



# The association between suicidal ideation and sleep quality in elderly individuals: A cross-sectional study in Shandong, China



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## A B S T R A C T

Previous studies have identified global associations between sleep quality and suicidal ideation. However, little is known regarding the relationship between sleep quality and suicidal ideation among Chinese older adults. We examined the relationship between sleep quality and suicidal ideation in older adults in China. A cross-sectional study was conducted in 3313 seniors in Shandong, China. Suicidal ideation was assessed using the interviewees' answers to the question "Have you ever seriously considered wanting to die?". Sleep quality was assessed using the Pittsburgh Sleep Quality Index. Logistic regression was performed to estimate odds ratios and 95% confidence intervals adjusted for confounders. When controlling for sex, age, living condition, economic status, marital status, education, past occupation, relationship with children, non-communicable diseases, and mental health, the odds of suicidal ideation increased in association with an increase in the total score for sleep quality and its components (subjective sleep quality, sleep duration, habitual sleep efficiency, and daytime dysfunction). Poor sleep quality was associated with increased odds of suicidal ideation in Chinese older adults. Sleep-based interventions should be developed to prevent suicide in older adults in China.

## 1. Introduction

Many studies have found that suicide rates are associated with age. In fact, the suicide rate is highest among those aged 70 years or older for both men and women in almost all regions of the world (Dong et al., 2015; Hawton et al., 2009; Zhang et al., 2014). Some studies have shown that seniors aged 65 and older have the highest rate of completed suicide, which reaches 44.3–200 per 100,000 in China (Li et al., 2009). China has already entered a period of fast growth for its aging population. In China, seniors aged 60 and older accounted for 15.2% of the total population in 2015 (United Nations, 2015). The problem of suicide in older adults in China thus deserves attention.

Suicidal ideation is the prelude to suicidal behavior (Klonsky et al., 2016). Suicidal ideators are individuals who consider suicide but have not displayed any recent overt suicidal behavior (Beck et al., 1979). The prevalence of suicidal ideation in seniors in China ranges from 2.2% to 21.5%, and suicidal ideation increases gradually with age in older adults (Dong et al., 2014). Many factors have been shown to be associated with suicidal ideation. These include gender, age, location, depression, and economic status (Hintikka et al., 2009). Recent evidence indicates that there are associations between sleep quality and suicidal ideation.

A study by Gelaye et al. indicates that poor subjective sleep quality is associated with suicidal ideation in pregnant Peruvian women (Gelaye et al., 2015). Poor sleep quality can also predict suicidal ideation, even after adjusting for depressive symptoms, in Japanese freshmen (Supartini et al., 2016). Another study indicates that school climate plays an important role in the suicidality of Chinese adolescents, and that this relationship is largely mediated by sleep quality (Li et al., 2016). However, most of the above studies have mainly focused on adolescents and pregnant women. Only one study in China has found an association between suicidal ideation and insomnia in older adults in a remote rural area of Southwestern China (Chiu et al., 2012). The study by Chiu et al. is only a preliminary study and has a small sample of 263 older adults from remote rural China. That study also implied a need for further larger scale surveys to examine the association between insomnia and suicidal ideation, which is precisely what we set out to do here. In addition, research examining the association between suicidal ideation and sleep quality in older adults in China is lacking.

We thus aimed to examine the relationship between sleep quality and suicidal ideation in older adults based on a large sample from both rural and urban areas of Shandong, China. To do so, we established the following specific objectives. First, we determined the prevalence of suicidal ideation in older adults in Shandong, China. We then examined

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the relationship between sleep quality and suicidal ideation in older adults.

## 2. Methods

### 2.1. Settings and participants

This study was conducted in Shandong Province. There were about 97 million people in Shandong Province in 2012. Older adults aged 60 and older accounted for over 15% of this population. We used a 3-stage cluster sampling method to select the participants. First, each of the districts and counties in Shandong Province was stratified into three groups based on gross domestic product (GDP) per capita (2011). Second, we chose one district and one county from each group. Three urban districts (Huaiyin, Dongchangfu, and Zhangdian) and three rural counties (Qufu, Chiping, and Leling) were then chosen as the study sites. Similarly, we chose three sub-districts and three townships in each sampling district or county on the basis of GDP per capita. Lastly, three communities and three villages were selected from each chosen sub-district and township. We thus selected 27 urban communities and 27 rural villages. In total, 3313 older individuals were included in this first-hand analysis.

### 2.2. Data collection

Data were collected from November 2011 to January 2012 using house-to-house interviews. Face-to-face interviews were conducted with older adults using a structured questionnaire by trained master's students from the Shandong University School of Public Health. Considering the potential poor vision of the older adults, the questionnaires were read to the participants by the trained interviewers. To ensure quality, completed questionnaires were carefully checked by quality supervisors at the end of each day. The questionnaire included items used to assess demographic characteristics, sleep quality, lifetime suicidal ideation, relationship with children, marital status, economic status, and mental health condition.

### 2.3. Measures

Sociodemographic and psychological characteristics, such as sex, age, living condition, economic status, marital status, education, past occupation, relationship with children, and non-communicable diseases (NCDs) were investigated.

### 2.4. Sleep quality assessment

The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire used to assess sleep quality and disturbances over a 1-month time interval (Buysse et al., 1989). The PSQI contains 19 items that can be grouped into seven components: (1) subjective sleep quality, (2) sleep latency, (3) sleep duration, (4) habitual sleep efficiency, (5) sleep disturbances, (6) use of sleeping medication, and (7) daytime dysfunction. Each component is weighted equally on a scale of 0–3. The PSQI total score, which ranges from 0 to 21, is the sum of the seven component scores. Individuals with higher scores have poorer sleep quality. The Chinese-language version of the PSQI instrument has good reliability and validity (Xianchen et al., 1996).

### 2.5. Lifetime suicidal ideation

Lifetime suicidal ideation (SI) was evaluated based on the interviewees' answers to the question "Have you ever seriously considered wanting to die?". If the response was "yes", suicidal ideation was coded as "yes". Similarly, if the answer was "no", suicidal ideation was categorized as "no". This question was also used to estimate SI in the U.S. National Comorbidity Survey (Bernert et al., 2014).

### 2.6. Mental health

Mental health was assessed using the Chinese version of Kessler-10 (K10), which is a brief 3-min screening instrument that aims to capture the overall level of mental health during the past 30 days. The K10 is mainly focused depression and anxiety (Kessler et al., 2002). This scale had also been used in the previous suicide studies (O'Connor et al., 2012). The Chinese version of K10 has been validated and has proved to be a good measure in Chinese populations (Zhou et al., 2008). The internal consistency of this scale in the current study (Cronbach's  $\alpha$ ) was 0.93.

### 2.7. Sociodemographic and psychological variables

The ages of the participants were categorized as follows: 60's, 70's, and 80+ years. Other demographic characteristics were classified as follows: sex (male vs. female), living alone (yes vs. no), economic status (good vs. poor), marital status (single vs. couple), education (illiterate, primary school, junior school, or higher), past occupation (farmer vs. others), relationship with children (good vs. bad), and NCDs in the past six months (yes vs. no).

### 2.8. Statistical analysis

The data were double-entered and checked using EpiData 6.04. Statistical analyses were performed using SPSS 21.0. For continuous variables,  $p$  values were calculated using Student's  $t$ -tests. For categorical variables,  $p$  values were calculated using chi-square tests. Binary logistic regression with an enter method was employed to assess the association between suicidal ideation and sleep quality. All reported CIs were calculated at the 95% level. Statistical significance was assessed at the 5% level.

### 2.9. Ethical considerations

The study protocol was approved by the Ethical Committee of Shandong University School of Public Health. The investigation was performed after the acquisition of informed consent from all participants. It should be noted here that the informed consent was obtained verbally from illiterate older adults. In these cases, thumbprints were also obtained from the participants.

## 3. Results

Table 1 shows basic information collected from the 3313 participants. The mean age of the participants was 68.76 years (standard deviation of 6.95). About 4.2% of the participants reported suicidal ideation. The majority of the participants were women (55.8%), were aged 60–69 years (65%), lived alone (62.5%), had poor economic status (76.2%), were married or in a relationship (75.6%), were illiterate or semilliterate (46.2%), were farmers (66.7%), had good relationships with their children (92.4%), and had non-communicable diseases (66.9%). There was a significant difference between men and women in suicidal ideation ( $p = 0.031$ ). Suicidal ideation was also different based on economic status ( $p = 0.000$ ), marital status ( $p = 0.000$ ), education level ( $p = 0.000$ ), past occupation ( $p = 0.001$ ), relationship with children ( $p = 0.000$ ), and NCDs ( $p = 0.001$ ). The K10 mean score for the participants was  $15.8 \pm 6.5$  (mean  $\pm$  standard deviation [SD]). The K10 scores were significantly higher in participants with suicidal ideation ( $24.7 \pm 8.4$ ) than in those without suicidal ideation ( $15.4 \pm 6.1$ ) ( $p = 0.000$ ).

The data presented in Table 2 indicate that the sleep quality scores in senior women were significantly higher than they were in men ( $p = 0.000$ ). Sleep quality scores also significantly increased with age ( $p = 0.000$ ). We also found that economic status ( $p = 0.000$ ), marital status ( $p = 0.000$ ), education ( $p = 0.000$ ), past occupation ( $p = 0.001$ ),

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