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A comparative study on cardiovascular disease risk factors in Korean adults according to clinical depression status

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ABSTRACT

This study was conducted to compare the association between depression and cardiovascular disease risk factors among Korean adults. This study was based on the data from the Korea National Health and Nutrition Examination Survey conducted in 2012–2014. Using a multivariable logistic regression model, we calculated odds ratios (ORs) and 95% confidence intervals (CIs). A total of 10,359 subjects aged 19–64 years were selected, and 432 subjects (74 men, 358 women) were included in the physician-diagnosed depression group. Several cardiovascular risk factors were associated with higher odds of clinical depression. For men, high waist circumference (≥91.3 cm) and body mass index (≥25.0 kg/m^2) were significantly associated with increased odds of depression, and high physical activity (≥50 MET h/week) was associated with decreased odds of depression. Men with dyslipidemia and metabolic syndrome had 2.43-fold and 2.0-fold higher odds of depression than those without the diseases. For women, current smokers had 2.25-fold higher odds of depression than nonsmokers, and frequent alcohol drinkers (≥4 times/week) also had 2.88-fold higher odds of depression than nondrinkers. Korean adults with clinical depression had a higher prevalence of some risk factors for cardiovascular diseases than those without depression.

1. Introduction

Depression is a common mental disorder, and at a global level, the total number of people with depression was estimated to exceed 300 million in 2015, and 4.4% of the world's population was estimated to suffer from depression. Depression is more common among women (5.1%) than men (3.6%) (World Health Organization, 2017). In Korea, the prevalence of depression is estimated to be 4.1% in 2015, and is more common in women (4.8%) than men (3.4%) (Global Burden of Disease Study, 2015).

Depression is characterized by sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, feelings of tiredness, and poor concentration, and it can lead to other disease and injury (World Health Organization, 2017). Several studies have reported that depression is associated with cardiovascular disease (Carney and Freedland, 2003; Lett et al., 2004). Depression and cardiovascular disease are one of the most cause of death worldwide. The prevalence of depression is more common in people with cardiovascular disease or at risk for the disease (Bradley and Rumsfeld, 2015). Several epidemiological studies have reported that cardiovascular disease risk factors including smoking status (Breslau et al., 1998), physical inactivity (Zhai et al., 2015), hypertension (Mushtaq and Najam, 2014), diabetes (Pan et al., 2012), and obesity (Luppino et al., 2010) were associated with prevalence or incidence of depression. An unhealthy lifestyle in people with depression may affect the development of cardiovascular disease, and the treatment of depression through lifestyle modifications may reduce the risk.

Several studies have examined the associations of cardiovascular disease risk factors in relation to depression status in different populations, but there are limited data on the associations in Korean populations, especially for men. Therefore, our study investigated the relationships of physician-diagnosed depression according to various risk factors of cardiovascular disease in Korean men as well as women, using the data from the large nationally representative surveys of Korean adults.

Abbreviations: WHO, World Health Organization; KNHANES, Korea National Health and Nutrition Examination Survey; MET, metabolic equivalent of task values; BMI, body mass index; KCDC, Korea Centers for Disease Control and Prevention; HDL, high-density lipoprotein; SBP, systolic blood pressure; DBP, diastolic blood pressure; HbA1c, hemoglobin A1c; SE, standard error of mean; OR, odds ratio; CI, confidence interval; HR, hazard ratio

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2. Methods

2.1. Data and subjects

This study was based on the data from the 5th and 6th KNHANES (2012–2014), which was performed by the Korea Centers for Disease Control and Prevention (KCDC). A total of 23,625 subjects (8057 in 2012, 8018 in 2013, and 7550 in 2014) were participated in KNHANES from 2012 to 2014. Among these people, 10,359 subjects aged 19–64 years were included in this study excluding pregnant women and subjects who did not respond to the questionnaires about alcohol consumption, smoking status, and physical activity. Each participant in the survey provided informed consent, and the Institutional Review Board of Korea Centers for Disease Control and Prevention provided formal ethics approval for the KNHANES datasets (2012–01EXP-01–2C, 2013–07CON-03–4C, 2013–12EXP-03–5C).

The depression status was defined using the question of "have you ever been diagnosed with depression by a physician?" The subjects who answered "yes" to the question were defined as a depression group. The remaining subjects excluding the depression group and subjects who did not respond to the questions were defined as a non-depression group. A total of 432 subjects (74 for men, 358 for women) were included in the depression group, and 10,359 subjects (3969 for men, 5958 for women) were included in the non-depression group.

2.2. General characteristics

General characteristics included age, sex, residential area (urban and rural), marital status (currently married; separation/bereavement/divorce; and never married), household income (low; lower middle; upper middle; and high), education level (elementary school or less; middle school; high school; and college or more), smoking status (non-smoker; past smoker; and current smoker), alcohol consumption (none; ≤1 time/week; 2–3 times/week; and ≥4 times/week), and physical activity. Household income was calculated by dividing the total household income by the square root of number of people in household and then was classified into quartiles to determine monthly household income level as low, middle low, middle high, and high. To estimate the physical activity, we used Metabolic Equivalent of Task values (MET) based on self-reported frequency and period of walking activities, mild intensity, and strenuous intensity during the week. MET hours per week was calculated by multiplying the MET value of a specific activity (walking: 3.3 METs, mild physical activity: 4.0 METs, and strenuous physical activity: 8.0 METs) with hours spent for a specific activity. Then, we calculated the total weekly physical activity by summing MET hours per week of specific activity (Ainsworth et al., 2000), and it was classified into three categories (< 10.0 h/week; 10- < 50 h/week, and ≥50.0 h/week).

2.3. Anthropometric and clinical measurements

Data on anthropometric measurements including height, weight, waist circumference, and body mass index (BMI) were obtained from the health examination survey. The waist circumference was categorized in gender-specific quintiles to consider the gender differences. The BMI was calculated from the weight and height of participants (kg/m^2) and was classified into five categories in compliance with the KCDC (Korea Centers for Disease Control and Prevention, 2008) and Western Pacific Regional Office of WHO for Asian adults (World Health Organization, 2000).

Clinical measurements included total cholesterol, triglycerides, high-density lipoprotein cholesterol (HDL-cholesterol), blood pressure levels (systolic blood pressure (SBP) < 120 and diastolic blood pressure (DBP) < 80; 120 ≤ SBP < 140 or 80 ≤ DBP < 90; and SBP ≥ 140 or DBP ≥ 90 or use of anti-hypertensive medication), fasting serum glucose levels (< 100 mg/dl; 100–125 mg/dl; and ≥126 mg/dl or use of insulin and oral medication for diabetes), and hemoglobin A1c (HbA1c) (< 5.7%, which is normal; 5.7–6.4%, which is high diabetes risk; and ≥6.5%, which is diabetes) which measured by health professionals. Blood pressure levels and fasting serum glucose levels were classified according to the criteria established by the KCDC (Korea Centers for Disease Control and Prevention, 2014). HbA1c level, which is the most reliable indicator of long-term glycemic conditions and reflects the average blood glucose level in the past 2–3 months, was classified according to the Korean Diabetes Association (Korean Diabetes Association, 2016).

2.4. Morbidity status

Dyslipidemia was defined if participants had currently taken a lipid-lowering drug, or had total cholesterol levels of higher than 240 mg/dl, triglyceride levels of higher than 200 mg/dl or HDL-cholesterol levels of lower than 40 mg/dl. Participants were considered to have a metabolic syndrome if they met at least three of the following criteria: abdominal obesity (waist circumference > 90 cm for men, > 80 cm for women), low HDL-cholesterol (< 40 mg/dl for men, < 50 mg/dl for women), high fasting glucose (≥100 mg/dl or drug therapy for diabetes), high blood pressure (SBP ≥ 130 mmHg or DBP ≥85 mmHg, or drug therapy for hypertension), or high fasting triglycerides (≥150 mg/dl) (Grundy et al., 2005; World Health Organization, 2000). Participants were assumed to have a history of hyperlipidemia, diabetes, hypertension or cardiovascular disease (including stroke, myocardial infarction, or angina pectoris) if they had at least one of the following criteria: a history of the above diseases diagnosed by a physician, use of drugs or medical cares for one of the above diseases, or outpatient clinics and experience of hospitalization for the above diseases.

2.5. Statistical analysis

Data from the three surveys conducted from 2012 to 2014 were combined. A chi-square test was used to compare the differences in frequency of categorical variables according to the depression status. In addition, *t*-test was used to compare the mean values and standard error of mean (SE) for continuous variables such as age, anthropometric and clinical measurements between two groups. Using a multivariable logistic regression analysis, we performed to estimate the odds ratio (OR) and two-sided 95% confidence interval (CI) of depression according to cardiovascular disease risk factors. In the multivariable model, we adjusted for survey year, age, marital status, household income, education level, smoking status, alcohol consumption, physical activity, and BMI. All statistical analyses were performed with Statistical Analysis Software version 9.4 (SAS Institute Inc., Cary, NC, USA). $P < 0.05$ was considered to be statistically significant.

3. Results

3.1. General characteristics

Table 1 shows the general characteristics of subjects according to the depression status. For men, the depression group showed significantly higher proportions of separation/bereavement/divorce (12.2 *vs.* 4.4%; $p < 0.001$) and low household income (25.7 *vs.* 7.9%; $p = 0.003$), and lower proportions of high education (29.7 *vs.* 42.1%; $p = 0.047$) and high physical activity (14.8 *vs.* 26.9%; $p = 0.034$) than the non-depression group. For women, the depression group was older than the non-depression group ($p < 0.001$), and they showed significantly higher proportions of separation/bereavement/divorce (19.7 *vs.* 8.4%; $p < 0.001$) and low household income (18.9 *vs.* 9.4%; $p < 0.001$), and a lower proportion of high education (18.2 *vs.* 36.9%; $p < 0.001$) than the non-depression group. In addition, women in the depression group were more likely to be current smokers (13.7 *vs.* 5.4%; < 0.001) and drink alcohol frequently (5.6 *vs.* 1.8%; $p = 0.001$)

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