Psychological distress in an earthquake-devastated area with pre-existing high rate of suicide

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ABSTRACT

On 12 March 2011 an earthquake devastated the Matsunoyama and Matsudai districts of Tōkamachi City, Niigata, Japan. These areas had high pre-existing suicide rates, especially among the elderly. We investigated whether mental health status became worse among the sufferers 5 months after the earthquake, and what kind of factors were implicated in any changes. A 15-item questionnaire that tapped earthquake-related variables and the Kessler 10 Psychological Distress Scale to measure psychological distress were distributed to 1923 residents aged over 40 years. The mean age (S.D.) of the total 1731 respondents (male, 805; female, 926) was 68.2 (13.1) years. Of these, we assessed K10 scores from 1346 respondents. The mean scores (S.D.) for K10 and K6 (six selected items from the K10) were 5.8 (6.3) and 3.4 (3.9), respectively. Among the respondents, 9.1% and 3.2% obtained a score of K10 ≥ 15 and K6 ≥ 13, respectively. These scores showed slightly higher psychological distress, especially among the elderly, in comparison with existing community-based data. Categorical regression analysis revealed significant and relatively strong effects of initial psychological impact, decrease in sleep hours, advanced age, and decrease in interpersonal relationships within the community on the K10 score. The last item suggests the importance of socio-environmental factors in post-disaster mental health.

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1. Introduction

A huge earthquake (magnitude of 9.0) struck northeast Japan on 11 March 2011, causing a devastating tsunami that left approximately 20,000 people dead or missing. To address the worst disaster in Japan's history, the Japanese government immediately set up the Emergency Disaster Response Headquarters to initiate disaster relief, and as many as 156 countries offered support by releasing emergency aid and sending medical workers (Kim, 2011). Although consistent mental health countermeasures were taken early in the aftermath of the earthquake, concerns persist about the effects of accumulating psychological distress and a possible increase in suicide cases among the disaster survivors.

Relatively less attention has been paid to the fact that the Great East Japan Earthquake also triggered earthquakes in areas of Japan remote from the epicenter. On 12 March 2011, a large earthquake (magnitude of 6.7) hit the northern areas of the Nagano prefecture and the adjacent Matsunoyama district of Tōkamachi City in the Niigata prefecture. There were concerns about adverse effects of the earthquake on the mental health of residents in Matsunoyama, an area that had an extremely high suicide rate among the elderly (434.6 per 10^5) even before the disaster struck. Takahashi et al. (1998) conducted a community-based intervention for depression and succeeded in markedly reducing the suicide rate in the area. This pioneering work has facilitated further suicide-prevention efforts in other areas of Japan (Ono, 2004; Oyama et al., 2006; Kaneko et al., 2007; Motohashi et al., 2007). Apparent similarities in temporal variations between unemployment and suicide rates in Japan (Kaga et al., 2009) have emphasized the importance of suicide prevention among middle-aged working people. Suicide among the elderly, however, is still a major public health problem, especially for aging communities in rural Japan.

Given that suicide rates may temporarily increase immediately after earthquakes and that the areas devastated by the Northern Nagano earthquake had a preexisting high suicide rate and might have had weak community resilience to the disaster, an examination of psychological distress among the victims after the earthquake

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would be helpful for estimating post-earthquake changes in suicide risk in different communities. Despite minimal damage to infrastructure and human life, the Northern Nagano earthquake may have had a significant psychological impact on the sufferers, for example, through changes in interpersonal relationships resulting from relocation, or the increased economic burden of reconstructing damaged houses and agricultural fields. Thus, we planned a study to answer the following two research questions: (1) whether mental health among the residents living in the affected area with a preexisting high rate of suicide worsened in comparison with previous reports and (2) what kind of environmental and individual factors affected mental health in the above areas.

2. Methods

2.1. Participants

As of February 28, 2011, Tōkamachi had an estimated population of 59,967 and a total area of 589.92 km². The areas around Tōkamachi are known to have one of the highest annual snowfalls in Japan. According to the census figures, approximately 30% of the population is aged over 65 years, and 30% of the workers are farmers. In total, the Matsunoyama and Matsudai districts have 2399 households and a population of 6217. Immediately after the earthquake, 369 people were forced to temporarily relocate because of damage to their homes and the threat of landslides. A small number of people were injured, but fortunately there were no fatalities.

We defined the object region as areas in the Matsunoyama and Matsudai districts where evacuation centers were placed or where more than 30% of the houses were partially damaged, half-collapsed, largely collapsed, or completely destroyed. In total, 1923 individuals (Matsunoyama, $n=1168$; Matsudai, $n=755$) aged over 40 years living in the selected region participated in this survey. Of these, 122 participants selected by the method described below were contacted to schedule diagnostic interviews using the Japanese version of the Mini-International Neuropsychiatric Interview (MINI) (Otsubo et al., 2005).

2.2. Procedures

On August 5, surveys were conducted among 1005 and 719 people, with completion rates of 87% and 95% in the Matsunoyama and Matsudai districts, respectively. The questionnaire consisted of items asking about demographic features, damage to homes and livelihood, evacuation behavior, history of medical and psychiatric illness, injury and psychological impact of the earthquake, changes in alcohol consumption, sleep status, interpersonal relationships between community and family members, and income, assessed on a three- to five-point Likert scale.

In addition, respondents completed the Kessler 10 Psychological Distress Scale (K10), which is a brief (approximately 3 min) questionnaire with 10 items (range: 0–40) that measures the degree of non-specific psychological symptoms in populations (Kessler et al., 2002). On the basis of the K10 results, respondents with a score of 15 or more on the K10 were considered to be at risk of having psychological distress. Those respondents were contacted to schedule diagnostic interviews using the MINI by registered psychiatrists. Special training for the diagnostic interview was not carried out. Before the interview, a chief interviewer briefly reviewed the use of the MINI interview with other members of the team. Target diseases and conditions comprised major depressive disorder (MDD), post-traumatic stress disorder (PTSD), alcohol abuse or dependence, and suicidal risk (Suzuki et al., 2011).

2.3. Measurements

The psychometric properties of the K10 are comparable or superior to existing instruments such as the General Health Questionnaire (GHQ) (Goldberg and Williams, 1988). The K10 is also known to predict serious mental illness (Kessler et al., 2003; Kessler et al., 2010), and there is a strong relationship between scores on the K10 and the presence of depressive and anxiety disorders as diagnosed by the Composite International Diagnostic Interview (CIDI) (Andrews and Slade, 2001; Rodgers et al., 2007; Fassaert et al., 2009). The Japanese version of the K10 was confirmed to have satisfactory reliability (Furukawa et al., 2008; Sakurai et al., 2011). The K10 has been used in the World Mental Health Survey (WMHS) in Japan (Furukawa et al., 2008) and recently has been used in populations beyond the original community survey: company employees (Shibaoka et al., 2010; Fushimi et al., 2011) and earthquake survivors (Oyama et al., 2012). K6 (range: 0–24) scores could be calculated using six items from the K10.

Since surveys using Japanese populations have proposed the appropriate cutoffs on the K10 (6/7 for a community sample; 9/10 for a psychiatric outpatient sample) and the K6 (4/5 on both) (Kawakami et al., 2004; Sakurai et al., 2011), we

calculated the percentage of the respondents that had K10/K6 scores beyond these cutoff points. Another cutoff of the K10 at 14/15 (Furukawa et al., 2002) may be too high for our community sample; however, we used this cutoff as a screener to narrow the number of subjects for the psychiatric interview mainly because of the limited manpower available for this stage. In this case, the sensitivity and specificity are known to be 82.4 and 87.9, respectively (Kawakami et al., 2004). For the K6, a score of 13 or more points was also used as the cutoff for comparing the data with those available from a large U.S. population (Pratt et al., 2007).

2.4. Statistical analysis

Data from the Matsunoyama and Matsudai districts were combined for further statistical analysis. Descriptive statistics of demographic and disaster-related variables were first summarized. Then, mean scores and suprathreshold scores from the K10/K6 were compared with those obtained in earlier studies in Japan and the U.S.

Then, we conducted a categorical regression analysis with total scores on the Japanese version of the K10 as an independent variable and examined variables that influenced psychological distress. Dummy variables were created as follows: gender (men, 1; women, 2); house damage determined by the public agency (not damaged, 1; partially damaged, 2; half collapsed, 3; largely collapsed, 4; completely collapsed, 5); damage to agricultural fields (not damaged, 1; damaged, 2); psychological distress after the earthquake (present, 1; absent, 2); injury caused by the earthquake (present, 1; absent, 2); changes in sleeping hours (increased, 1; unchanged, 2; decreased, 3); changes in alcohol consumption (increased, 1; unchanged, 2; decreased, 3); changes in interpersonal relationships between community members (increased, 1; unchanged, 2; decreased, 3); changes in interpersonal relationships between family members (increased, 1; unchanged, 2; decreased, 3); and changes in income (increased, 1; unchanged, 2; decreased, 3). Diagnoses of hypertension, abnormalities in lipid metabolism, diabetes mellitus, cerebrovascular disease, heart disease, and other forms of significant illness were inquired about individually (absent, 1; present, 2). Number of physical illnesses was calculated by summing these (minimal, 0; maximum, 6), partner in marriage (present, 1; absent, 2), and history of any mental illnesses (absent, 1; present, 2). Age and number of family members living together when the earthquake occurred were entered directly.

All statistical analyses were performed using IBM SPSS statistics 20 (Chicago, IL, USA). A P-value of less than 0.05 indicates statistical significance. This survey was approved by the Ethical Committee of the Niigata University School of Medicine. The respondents gave their consent by submitting a questionnaire marked with their agreement to participate.

3. Results

3.1. Descriptive statistics

The mean age (S.D.) of the total 1731 respondents (male, 805; female, 926) was 68.2 (13.1) years and 51% of the respondents were aged over 70 years. Of these, 68 were excluded from further statistical analysis because they were found not residing in the Matsunoyama or Matsudai district when the earthquake occurred. Farming was the most common occupation among the respondents (25.2%) as predicted from the census figures. Since 84.5% of the respondents without occupations were aged over 65 years (mean age [S.D.], 76.8 [11.1]), many retired people could be included in this group. Other earthquake-related items are described in Table 1.

A total of 1346 people (77.8%) completed the K10. The mean (S.D.) and median (quartile deviation) of the K10 were 5.8 (6.3) and 4.0 (5.0), respectively, while the values for the K6 were 3.4 (3.9) and 2.0 (3.0). Similar to a previous report from an intermediate and mountainous area in Japan (Suzuki, 2008), both the K10 and K6 distributions were positively skewed (lower score). Percentages of respondents who showed scores on the K10 ≥ 7, 10 and 15 were 37.3%, 25.0%, and 9.1%, respectively, while percentages for the K6 ≥ 5 and 13 were 33.1% and 3.2%, respectively.

3.2. Regression analysis

Of 15 independent variables introduced into the regression model, seven had significant standardized regression coefficients (β) (All $Ps < 0.05$) and four had βs of 0.10 or more (Table 2).