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Original Article

Suicide risk among individuals with sleep disturbances in Japan: a case–control psychological autopsy study

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ABSTRACT

Objective: This case–control psychological autopsy study aimed to explore a relationship between sleep disturbances and suicide among Japanese, as well as determine the importance and usability of screening for sleep disturbances in suicide prevention.
Methods: A semi-structured interview was conducted with the close family members of 49 adult suicide completers and 145 gender-, age-, and residential municipality-matched living controls. The survey included sections on demographics, sleep disturbances, and mental disorders. Conditional logistic regression analyses were performed to compare sleep disturbance prevalence between the two groups.
Results: A significantly higher prevalence of sleep disturbances was found among the suicide group (75.5%) compared to the controls (11.0%) (odds ratio [OR]=21.6, $p < 0.001$). The association remained significant after adjusting for mental disorders (OR = 12.7, $p < 0.001$). The population attributable risk percent of suicide associated with sleep disturbances and mental disorders was estimated to be 56.4% and 35.3%, respectively.
Conclusions: The study confirmed that sleep disturbances are an important risk factor of suicide, independent of mental disorders. Sleep disturbances accounted for a greater proportion of suicide cases than did mental disorders in the Japanese population given the higher prevalence, and could thus be considered an important target in suicide prevention in Japan.

1. Introduction

Suicide is a major global health concern. The World Health Organization estimates that approximately one million people die by suicide every year. Japan's annual suicide rate is the highest of the seven major industrialized nations [1] and dramatically increased in 1998; since then, more than 30,000 individuals have died annually by suicide through 2011 [2]. Factors that increase risk of suicide and suicidal behaviors include mental disorders [3–4], physical disease [5–7], unemployment [8–11], adverse working conditions [10], divorce [11–12], childhood maltreatment [13–15], and family history of suicidal behavior [15].

Sleep disturbances may also represent a critical risk factor for suicide, and the early detection and treatment may greatly contribute to suicide prevention. A previous meta-analysis reported significant associations between sleep disturbances and suicidal thoughts and behaviors [16]. A Norwegian population-based study reported that age- and sex-adjusted hazard ratios for suicide among individuals with sleep disturbances ranged from 1.9 to 4.3, depending on the frequency [17]. Sleep disturbances that increased suicide risk included insomnia [18–23], nightmares [22,24–28], difficulty initiating sleep [29], and difficulty maintaining sleep [30]. Short sleep duration was also significantly associated with suicide risk [28,31–33]. The association was not explained by mental disorders; rather, it was independent of mental disorders [16,17,29,31,34]. Although previous studies have consistently shown an association between sleep disturbances and suicide, the usefulness of sleep disturbance assessment as a marker of suicide, compared to mental disorders, has not been clearly

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evaluated, and no quantitative measures, such as population attributable risk proportion (PARP) and estimated post-screening probability of suicide, have been provided.

In addition, the relationships between sleep disturbances, mental disorders, and suicide may differ by culture and country. Limited data are available regarding the relationship between sleep disturbances and suicide in Japan. Only a prospective cohort study of 13,259 middle-aged adults indicated that difficulty maintaining sleep increased risk of suicide [30]. As for suicidal tendencies, there were significant associations between feelings of insufficient sleep and suicide ideation among middle-aged female [35] and male workers [36]. Insomnia and overall sleep disorders were also significantly associated with increased risk of suicide ideation among psychosomatic clinic outpatients [37]. These findings suggest that sleep disturbances are also a risk factor for suicide in Japan. However, sleep time in Japan is the second shortest in the world after Korea [38], and the prevalence of mental disorders tends to be lower in Asian countries, including Japan, compared to Western countries [39]. These country-dependent differences may influence the impact that sleep disturbances or mental disorders have on suicide prevention.

In the present study, we analyzed data from the first Japanese case–control psychological autopsy study [40] to assess the association between sleep disturbances and suicide in Japan, after adjusting for mental disorders including depression. To verify a comparable impact of sleep disturbances in suicide prevention, we also calculated a PARP of suicide associated with sleep disturbances, as well as mental disorders, and also simulated posterior probabilities of suicide among screening positives for populations with different risks of suicide when sleep disturbance assessment was used in a screening of suicide.

2. Methods

2.1. Study participants

The study included 52 individuals over 20 years of age who died by suicide in various areas of Japan. Bereaved family members who visited prefectural Mental Health Welfare Centers for individual support or survivor meetings were asked to participate at the time of visit. Suicide case respondents represented various areas of Japan. The surveys, described below, took place from January 2007 to July 2009. The mean period from incidence of suicide to administration of the survey was 17.4 months (SD, ±14.7 months).

Control participants recruited from September through November 2009 were living individuals matched to the suicide cases by gender, age (5-year age group), and residential municipality. Up to 30 control candidates for each suicide case were randomly selected from the Basic Resident Register. Interviewers employed by a research company contacted the candidates by first sending an invitation letter and then visiting their homes if there was no response to the letter. Once a candidate agreed to participate, the interviewer contacted the closest family member living with the candidate. A total of 152 controls and their family members agreed to participate in the study; however, the genders of three suicide cases were found to be wrongly coded after data collection. Those cases and the seven controls matched to them were subsequently excluded from analyses, giving a final dataset of 49 suicide cases and 145 matched controls.

2.2. Procedures

Information on the suicide cases and controls was collected through an interview with a family member for each. An informant for a suicide case was a family member who had a close relationship and lived together with the deceased. An informant for a control was the closest family member living together with him/her. If two or more close family members were available, the highest selection priority was given to spouse, followed by parent and child. Data collection through interview surveys started once informants and controls gave consent in writing to participate in the study.

A semi-structured interview was conducted using an assessment instrument for psychological autopsy studies described below. Interviews for suicide cases were conducted by paired local investigators consisting of a psychiatrist and another mental health professional such as a public health nurse. All local investigators participated in a three-day training program for the study. Interviewers from the research company received a day-long training session to be qualified to recruit controls as described above and also conduct their interviews. Data coding and entry were performed by the research company staff.

The study protocol was approved by the Research Ethics Committee of the Faculty of Medicine/Graduate School of Medicine at the University of Tokyo and the Ethics Committee of the National Center of Neurology and Psychiatry.

2.3. Assessment instruments

The assessment instrument was based on one formulated by the Beijing Suicide Research and Prevention Center in China [41] and modified through a preliminary study with 25 suicide cases to accommodate situations and interests in Japan. The instrument consisted of eight sections: (1) socio-demographic background, (2) previous suicidal behaviors (and characteristics of completed suicides for suicide cases), (3) childhood and school experiences, (4) job characteristics (for those employed), (5) financial problems, (6) quality of life, (7) physical conditions (including sleep disturbances), and (8) mental disorders. This study mainly used socio-demographic background, sleep disturbances, and mental disorders for data analyses.

Socio-demographic variables included gender, age (or age of death for suicide cases), education, marital status, employment status, and household income in the past year. Education was categorized as junior high school graduate (11 years of education or less), high school graduate (12–15 years), and college graduate or higher (16+ years). Marital status was dichotomized into ‘married’ and ‘not married’, and employment status into ‘employed’ and ‘not employed’.

Overall sleep condition in the month prior to suicide or the survey was dichotomized into ‘disturbed’ or ‘not disturbed’. When a family member was unable to recall the deceased’s sleep disturbances, we coded this response as ‘unknown’ and interpreted this as ‘not disturbed’ in the data analysis. Sleep disturbances were divided into six categories: ‘difficulty falling asleep’, ‘interrupted sleep’, ‘early morning awakening’, ‘lack of deep sleep’, ‘day-night reversal’, and ‘other’. Categories for frequency of sleep disorders included ‘none’, ‘1–2 days’, ‘3–4 days’, ‘5–6 days’, ‘every day’, and ‘unknown’ (‘3–4 days’ and ‘5–6 days’ were combined for data analyses due to few frequencies). Continuity of sleep disorders was dichotomized into ‘more than one year (prior to suicide)’ or ‘less than one year’.

A psychiatric structured interview schedule was used with suicide cases at the time of death and controls at the time of the interview to assess mental disorders such as alcohol-related disorders (alcohol dependence and alcohol abuse), drug-related disorders (drug dependence and drug abuse), mood disorders (major depressive disorder, dysthymic disorder, and bipolar I and II disorders), psychotic disorders (schizophrenia, brief psychotic disorder, and other psychotic disorder), and anxiety disorders (panic disorder, generalized anxiety disorder, and acute and post-traumatic stress