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Research report

Associations between serum lipid levels and suicidal ideation among Korean older people

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ABSTRACT

Introduction: There have been inconsistent reports on the relationships between lipids and suicidality, and studies conducted in older adults are rare. This study examined associations between serum lipid levels and suicidal ideation in an older population.
Methods: This study used data obtained from a representative Korean sample of 4265 people age 65 years or older who completed a self-administered questionnaire about suicidal ideation over the last year. The fasting serum concentrations of total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides were measured and categorized into lower, intermediate (reference), and upper quartiles. A complex sample logistic regression stratified by gender was performed to determine the associations between serum lipid levels and suicidal ideation after controlling for covariates including age, education, marital status, current smoking, alcohol drinking, body mass index, hypertension, diabetes, diagnosed depression, antidepressant use, and lipid-lowering therapies.
Results: In this study, the prevalence of suicidal ideation in an older Korean population was 22.9% (SE=0.9%). The prevalence was significantly higher in women than in men, 27.7% (1.2%) vs. 15.9% (1.1%) respectively. After adjusting for covariates, lower triglyceride levels were significantly associated with a decreased risk of suicidal ideation (OR=0.65; 95% CI=0.43–0.99) among men but no significant associations were observed among women. Additionally, there were no significant associations between any other measure of cholesterol levels and suicidal ideation in either men or women.
Limitations: Cross-sectional design cannot infer temporality or the effects of changes in variables.
Conclusions: These results support the association between lower triglyceride levels and a reduced risk of suicidal ideation among Korean men over 65. Further studies are necessary to investigate gender difference and the biological mechanism.

1. Introduction

Suicide is a challenging and complex problem, and suicide rates vary greatly between countries (Hawton and van Heeringen, 2009). The suicide mortality rate in Korea was reported to be 33.3 per 100,000 in 2011—much higher than the OECD average of 12.4 per 100,000 (Organization for Economic Co-operation and Development., 2014). In particular, suicide is a major public health concern for older adults, who are at greater risk of suicide than any other age group in most countries (Conwell and Thompson, 2008). Therefore, greater emphasis must be placed on detection and preventive intervention among older people at high risk for late-life suicide.

Several studies have searched for biological markers that might be related to suicidal behavior (Lee and Kim, 2011; Pandey, 2013). Lower total cholesterol levels have been investigated as a potential marker for suicide risk (Coryell and Schlesser, 2007; Lee and Kim, 2003; Olie et al., 2011; Papadopoulou et al., 2013). Moreover, a meta-analysis showed that lower total cholesterol levels are associated with increased risk of completing suicide (Lester, 2002). However, some studies have found no association between total cholesterol and suicidal behavior (D'Ambrosio et al., 2012; da Graca Cantarelli et al., 2014; Huang, 2005; Persons et al., 2012). On the other hand, several studies have demonstrated an association between triglyceride levels and suicide risk, though their findings were not consistent (Baek et al., 2014; Chang et al., 2012; da Graca

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Cantarelli et al., 2014; Lee and Kim, 2003; Park et al., 2014; Roaldset et al., 2014).

Most previous studies on the associations between cholesterol levels and suicidal behavior were carried out in working age adults with psychiatric illnesses (Coryell and Schlesser, 2007; De Berardis et al., 2012; de Leon et al., 2011; Papadopoulou et al., 2013; Persons et al., 2012; Sarchiapone et al., 2001). Studies on this issue conducted among community-living older adults are rare (Kim et al., 2014). In addition, most studies have examined only total cholesterol levels and rarely investigated sub-fractions such as high density lipoprotein (HDL) and low density lipoprotein (LDL) cholesterol or triglyceride levels (Lester, 2002). This study examined associations between four serum lipid levels and suicidal ideation in an older Korean population based on a nationally representative survey.

2. Methods

2.1. Study population

This study was based on data obtained from the Korean National Health and Nutrition Examination Survey (KNHANES) in 2010–2012, a nationally-representative survey conducted by the Korea Centers for Disease Control and Prevention (KCDC). KNHANES is a nationwide survey designed to assess national health and nutrition levels and consists of a health interview survey, a nutrition survey and a health examination survey (Kweon et al., 2014). It used stratified multi-stage clustered probability sampling to reflect the non-institutionalized Korean population. This study drew primary sampling units (PSUs) from approximately 200,000 geographically defined PSUs for the entire country. Each PSU consisted of an average of 60 households and 20 final target households were sampled from each PSU using a systematic sampling method. The 2010–2012 KNHANES response rates were between 80.0% and 81.9%.

Of the 25,534 people who participated in the 2010–2012 survey, 4557 people were aged 65 or above and were, therefore, potential participants. Written informed consent was given by all participants, and the study protocol for the survey was approved by the Institutional Review Board of the KCDC. The current study did not require additional Institutional Review Board approval because the KNHANES data set is publicly available.

2.2. Suicidal ideation

The presence of suicidal ideation was identified using the questionnaire from the health interview survey of the KNHANES. Participants were asked: “Have you felt that you wanted to kill yourself over the last year?” They responded “Yes” or “No” to the question.

2.3. Measurement of serum lipid profiles

Blood samples were taken after the participants fasted for 8 or more hours. The samples were immediately centrifuged and refrigerated and then transported in cold storage to the Central Testing Institute in Seoul, Korea and analyzed within 24 h. The serum levels of total cholesterol (TC), HDL cholesterol (HDL-C), and triglyceride (TG) were measured using a Hitachi Automatic Analyzer 7600 (Hitachi, Tokyo, Japan). LDL cholesterol (LDL-C) level was calculated using the Friedewald formula for subjects with serum TG levels below 400 mg/dL and was measured directly using commercially available kits (Cholestest® LDL, Sekisui Medical, Tokyo, Japan) when TG levels were 400 mg/dL or above.

2.4. Covariates

The covariates included in the analysis were age, education, marital status, current smoking, alcohol drinking, body mass index (BMI), hypertension, diabetes, depression, and current antidepressant use. Data on age, education (none or elementary school, middle school, high school, college or above), marital status (married living with spouse, others), current smoking (yes, no), and alcohol drinking (yes, no) were obtained from the health interview survey. Height and weight were measured to calculate BMI. A standard mercury sphygmomanometer was used for blood pressure (BP) measurement. Systolic blood pressure and diastolic blood pressure were measured twice at 5-min intervals, and the average values were used for the analysis. Hypertension was defined as an average BP $\geq$ 140/90 mmHg or if the subjects were taking antihypertensive medication. Diabetes was defined as hemoglobin A1c $\geq$ 6.5% or fasting plasma glucose levels $\geq$ 126 mg/dL or if the subject were using antidiabetic medication including insulin. Depression was considered present when diagnosed by a physician, and those who were taking antidepressants were considered current antidepressant users. The use of lipid-lowering therapy was checked using a self-administered questionnaire.

2.5. Statistical analysis

A complex sample analysis was performed based on an analysis plan file in which weights, stratification variables and primary sampling units were designed. Missing data were included in the complex sample analysis to produce results based on the instructions for the data analysis. The general linear model and chi-square tests were performed to determine differences in variables after participants were divided into two groups based on the presence of suicidal ideation. Men and women were examined in separate analyses because we found that they differed significantly with regard to both serum lipid levels and suicidal ideation. Complex sample logistic regression was performed to determine the associations between serum lipid levels and suicidal ideation after controlling for other covariates. Model 1 was stratified by gender and adjusted for age, educational level, and marital status and Model 2 was further adjusted for smoking, alcohol drinking, hypertension, diabetes, and BMI. Compared with Model 2, Model 3 was further adjusted for depression and use of antidepressant and lipid lowering therapy. Serum lipid levels were categorized into three classes corresponding to the quartile of the upper lipid levels, the quartile of the lower lipid levels, and the two intermediate quartiles (reference). The adjusted odds ratios (ORs) and the corresponding 95% confidence intervals (95% CIs) were obtained relating each of the quartile categories of serum lipid levels to the presence or absence of suicidal ideation. A p-value of less than 0.05 was considered statistically significant. SPSS 21.0 was used for the statistical analysis.

3. Results

Of a total of 4557 survey subjects aged 65 or above, 4265 subjects (response rate: 93.6%) answered the survey item about past year suicidal ideation. Characteristics of the study subjects are shown in Table 1. A total of 915 cases of suicidal ideation were identified, and the prevalence of suicidal ideation in this older population was 22.9% (SE = 0.9%). The prevalence was significantly higher among women than men, 27.7% (1.2%) vs. 15.9% (1.1%) respectively. In the univariate analyses, suicidal ideation was significantly associated with higher age, lower education, unmarried status, alcohol drinking, depression, and antidepressant use. Serum levels of TC and LDL-C were significantly higher in older