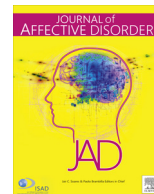




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Research paper

# Long-term psychological consequences among adolescent survivors of the Wenchuan earthquake in China: A cross-sectional survey six years after the disaster



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## ABSTRACT

**Background:** Most epidemiological studies on adolescent survivors' mental health have been conducted within 2 years after the disaster. Longer-term psychological consequences remain unclear. This study explored psychological symptoms in secondary school students who were living in Sichuan province 6 years after the Wenchuan earthquake.

**Methods:** A secondary data analysis was performed on data from a final survey of survivors conducted 6 years after the Wenchuan earthquake as part of the five-year mental health and psychosocial support project. A total of 2641 participants were divided into three groups, according to the level of traumatic experience exposure during the earthquake (0, 1, and 2 or more). ANCOVA was used to compare the mean scores of the Symptom Checklist-90 (SCL-90) among the three groups, adjusting for covariates such as age, gender, ethnicity, having a sibling, parents' divorce, and socio-economic status. Logistic regression analysis was used to identify relationships between the traumatic experiences and suicidality after the disaster.

**Results:** Having two or more kinds of traumatic experiences was associated with higher psychological symptom scores on the SCL-90 (Cohen's  $d=0.23$ – $0.33$ ) and suicidal ideation (OR 1.98, 95% CIs:1.35–2.89) and attempts (OR 3.32, 95% CIs:1.65–6.68), as compared with having no traumatic experience.

**Limitations:** Causality cannot be inferred from this cross-sectional survey, and results may not generalize to other populations due to convenience sampling.

**Conclusions:** Severely traumatized adolescent survivors of the earthquake may suffer from psychological symptoms even 6 years after the disaster. Long-term psychological support will be needed for these individuals.

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## 1. Introduction

Adolescents are thought to be vulnerable to the impact of disasters (Maeda et al., 2009; Norris et al., 2002) because they lack the experience, skills, and resources to independently cope with issues that may impact their mental health (National Commission on Children and Disasters, 2010). Adolescents may manifest a variety of psychological problems such as acute stress reactions, adjustment disorder, depression, anxiety disorders, and posttraumatic stress disorder (PTSD) following a disaster. In addition, they

may demonstrate behavioral problems, such as substance use, that can lead to social difficulties and academic failure (Chemtob et al., 2009). Estimated rates of occurrence of psychological symptoms and behavioral problems among adolescent survivors after a disaster have varied greatly across previous studies, depending on the nature of the disaster, the follow-up interval, measurements used, cultural issues regarding meaning of trauma, and support available (Kar, 2009; Pfefferbaum et al., 2015). In general, psychological symptoms peak during the first year post-disaster (Fan et al., 2015; Piyasil et al., 2011); however, some studies have shown that psychological symptoms do not decrease significantly over time (Jia et al., 2013; McFarlane, 1987; Weems et al., 2010), or may even increase 2–5 years after the disaster (Goenjian et al., 2005; Ye et al., 2014; Zhou et al., 2014). According to a recent systematic

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review (Wang et al., 2013), most empirical studies of child and adolescent survivors have been conducted within 2 years after the disaster. Therefore, results of studies on the long-term consequences of psychological symptoms after disaster among adolescent survivors remain contradictory and inconclusive.

The Japan International Cooperation Agency (JICA) conducted a five-year mental health and psychosocial support project for survivors of the Wenchuan earthquake in collaboration with the All China Women's Federation. The Wenchuan earthquake hit Sichuan Province, southwest China, on March 12, 2008, and killed more than 5000 children and adolescents. The aim of this project was to establish a mental health and psychosocial support system in the affected areas of Sichuan. A series of training seminars and supervisions were offered for the professional development of mental health care providers, including medical doctors, nurses, psychologists, school teachers, and social workers. In addition, various mental health activities were organized, such as psycho-educational lectures and counseling services for people affected by the earthquake; these activities were focused on child and adolescent survivors.

A large number of studies on the mental health of the adolescent survivors have been conducted since the Wenchuan earthquake. The majority of these studies focused on PTSD and depression and were conducted within 3 years of the earthquake. The prevalence rate of PTSD symptoms 1 year after the earthquake ranged from 8.6% to 28.4% (Liu et al., 2011; Wang et al., 2012; Ying et al., 2013), and the rate decreased over time (Fan et al., 2015; Zhang et al., 2012). However, the prevalence of depressive symptoms ranged from 13.9% to 41%, and was relatively stable over time (Jia et al., 2013; Shi et al., 2016; Ye et al., 2014). In addition, some studies examined suicidal ideation in relation to earthquake exposure, PTSD, and depression in this population. One study reported that the rate of suicidal ideation decreased among adolescents from an area not severely affected by the earthquake 1 month after it occurred (Yu et al., 2010). However, other studies reported high rates of suicidal ideation 1 year after the earthquake in the areas that were severely affected; importantly, it was associated with PTSD (Ying et al., 2015) or depression (Ran et al., 2015). However, there is a paucity of epidemiological studies regarding suicidality and long-term psychological consequences (other than PTSD, depression, and suicidal ideation) 3 years after the earthquake.

The purpose of this study was to compare adolescents having traumatic experiences during the Wenchuan earthquake with those not having such experiences to explore the psychological impact of disaster exposure on mental health 6 years after the event.

## 2. Methods

### 2.1. Participants and procedure

The current study was a secondary data analysis of the final assessment of the mental health and psychosocial support project for survivors of the Wenchuan earthquake. The project began in June 2009; the baseline survey included interviews with stakeholders and direct observations in the affected area of Sichuan Province. And it ended in May 2014; the final project assessment included interviews, direct observations, and quantitative questionnaires.

The cross-sectional survey was conducted in April 2014, 6 years after the earthquake, at seven secondary schools in Sichuan Province. Four of the schools were in severely damaged areas including Anxian county and Mianzhu county; two schools were in a mildly damaged area, Chengdu city; one school was in an

undamaged area, Anyue county. With help from the school teachers, we recruited 4067 students based on their availability. Of those invited, 2939 agreed to participate in this self-administered questionnaire survey (participation rate: 72.3%). Participants with missing items on the Symptom Checklist-90 ( $n=186$ ), traumatic experiences ( $n=95$ ), and demographics (ethnicity:  $n=5$ , having a sibling:  $n=9$ , history of parents' divorce:  $n=16$ , and socio-economic status:  $n=17$ ) were excluded from the analysis; 2641 participants were included in the final analysis.

The objective of this survey was explained to, and written informed consent was obtained from, all participants. This secondary data analysis study was approved by the Ethics Review Committee of Hyogo Institute for Traumatic Stress, and permission for secondary use of the data was granted by the JICA.

### 2.2. Measures

#### 2.2.1. Demographic variables

Demographic variables included age, gender, ethnicity, current area of residence, grade, having a sibling, history of parents' divorce, and socio-economic status (SES) as measured by the Family Affluence Scale (FAS). The FAS was used to examine and explain socioeconomic inequalities in the Health Behavior in School-aged Children study (Currie et al., 2008), and it has also demonstrated reliability and validity as an SES measure for adolescents in China (Liu et al., 2012). The scale comprises four items: Does your family own a car (0, 1, 2 or more)? Do you have your own room (0, 1)? How many times over the last year did you travel away somewhere on holiday with your family (0, 1, 2, 3 or more)? and How many computers does your family own (0, 1, 2, 3 or more)? As in previous studies (Currie et al., 2008; Liu et al., 2012), the two highest response categories ("2" and "3 or more") of the last two items (holidays and computers) were combined and coded as "2". A composite FAS score was calculated by summing the responses of these four items, resulting in a score range of 0–7. These composite scores were subsequently recoded into high (6, 7), medium (4, 5), and low (0–3) family affluence.

#### 2.2.2. Mental health and suicidality

Participants' mental health symptoms experienced during the previous week were assessed with the Symptom Checklist-90 (SCL-90). The SCL-90 has been translated into Chinese, and the translated version has empirical support for its validity (Chen and Li, 2003; Liu and Zhang, 2004). The SCL-90 includes nine symptom factors, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobia, paranoia, and psychoticism. In this study, we only used five symptom factors: somatization, obsessive-compulsive, depression, anxiety, and phobia, because these were most often seen among affected people (North, 2007). The factors were analyzed as continuous variables because there are no cut-off scores in Chinese validation studies.

Suicidality after the disaster was assessed through the following three items where participants were asked to rate their experiences since the Wenchuan earthquake. The questions were as follows: "Have you ever seriously thought about committing suicide? (Ideation)", "Have you ever made a plan for committing suicide? (Plans)", and "Have you ever attempted suicide? (Attempts)". The response choices were dichotomous (yes or no). These three items are originally from the Composite International Diagnostic Interview (CIDI) (Kessler and Ustun, 2004). The CIDI is a fully structured, lay-administered diagnostic interview, the Chinese version of which has been validated (Lu et al., 2015). Although the items in the validation study were not self-administered, we thought adolescents would feel free to answer more honestly in the self-administered manner. In fact, previous studies indicate that self-report measures are as well as or better than

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