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Psychological distress and completed suicide in Japan: A comparison of the impact of moderate and severe psychological distress

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ABSTRACT

It has already been established that severe psychological distress is a major risk factor for completed suicide. However, the impact (population attributable fraction; PAF) of moderate psychological distress on completed suicide has not been clarified. The present study investigated the association between various severities of psychological distress and completed suicide. We analyzed follow-up data covering a 7.3-year period (2006–2014) for 43,473 adults (aged ≥ 40 years) participating in a community-based, prospective cohort study. Psychological distress was measured using the K6 psychological distress scale at the baseline. Participants were classified into three groups according to their K6 score (low: 0–4; moderate: 5–12; severe: 13–24). Completed suicide was determined from a Japanese national database. The Cox model was used to estimate hazard ratios (HRs) for completed suicide. The PAFs of moderate and severe psychological distress for completed suicide were also estimated. The multivariate-adjusted HRs (95% confidence interval) for completed suicide were 2.37 (1.49–3.78) among participants with moderate psychological distress, and 4.16 (2.13–8.15) among those with severe psychological distress, relative to those with low psychological distress (P for trend < 0.001). The PAF of the moderate group for completed suicide was 26.8%, whereas that of the severe group was 10.9%. Not only severe but also moderate psychological distress was significantly associated with an increased risk of completed suicide. The PAF of moderate psychological distress for completed suicide was larger than that of severe psychological distress. Public health actions for suicide prevention should focus on moderate as well as severe psychological distress.

1. Introduction

The suicide rate in Japan (16.8 per 100,000 person-years in 2016) is among the highest in the world (Statistics and Information Department Minister's Secretariat Ministry of Health Labour and Welfare Japan, 2017). According to data from the World Health Organization (WHO) for the period 2013–2015, the suicide rate in Japan ranked sixth in the world, being especially high among the developed countries (World Health Organization, 2017). In fact in Japan, suicide is the second to fourth leading cause of death among middle-aged adults aged 40 to 64 years (Statistics and Information Department Minister's Secretariat Ministry of Health Labour and Welfare Japan, 2017). Thus, public health action for suicide prevention is an important issue in Japan.

It has been generally acknowledged that psychological illness including clinical depression is a major risk factor for completed suicide (Walker et al., 2015). Accordingly, public health action for suicide prevention has focused on individuals with severe psychological distress (Zalsman et al., 2016). Only one previous study has investigated the association between various severities of psychological distress and completed suicide in a general population (Bell et al., 2015). That study reported that not only severe but also moderate psychological distress was associated with an increased risk of completed suicide. Additionally, in the case of Japan, it has been reported that the prevalence of moderate psychological distress (23.1%) is approximately 7 times higher than that of severe psychological distress (3.5%) among adults aged 40 years and older (Ministry of Health, Labour and Welfare, Japan, 2017). Therefore, the population attributable fraction (PAF) of moderate psychological distress for completed suicide may be higher than that of severe psychological distress because the prevalence of the former is higher than that of the latter, even if the relative risk is lower for the former. Accordingly, the impact of moderate psychological distress on completed suicide may be larger than that of severe psychological distress. One previous systematic review has estimated the PAF of mental disorders (severe psychological

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distress) for completed suicide using data from case-control studies (Cavanagh et al., 2003). To our knowledge, however, no study has investigated the impact of various severities of psychological distress on suicide risk in the general population. Here we propose two hypotheses: 1. Not only severe but also moderate psychological distress is associated with an increased risk of completed suicide in the general population; and 2. the impact of moderate psychological distress on completed suicide is larger than that of severe psychological distress. Confirmation of these possibilities would facilitate future planning for suicide prevention.

The aim of the present population-based prospective cohort study was to investigate whether various severities of psychological distress are associated with an increased risk of completed suicide, and to compare the impact of moderate psychological distress on completed suicide with that of severe psychological distress.

2. Methods

2.1. Study cohort

The design of the Ohsaki Cohort 2006 Study has been described in detail elsewhere (Kuriyama et al., 2010). In brief, the source population for the baseline survey comprised all older citizens living in Ohsaki City, Miyagi Prefecture, northeastern Japan, on December 1, 2006, i.e. 78,101 men and women aged ≥40 years. The survey included questions about psychological distress, as well as items on history of disease, education level, smoking, alcohol drinking and time spent walking per day. The baseline survey was conducted between December 1 and December 15, 2006. A questionnaire was distributed by the heads of individual administrative districts, and then collected by mail. For this analysis, 49,603 individuals who provided valid responses formed the study cohort (response rate: 63.5%). We excluded 18 persons who had died or moved away during the period of the baseline survey and 6112 persons who had not entered responses for psychological distress. Thus, 43,473 individuals were analyzed for the purpose of this study.

During the 7.3-year period covered by the study, 1176 individuals were lost to follow-up because they moved away from the study area; thus, the follow-up rate was 97.3%.

2.2. Exposure measurement

The main exposure was psychological distress, as measured by the Kessler 6-item psychological distress scale (K6) (Kessler et al., 2002). The Japanese version of the K6 has been validated previously (Furukawa et al., 2008). The K6 consists of six questions about how often an individual has felt the following in the previous month: 1) nervous, 2) hopeless, 3) restless or fidgety, 4) so sad that nothing could cheer you up, 5) everything was an effort, and 6) worthless. The total K6 score ranged from 0 to 24. In previous studies, cut-off points of 5 and 13 have been commonly used to screen for moderate and severe psychological stress, respectively (Prochaska et al., 2012; Sakurai et al., 2011; Watanabe et al., 2016; Yokoyama et al., 2014). Therefore, we classified participants into three groups according to their K6 score (low: 0–4, moderate: 5–12, severe: 13–24).

2.3. Follow-up and case details

The end-point was completed suicide. We followed up the participants for mortality and emigration by reviewing the Residential Registry Record of Ohsaki City from 16 December 2006 to 31 March 2014. To determine the causes of death for decedents, we used the National Vital Statistics Database of Japan with permission from the Ministry of Health, Labour and Welfare, Japan. Cause of death was classified according to the International Classification of Diseases, 10th revision (ICD-10) (World Health Organization, 1992). Death due to suicide was identified as ICD-10: X60-X84.

2.4. Ethical issues

We considered the return of completed questionnaires to imply consent to participate in the study involving the baseline survey data and subsequent follow-up of death and emigration. The Ethics Committee of Tohoku University Graduate School of Medicine (Sendai, Japan) reviewed and approved the study protocol.

2.5. Statistical analysis

We counted the person-years of follow-up for each participant from 16 December 2006 until the date of death, date of emigration from the study area, or the end of the study period (31 March 2014), whichever occurred first.

First, we examined the Schoenfeld residuals to confirm that the proportional hazards assumption had not been violated, and found no important departures. We used the Cox proportional hazards model to calculate the hazard ratios (HRs) and 95% confidence intervals (CIs) of completed suicide according to each group of psychological distress, treating the low psychological distress group as the reference group. For cases where values for a confounding variable were missing, we created a separate missing category and included this in the model. To test for linear trends, we also entered the categories of psychological distress as ordinal numbers (low, moderate, or severe: 1, 2, or 3) in the corresponding Cox proportional hazards model. In these analyses, we considered the following variables as covariates in accordance with the existing literature (Bell et al., 2015): age (continuous variable), sex, medical history (cancer, stroke, or myocardial infarction), smoking status (never, ever, currently, or missing), drinking status (never, ever, currently, or missing), time spent walking per day (< 0.5 h, 0.5–1 h, ≥1 h, or missing) and education level (junior high school or less, high school, college/university or higher, or missing). We also estimated the shape of the continuous relationship between psychological distress and completed suicide using penalized splines (P-splines) in which automatic selection criteria for deciding the optimal degree of smoothing (or equivalently, the optimal degrees of freedom) with P-splines were implemented (Meira-Machado et al., 2013).

We estimated the population attributable fractions (PAFs) of moderate and severe psychological distress for completed suicide. PAF was calculated as: P × (multivariate HR-1) / multivariate HR, where P = proportion of cases arising from the each psychological distress group (Azimi et al., 2015; Rockhill et al., 1998).

All data were analyzed using SAS version 9.4 (SAS Institute Inc.), and P-splines were drawn by R version 3.2.1. All statistical tests were 2-sided, and differences at $p < 0.05$ were accepted as significant.

3. Results

During a mean follow-up period of 6.8 years of follow-up (297,041 person-years), 84 deaths due to suicide were certified (suicide rate 28.3 per 100,000 person-years).

Baseline characteristics according to each psychological distress group are shown in Table 1. The number of participants with moderate and severe psychological distress was 14,322 (32.9%) and 2908 (6.7%), respectively. Participants with severe psychological distress were more likely to be younger, to be female, to have a history of stroke, myocardial infarction or cancer, to be current smokers, and to have a higher education level. Additionally, participants with severe psychological distress were less likely to be current drinkers and to walk ≥1 h/day.

The association between psychological distress and completed suicide is shown in Table 2. The multivariate HRs (95% CIs) for completed suicide were 2.37 (1.49–3.78) among participants with moderate psychological distress (K6 score: 5–12), and 4.16 (2.13–8.15) for those with severe psychological distress (K6 score: ≥13), relative to those with low psychological distress (K6 score: ≤4) (P-trend < 0.001).

Fig. 1 shows the continuous association of psychological distress