuberculosis may impact airflow and cause airway inflammation or pulmonary fibrosis, thus resulting in airway changes [8].

According to The Korea Environment Corporation, unfortunately, the concentration of fine dust (PM_{10}) in South Korea has recently reached a daily average of up to 99 μg/m^3 [28], raising concerns regarding respiratory infections. South Korea is greatly affected by environmental influences from China, which is the largest emitter of air contaminants in northeast Asia. Despite the severity of air pollution or the increase in the number of nonsmoking COPD patients, not many studies have been conducted to investigate factors that play a major role in the occurrence of the disease among nonsmokers. A few previous studies identified the factors associated with COPD among nonsmoking adults as sex, age, socioeconomic status and educational background, occupational exposure to dust, body mass index (BMI), and history of pulmonary tuberculosis or asthma [9,12,29,30]. However, conclusions cannot be made based on just a few studies.

The Korea National Health and Nutrition Examination Survey (KNHANES) includes pulmonary function test and the variables related to respiratory problem. It provides data that are representative of the population since the sample size is large. Therefore, the present study used data from the fifth KNHANES from 2010–2012, to determine the prevalence and to identify the risk factors of COPD among nonsmoking adults. Ultimately, this study is expected to contribute to efforts for prevention of COPD for nonsmoking adults, which should in turn improve their quality of life by preventing physical, social, and financial loss.

1.2. Objective

The objective of this study was to determine the prevalence of COPD among nonsmoking adults aged 40–79 years, and to investigate the risk factors that affect disease occurrence.

2. Materials and methods

2.1. Research design

Descriptive and cross-sectional study design was used for secondary data analysis.

2.2. Participants

The study included 40–79-year-old participants of the fifth KNHANES from 2010 to 2012, who underwent PFT, and who were self-reported "never smokers". Participants with no FEV_1/FVC results, those who smoked fewer than five packs of cigarettes in their lifetime, and those who did not respond to smoking survey questions were excluded from the analysis (Figure 1).

2.3. Data collection procedures

The data used in this study were downloaded from the website of the Korea Centers for Disease Control and Prevention (KCDCP; http://knhanes.cdc.go.kr). According to the report by the KCDCP, the fifth KNHANES (2010–2012) is a health and nutrition survey conducted nationwide from a sample of 192 districts, and extracted every year from all household members aged ≥ 1 year in 3,840 households. Within the districts, 20 sample households were selected. Excluded were facilities such as nursing homes for the elderly, military and prison installations, and foreigners. All household members aged ≥ 1 year older within the sample households were selected as survey participants [5].

Data were collected by technical researchers consisting of nurses and health science personnel who had