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Brief report

Longitudinal associations between serum cholesterol levels and suicidal ideation in an older Korean population

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ABSTRACT

Introduction: Relationships between low total cholesterol levels and suicidality have been reported but there has been little investigation of this issue in older age groups. This study aimed to investigate longitudinal associations between serum lipid levels and suicidal ideation in an older population.
Methods: 732 community dwelling elderly aged 65 or over were evaluated at baseline. Of 639 did not have suicidal ideation at baseline, 579 (90.6%) were followed two years later. Prevalence and incidence of suicidal ideation within the previous one month was ascertained. Serum levels of total-, high density lipoprotein (HDL)-, low density lipoprotein (LDL)- cholesterol, and triglycerides were assayed at both baseline and follow-up. Baseline data on potential covariates including sociodemographic characteristics, life stress, social support, pain, alcohol drinking, depressive symptoms, cognitive function, and disability were gathered.
Results: Both higher and lower total and LDL cholesterol levels at baseline and a decline in total cholesterol levels over the follow-up period predicted an increased incidence of suicidal ideation at follow-up independent of sociodemographic and clinical covariates. Significant cross-sectional associations were found between suicidal ideation at baseline and higher total and LDL cholesterol levels.
Limitations: Suicidal ideation was the outcome of the study. Therefore generalizability should be considered.
Conclusions: These results support a role of dyslipidemia in the etiology of late-life suicidal ideation. Not only low but also higher cholesterol levels predicted the incidence of suicidal ideation in elders. Lipid sub-fraction assays might be informative in this respect at least in older populations.

1. Introduction

Older adults are at the highest risk of suicide in most countries (Hawton and van Heeringen, 2009), and suicide is closely related to depression in late-life (Conwell et al., 2002). The spectrum of suicidal behavior ranges from suicidal ideation to attempts, and, finally, to completion (Beck et al., 1979). Cholesterol levels have received some attention in relation to suicidal behavior. Lower serum total cholesterol levels have been found to be significantly associated with suicidal ideation (Modai et al., 1994; Sullivan et al., 1994), suicide attempts (Alvarez et al., 1999; Garland et al., 2000; Olie et al., 2011), and suicide completion (Zureik et al., 1996; Partonen et al., 1999; Jee et al., 2011). However, these findings have been drawn mostly from working age adult samples, and this hypothesis has rarely been tested in older adults, who are most vulnerable to depression and suicide related to dyslipidemia (Camus et al., 2004). Furthermore, most previous studies have investigated only total cholesterol levels and rarely examined its sub-fractions (high density lipoprotein (HDL) and low density lipoprotein (LDL) cholesterol) or triglyceride levels (Lester, 2002). Using data from a longitudinal community study of an older Korean population, we investigated serum lipid profiles in relation to prevalence and incidence of late-life suicidal ideation.

2. Methods

2.1. Study overview and participants

This study was a part of a community based prospective survey of late-life psychiatric morbidity carried out in Kwangju, South

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Korea (Kim et al., 2004, 2006). At baseline, community residents aged 65 or over within two geographic catchment areas were approached to participate. Attempts were made to follow up all participants two years later. Suicidal ideation and serum lipid profiles were examined both at baseline and at follow-up; and all the other data were obtained at baseline. All participants gave formal written informed consent at each examination. This study was approved by the Chonnam National University Hospital Institutional Review Board.

2.2. Suicidal ideation

The presence of suicidal ideation was identified using the questions from the community version of the Geriatric Mental State diagnostic schedule (GMS B3; Copeland et al., 1986). Participants were asked "Have you ever felt that you'd rather be dead? Have you ever felt you wanted to end it all? Have you ever felt killing yourself?" If participants answered with a more obvious positive response to any of the questions, they were further asked "When was that? Have you felt like that in the last month?" Based on these questions, one month prevalence of suicidal ideation was identified both at baseline and at follow-up. For analysis of suicidal ideation 'incidence', the sample was restricted to those without suicidal ideation at baseline.

2.3. Serum lipid profiles

Blood samples were taken in a fasting state at both baseline and follow-up. The following assays were carried out: total, HDL and LDL cholesterol, and triglycerides.

2.4. Other covariates

Sociodemographic and clinical characteristics potentially associated with suicidal ideation were considered. Data on age, gender, education, accommodation status (owned or rented), past occupation (manual or non-manual), current occupation (employed or not), nine stressful life events and six social support deficits (Prince et al., 1997), severity of pain (no (0)–unbearable (5)), and problem drinking were obtained. Depressive symptom, cognitive function, and disability were evaluated by the Geriatric Depression Scale (Yesavage et al., 1983), Mini-Mental State Examination (Folstein et al., 1975), and Korean version of the World Health Organization Disability Assessment Schedule II (Kim et al., 2005), respectively. Self-reported diagnoses of and treatment histories for hypertension and diabetes were recorded. Body mass index was calculated.

2.5. Statistical analysis

Baseline characteristics were compared between elders with and without suicidal ideation at baseline using *t*-tests or χ^2 tests, as appropriate. Factors significantly associated with the outcome (p-value $< .05$) were entered as covariates in the adjusted analyses. For the four lipid levels, baseline levels and change in levels over the follow-up period (level at follow-up minus level at baseline) were re-categorized by quartiles. For each lipid level in unadjusted analyses, prevalence of suicidal ideation was compared across baseline quartiles, and incidence of suicidal ideation was compared across quartile groups for both baseline levels and change in levels. Where curvilinear relationships were suggested, associations were tested entering both linear and quadratic terms for quartiles of lipid levels. Adjusted associations of lipid profiles with prevalence and incidence of suicidal ideation were further analyzed using stepwise logistic regression models to investigate confounding by covariates. Strengths of the associations were estimated as ORs (95% CIs) for the lipid levels with linear terms, or as Wald coefficients for the lipid levels with quadratic terms. Additionally, cross-sectional associations between the four lipid levels and suicidal ideation at follow-up were investigated using *t*-tests. Statistical analyses were performed using SPSS 18.0 software.

3. Results

3.1. Descriptive data

Of 732 participants at baseline, suicidal ideation was reported within the previous month by 93 (12.7%). Of 639 without suicidal ideation at this stage, 579 (90.6%) were followed, and of these, suicidal ideation was reported by 57 (9.8%) at follow-up. Baseline characteristics of participants at baseline and analyzed participants at follow-up are summarized in the first and last columns of Table 1. There were no substantial differences in any characteristics between the participants and non-participants at follow-up (all p-values $> .09$).

3.2. Sociodemographic and clinical characteristics associated with suicidal ideation

Baseline characteristics are compared between those with and without suicidal ideation at baseline in the 2nd–4th columns of Table 1. Suicidal ideation was significantly associated with older age, rented accommodation, current unemployed status, higher numbers of recent life events and social support deficits, more severe pain and depressive symptoms, lower cognitive function, more severe disability, and higher total and LDL cholesterol levels.

3.3. Unadjusted associations between lipid levels and suicidal ideation

Mean (SD) changes in lipid levels in all followed up sample were as follows: total cholesterol +6 (33) mg/dl; HDL cholesterol −1 (12) mg/dl; LDL cholesterol +15 (33) mg/dl; and triglycerides +15 (90) mg/dl. Unadjusted associations of baseline and change quartile groups with prevalence and incidence of suicidal ideation are described visually in Fig. 1. Higher contemporaneous total and LDL cholesterol levels were significantly associated with prevalence of suicidal ideation at baseline. Considering baseline lipid levels and incidence of suicidal ideation at follow-up, significant U-shaped associations were observed with incident ideation associated with both lowest and highest baseline levels of total and LDL cholesterol. Finally, a decline in levels of total and LDL cholesterol over the follow-up period was also significantly associated with incident suicidal ideation.

3.4. Adjusted associations between lipid levels and suicidal ideation

Results of logistic regression analyses are summarized in Table 2. Higher total and LDL cholesterol levels remained significantly associated with prevalence of suicidal ideation at baseline after adjustment for sociodemographic and clinical covariates. The quadratic terms for the relationships of quartiles of baseline total and LDL cholesterol with incidence of suicidal ideation also remained significant after adjustment for all covariates. Lastly, incidence of suicidal ideation remained significantly associated with decreasing total cholesterol levels but that with decreasing LDL cholesterol levels fell below conventional significance levels in the adjusted analyses.