Annals of Epidemiology 24 (2014) 199–205

Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Original article

Coping behaviors and suicide in the middle-aged and older Japanese general population: the Japan Public Health Center-based Prospective Study

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ARTICLE INFO

Article history:
Received 17 June 2013
Accepted 16 December 2013
Available online 1 January 2014

Keywords:
Coping
Suicide
Self-blame
Planning
Avoidance
Approach
Japan

ABSTRACT

Purpose: Cross-sectional studies have shown an association between different coping styles and suicidal behavior. It is unknown whether there is any prospective association between coping behaviors and suicide in the general population.
Methods: The study population consisted of participants of the Japanese Public Health Center-based Prospective Study. In the 10-year follow-up questionnaire, subjects aged 50–79 years were asked how they handle daily problems. Coping behaviors were used to determine two coping strategies (approach coping and avoidance coping). Of 99,439 subjects that returned the 10-year follow-up questionnaire, 70,213 subjects provided complete answers on coping and were included in our analyses. Cox regression models, adjusted for confounders, were used to determine the risk of committing suicide according to coping style. Mean follow-up time was 8.8 years.
Results: Two coping behaviors were significantly associated with suicide over time: planning (hazard ratio [HR], 0.64; 95% confidence interval [CI], 0.41–0.98) and self-blame (HR, 2.20; 95% CI, 1.29–3.76). Of the coping strategies, only the avoidance coping strategy was significantly associated with suicide (HR, 2.45; 95% CI, 1.24–4.85).
Conclusions: For the first time, two coping behaviors and one coping strategy have been shown to have a significant prospective association with suicide in a general population.

Introduction

Global suicide rates have increased by 60% over the past 45 years [1]. The estimated annual worldwide suicide rate is 16 deaths per 100,000 individuals which translates into almost a million people taking their lives each year [1].

In 2011, the Japanese annual mortality rate was 22.9 suicides per 100,000 people [2], with suicides ranking as the 7th leading cause of death of all ages in 2011 [3], and the number of individuals who take their own lives every year increasing until only recently [4].

According to the available age-specific WHO suicide data [5], Japanese suicide rates for individuals aged 50–64, 65–75, and 75+ years, rank 6th, 12th, and 23rd in the world, respectively. In addition, the suicides of persons aged 50 years or older comprised the majority (56%) of all suicides in Japan in 2011 [6]. Japan also has the highest proportion in the world of people aged older than 65 years [7], a group which is known to have high prevalence of suicide ideation [8,9].

There are many known risk factors for suicide, of which mental disorders are a major factor in North America and Europe [1].

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1047-2797/$ – see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.annepidem.2013.12.006

Psychological autopsies of suicide victims have shown that 90% of those who die by suicide have a mental disorder [10]. However, far from everyone with a diagnosed mental disorder attempts to take their life, indicating that there are other factors involved and that suicide is the outcome of complex interactions.

Previous studies have demonstrated a positive correlation between suicide ideation and passive coping [11], dysfunctional coping [12,13], avoidance [14], avoidance distraction and emotion-oriented coping [15], and lack of active coping skills [16]. In addition, emotion-oriented coping and avoidance distraction have been shown to positively correlate with suicide attempts [15]. On the other hand, active coping styles [11] as well as problem focused coping and certain subtypes of emotion-focused coping correlate negatively with suicide ideation [12]. A possible mechanism for the association between coping and suicide ideation was provided by Zhang et al. [11], who in a recent study showed that passive coping, in particular fantasizing, was a significant mediator between life stress and suicide ideation. However, most studies looking at coping styles and suicide have focused solely on the cross-sectional association between coping and suicidal behavior or between coping and completed suicide [17] and have thus been limited due to their cross-sectional design [11–16,18].

Considering the high suicide rates in Japan, longitudinal studies that explain the association between individuals' coping behaviors and subsequent suicide are warranted. To our knowledge, no studies to date have used a large general population-based longitudinal design to ascertain this association. For this reason, our study will offer important additional information to already existing models attempting to explain the association between coping and suicide. This is a vital step to achieve a reduction of suicide rates.

Method

The Japan Public Health Center-based Prospective Study (JPHC Study) was started in 1990 and conducted in two cohorts, one initiated in 1990 (cohort I) and the other in 1993 (cohort II). The study population was defined as all registered Japanese inhabitants aged 40–59 years in cohort I and 40–69 years in cohort II in 11 public health center areas, identified by the population registries maintained by the local municipalities. The study design has been described in detail previously [19], and the study has been approved by the institutional review board of the National Cancer Center, Tokyo, Japan.

Surveys of the cohort participants were conducted thrice, at baseline (1990–1994), 5 years (1995–1999), and 10 years (2000–2004). Questions on coping behaviors were asked in the third survey only, thereby making this survey the starting point in the present study. The questionnaire also included information on medical history and lifestyle factors such as smoking, alcohol, unemployment, and living arrangements. The participants in the present study were individuals in the JPHC Study who responded to the self-administered 10-year follow-up questionnaire at age 50–79 years.

At baseline, 140,420 individuals were identified as being in the study population. After excluding 454 persons with non-Japanese nationality ($n = 51$), duplicate enrollment ($n = 4$), a late report of emigration occurring before the start of the baseline study ($n = 392$) or ineligibility due to an incorrect birth date ($n = 7$), a population-based cohort of 139,966 individuals was established. After further excluding 14,121 persons who had died ($n = 12,405$, 8.9%), moved out of the study area ($n = 1527$, 1.1%), refused further follow-up ($n = 1$, 0.0007%), and had been lost to follow-up before the starting point ($n = 188$, 0.1%), 125,845 subjects remained. A total of 99,439 subjects responded to the 10-year follow-up questionnaire, yielding a response rate of 79%.

Of the 99,439 respondents, we excluded individuals who did not provide complete answers on the coping component of the questionnaire ($n = 29,207$, 29%) and individuals with mental disorder as a cause of death according to the *International Classification of Diseases, Tenth Revision* (*ICD-10*) [20] ($n = 19$, 0.02%). The number of participants included in our analyses was 70,213.

Follow-up and identification of suicide

Participants were followed from starting point until December 31, 2010. Information on the cause of death for deceased participants was obtained from death certificates, with the permission of the Ministry of Health, Labor and Welfare, on which the cause of death is defined according to the *ICD-10*. Death by suicide was defined as *ICD-10* codes X60-X84. Residency registration and death registration are required by the Basic Residential Register Law and Family Registry Law, respectively, and the registers are thought to be complete.

Coping behaviors and coping strategies

The main variables of interest in the present study were coping behaviors. Six coping behaviors, each represented by one of the following statements in the 10-year follow-up questionnaire, (1) Make a plan and carry it out (planning); (2) Consult with someone (consulting); (3) Hope or fantasize about being able to change it (fantasizing); (4) Endeavor to find the positive side of the situation (positive reappraisal); (5) Blame and criticize yourself (self-blame); and (6) Avoid those things and do something else (avoidance) were assessed through one question, "How do you handle various problems and events that you experience daily?" Individuals could grade the extent to which they used a particular coping behavior according to a five-step Likert scale ("Hardly ever," "Infrequently," "Sometimes," "Fairly often," and "Extremely often").

Coping behaviors were subsequently converted into binary variables; answers of Fairly often or Extremely often corresponded to a participant adopting that particular behavior. Conversely, the answers Sometimes, Infrequently, or Hardly ever indicated that the participant did not use the particular behavior to solve daily problems.

Based on their provided answers, participants were also categorized as adopting one of two coping strategies. Planning, consulting, and positive reappraisal are considered to represent an approach-oriented coping strategy, whereas fantasizing, avoidance, and self-blame constitute an avoidance coping strategy. We considered a participant as having adopted a particular coping strategy if they actively used at least two of the three coping behaviors from that strategy. The questions on coping behaviors in our study were based on the Japanese version of the Stress and Coping Inventory, a self-report questionnaire validated for use among college students in Japan [21].

Statistical analysis

Person-years of follow-up were calculated for each participant from starting point to the date of death, emigration from the study area, or end of follow-up period (December 31, 2010), whichever occurred first. For individuals who withdrew from the study or were lost to follow-up, the date of censoring was set as the date of withdrawal or the last confirmed date of presence in the study.

Hazard ratios (HRs) and 95% confidence intervals (CIs) were used to characterize the relative risk of suicide associated with coping behaviors and coping strategies. The Cox proportional