



## Research paper

## Socioeconomic and lifestyle factors as risks for suicidal behavior among Korean adults



Han-Byol Song, Sang-Ah Lee\*

Department of Preventive Medicine, Kangwon National University, Kangwon-do, Republic of Korea

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## ABSTRACT

**Background:** Preventing suicide has become a major public health priority in Korea. The aim of this study was to evaluate the associated factors of suicidal ideation (SI<sup>1</sup>) and attempt (SA<sup>2</sup>) among Korean adults. **Methods:** The data were collected from the Korea National Health and Nutrition Examination Surveys (KNHANES), a nationally representative sample recruited using a multi-stage clustered probability design. The association of putative risk factors focused on nutrition and health behaviors which were evaluated using multiple logistic regression analyses after adjusting for confounding factors. Survey sample weights were used for all analysis.

**Results:** The 12-month prevalence of SI and SA in Korea was 15.0% and 0.85%, respectively. Female, previously married status, lower education and lower household income were associated with SI and SA. In particular, the effect of age on SI presented a reverse pattern based on gender; there was a positive association for men and a negative association for women. Additionally, drinking, smoking, physical activity above moderate intensity and eating fewer meals were associated with SA in women, whereas regular exercise was protective against SI in men.

**Limitations:** The data were collected using a cross-sectional survey, embedding possible bias.

**Conclusions:** Higher prevalence of SI and SA among women was associated with smoking, drinking, avoiding regular exercise and insufficiency of food. Lower prevalence of SI was observed in men who engaged in physical activity while men with insufficient food showed a higher prevalence of SI and SA.

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## 1. Introduction

The suicide rate in South Korea (hereafter referred to as Korea) is the highest among the member countries of the Organization for Economic Co-operation and Development (OECD) (Korea Statistics, 2013). Although suicide rates increased in the 1970s and peaked at the beginning of the 1980s in the majority of countries, Korea experienced an unprecedented increase in suicides since 1997. From 2007, suicide has been the fourth leading cause of all deaths in Korea and has continued to increase until it peaked in 2011, with a suicide rate of 31.7 per 100,000. Death from suicide seemed to decrease after one year; however, 28.5 per 100,000 Koreans died due to suicide in 2013 (Korea Statistics, 2013). This rate is nearly triple the average suicide rate worldwide (11.4 per 100,000 persons) (World Health Organization, 2014). Compared to Japan,

where the suicide rates have been declining in recent years, the suicide rates in Korea presented a sharper increase and stronger persistence (OECD, 2013).

Suicidal crisis is a temporary and treatable state, and suicide rates can be reduced by appropriate treatment and interventions (Mann et al., 2005). However, the infeasibility of interviewing individuals who completed suicide makes it difficult to establish the causes of suicide. A nonfatal SA is the strongest known clinical predictor of eventual suicide and among attempters 10–15% eventually die by suicide (Suominen et al., 2004). Borges et al. (2010) noted that the cumulative likelihood for transitioning from ideation to a plan was 34% and from a plan to an attempt was 72%. Additionally, across all countries, approximately 60% (from 60.5% in Israel to 94.0% in Italy) of the transitions from SI to a plan and attempt occurred within the first year after the ideation onset (Borges et al., 2010). Korea shows the highest prevalence of SI compared to Western and other Asian countries (Borges et al., 2010; Lee et al., 2007; Nock et al., 2008b). The SI for 12-month ranged from 2.6% to 6.9% in nationally representative sample studies of different countries (Nock et al., 2008b). In our study, 12-month SI of Koreans were estimated at 15.0%. Other nationally representative researches during last 5 years observed similar

\* Correspondence to: Department of Preventive Medicine, Kangwon National University College of Medicine, Kangwon National University, Hyoja 2-dong, Chuncheon-si, Gangwon-do, Republic of Korea.

E-mail address: [sangahlee@kangwon.ac.kr](mailto:sangahlee@kangwon.ac.kr) (S.-A. Lee).

<sup>1</sup> SI: Suicidal ideation

<sup>2</sup> SA: Suicidal attempt

results (14.8%) (Park, 2014) (14.5%) (Kim et al., 2015). A nationwide Korean study observed that female sex, younger age, lower education and income, single marital status, alcohol use disorders, mood disorders, obsessive compulsive disorder and post-traumatic stress disorder were significantly associated with suicidal behavior (Jeon et al., 2010). In our study, we analyzed putative risk factors of suicidal behavior which were relatively easy to modify.

The aims of the present study were as follows: first, to evaluate the sociodemographic variables that influence the suicidal behavior; second, to investigate lifestyle factors including drinking, smoking, physical activity, and dietary habits that are associated with SI and SA in Koreans.

## 2. Methods

### 2.1. Study population

The present study was based on the data from the fourth and fifth Korea National Health and Nutrition Examination Survey (KNHANES IV and V, 2007–2012) by the Korean Centers for Disease Control and Prevention (KCDC) and the Ministry of Health and Welfare. KNHANES is a nationally representative survey that includes the following: (1) Health interview survey; (2) health behavior survey; (3) nutrition survey; and (4) health examination survey. The interviews were carried out by professional investigators, who were trained with the guideline published by Ministry of health and welfare and KCDC. The health interviews and health examination were carried out in mobile examination centers and nutrition survey was conducted by nutritionists with home visits. To select a representative sample, a multi-stage clustered probability design based on the administrative district, place of residence and residential means (apartment, other than apartment) was adopted. The sampling frames for KNHANES IV and KNHANES V were non-institutionalized civilians aged 1 year or older in the Korean population based on the 2005 population census and 2009 registration population, respectively. A total of 13,800 sample households from 600 enumeration districts and 11,400 sample households from 576 enumeration districts were primarily selected for KNHANES IV and V, respectively. The response rate of KNHANES IV was 78.4% and KNHANES V was 80.8%. Among the KNHANES IV (N=24,871) and V (N=25,534), our study sample excluded individuals who were <19 years of age (N=12,400) and who did not participate in the health interview survey (N=2,641). Additionally, we excluded 289 subjects who did not give information to evaluate suicidal behaviors. A total of 35,075 participants (14,870 males and 20,205 females), including 5773 subjects who were suicidal ideators and 331 who were suicide attempters were selected as the final sample to be analyzed. The weighted number of our total sample is 222,475,716, because we used KNHANES IV and V which consist of 6 consecutive surveys that each represent Korean population. The mean age of weighted population is 44.8 year and the median education level of study population was high school graduate. The mean family income of the study population was 3334(US\$) per month. All of the subjects were fully informed of the study protocol, and they provided a written statement of informed consent that was signed by the subjects or their legal guardians. The institutional review board at the KCDC approved the study protocol (nos. 2007-02CON-04-P, 2008-04EXP-01-C, 2009-01CON-03-2C, 2010-02CON-21-C, 2011-02CON-06-C, 2012-01EXP-01-2C)

### 2.2. Assessment of suicidal behaviors

For the evaluation of suicidal behaviors in KNHANES, the information on SI and SA was collected. SI of subjects was evaluated

by asking: “In the last 12 months, did you ever think about committing suicide?” The subjects who responded negatively were assigned as non-SI controls, and those who responded positively were determined to have SI and were asked an additional question regarding their SA: “In the last 12 months, did you ever attempt suicide?” The subjects who answered ‘yes’ were assessed to be suicide attempters.

### 2.3. Sociodemographic factors

In our study, age, marital status, education level, household income and occupation were included as sociodemographic factors. Age was classified into 6 categories for the evaluation of SI (19–29, 30–39, 40–49, 50–59, 60–69 or  $\geq 71$  years) and 3 categories for analysis of SA, (19–39, 40–59 or  $\geq 60$  years) because of the low frequency of events. Marital status was defined as married, never married or previously married, which includes subjects who were divorced, separated, or bereaved. Educational attainment was classified by the years of education ( $\leq 6$  years, 7–9 years, 10–12 years, and  $\geq 12$  years). Household income was categorized into quartile groups (low, moderate low, moderate, upper) according to the equivalent household income (Equivalent income of household = monthly household income/ $\sqrt{\text{No. of a household members}}$ , after considering sex and each 5-year age stratum). Categories of occupational status were reclassified into 6 subgroups from the Korean Standard Classification of Occupations (KSCO, 2007) of the Korea National Statistical Office. White-collar jobs included administrators, professionals and clerks. Blue-collar jobs were service workers, salesperson, technicians, mechanics and soldiers. Physical workers consisted of laborers and subjects who worked in agriculture, forestry and fishery. Non-occupied subjects were reclassified into those who did not require job, those unable to work and others. Subgroup of unable to work consists of persons unable to work because of health issues and those unemployed. The others consists of students, homemakers and retired persons, their association with suicidal behaviors were roughly similar.

### 2.4. Lifestyle

Drinking was classified into drinkers who had had at least one alcoholic beverage in their lifetime and non-drinkers who had never consumed alcohol. Alcohol consumption was also evaluated in terms of frequency which was categorized into never drinkers as reference, subjects who did not drunk during the past year, who drunk once a month or less, who drunk 2–4 times a month and who drunk more than 2 times a week. Dependence on alcohol was assessed using the Alcohol Use Disorders Identification Test (AUDIT) scores  $\geq 20$  (Babor et al., 2001). Binge drinking is considered to be consuming  $> 60$  g of alcohol in men and  $\geq 40$  g in women per occasion. Additionally, KCDCs definition of binge drinking requires drinking two times or more per week according to the quantity that WHO had established.

Smoking status was differentiated into categories of those who had smoked and those who had never smoked. The amount of smoking was classified into three groups according to pack-years of smoking (PY), which was calculated with average numbers of cigarettes smoked daily and years of smoking.

Physical activity was defined as ACSMs physical activity recommendations (Garber et al., 2011), for example, walking regularly at least five times per week for at least 30 min at a time or engaging in regular moderate (at least five times per week for at least 30 min at a time) or vigorous (at least three times per week for at least 20 min at a time) exercise during the survey period. Physical activity above moderate intensity was defined according to the CDC and ACSM guidelines and categorized into hours of activity per day. Strength training was defined as muscular

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