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Risk indicators for post-traumatic stress disorder in adolescents exposed to the 5.12 Wenchuan earthquake in China

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ABSTRACT

In Chinese adolescents exposed to the Wenchuan earthquake, we used the Children's Revised Impact of Event Scale (CRIES) as the screening tool, and Post-traumatic Cognitions Inventory (PTCI) and the Social Support Rating Scale (SSRS) were used to assess the cognitive status and their social supports, to evaluate the prevalence and the predictors variables of post-traumatic stress disorder (PTSD) after the Wenchuan earthquake in China, which occurred on 12 May 2008. Subjects with a CRIES score greater than 30 were interviewed and assessed using the DSM-IV criteria for PTSD diagnosis by a trained psychiatrist with the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children Lifetime version (Kiddie-SADS-L). We found the overall prevalence of PTSD was 2.5% in 3208 adolescents from the surrounding areas of the epicentre 6 months after the earthquake. Risk factors for post-traumatic stress symptoms are as follows: being female, being buried/injured during the earthquake, having parents who were severely injured, having classmate(s) who died, having a house destroyed, and witnessing someone buried/wounded/dying during the earthquake. Individuals with better social support had significantly lower scores on the CRIES. There were significant differences in cognitive style between individuals at low risk for PTSD (CRIES$<$30) and those at high risk for PTSD (CRIES$\geq$30). Post-traumatic cognition emerged as an important factor that was associated with PTSD reactions in children. Social support can lessen the impact of a natural disaster by affecting post-traumatic cognition.

1. Introduction

On 12 May 2008, a devastating earthquake, measuring 8.0 on the Richter scale, struck Wenchuan County in Sichuan province and surrounding areas, China. The affected area is mainly a rural mountainous region; traffic accessibility of some regions is inadequate. Cities in the region were extensively damaged, and experienced many aftershocks. The number of dead and missing exceeded 90,000. More than 400,000 people were injured, and about 10,000,000 displaced after their homes were destroyed. A number of schools collapsed, burying many children, some of whom died. The significant level of aftershock created fear among the population, with many people hesitant to sleep indoors, even those whose houses had sustained minimal or no damage. The present study was undertaken in Mianzhu city. Situated in the northwest Sichuan Basin, Mianzhu is a county-level city in Deyang City, 83 km away from Chengdu, the largest city of Sichuan province. It covers an area of 1245 sq. km., and has a population of 510,000. It is divided into 19 towns and two townships. The city was seriously damaged in the earthquake.

Previous research has shown that children and adolescents exposed to traumatic or life-threatening events may develop symptoms of post-traumatic stress and post-traumatic stress disorder (PTSD) (Schnurr et al., 2002). Children with PTSD may reexperience the traumatic event, avoid trauma-related cues and thoughts, and suffer from emotional numbness and disruptions of arousal. However, not all individuals exposed to trauma develop PTSD. The rates of PTSD vary between 3% and 70%, depending on sex, age, the nature of the event, severity of injury, financial loss, social support, previous metal illness and the population studied (La et al., 1996; Cohen, 1998; Asarnow et al., 1999; Davis and Siegel, 2000). Structured diagnostic interviews are viewed as the gold standard for assessing PTSD (Cohen, 1998), but their use in large-scale traumas can be impractical. An alternative strategy involves using brief, child-friendly, self-report measures to initially screen large numbers of trauma-affected children (Yule and Udwin, 1991; Stallard et al., 1999; Brewin et al., 2000), and to conduct structured diagnostic interviews only with those identified as being at high risk of developing PTSD (Sahin et al., 2007).

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One of the most commonly used instruments to screen for PTSD symptoms is the Children's Revised Impact of Event Scale (CRIES).

Findings as regards risk indicators of PTSD are inconsistent, and some results are contradictory. Considering the individual differences, recent research has shown the development and sustainment of PTSD to be partly associated with an individual's post-traumatic cognitive structures and beliefs (Resick and Schnicke, 1992; Bennett et al., 2001). Wenninger (Wenninger and Ehlers, 1998) reported the process of traumatisation to be associated with the "shattering of cognitive schemas or core assumptions" in survivors who were unable to adapt. A recent report on the aetiology of PTSD in adolescents implicated problems in emotional regulation and maladaptive cognitive styles, with traumatized adolescents experiencing high levels of dissociation, trauma-related cognitions, and depression (Ehlers et al., 2003). Cognitive models of PTSD in adolescents postulate that emotions and cognitions related to traumatic events are stored together in memory or fear networks (Salmon and Bryant, 2002). Pine et al. (Pine et al., 2005) suggest that individuals with PTSD may have an attentional bias for threatening stimuli, and difficulty managing emotions associated with problematic memories.

Social support is considered an important factor influencing an individual's reaction to stress. Galea et al. (Galea et al., 2005) found social support to have a beneficial effect in PTSD. Low levels of social support after traumatic experiences have been associated with significantly higher rates of PTSD symptomatology (Flannery et al., 1991). Similar results have been reported for Chinese flood victims (Feng et al., 2007). The results of these individual studies are supported by those of meta-analyses (Brewin et al., 2000; Ozer et al., 2003).

Although previous studies suggested a number of predictive factors for PTSD, the optimal method to define multifactor strategies is controversial. As part of a larger epidemiological study on PTSD and related factors in a population affected severely by the 5.12 Wenchuan earthquake in China, the main aims of the present study were: firstly, to evaluate the prevalence of post-traumatic stress symptoms and PTSD by using CRIES as the screening tool in adolescents, who were near the epicentre when the earthquake happened; secondly, to assess cognition and social supports in this population in 6 months after the earthquake by using Post-traumatic Cognitions Inventory (PTCI) and the Social Support Rating Scale (SSRS); finally, to identify variables predictive of or associated with the presence of PTSD, post-traumatic cognition and post-traumatic stress symptoms in adolescents by jointly employing both logistic regression methods and classification and regression tree (CART) analysis. The latter method allows probing of optimal cut-offs and the sequencing of predictive factors.

2. Method

2.1. Subjects

The study population included 3,645 adolescents, aged 12–18 years, from four counties affected severely by the earthquake in Mianzhu city. All participants are Han Chinese and speak Chinese. Of the 3,645 children, 3,208 children (88%) completed the investigation. The majority of subjects came from three middle schools: 919 from school A, 899 from school B, and 1,004 from school C. There was severe building destruction at all three schools, but no deaths at schools B or C. The rest of the 386 subjects were from local communities.

The study was conducted with the permission of the National Science and Technology Ministry. The interview procedures were explained to the students, and the parents and teachers gave written consent for their children to participate. Written informed consents were obtained from all participants.

2.2. Procedure

The data were collected in the beginning of December 2008, more than 6 months after the earthquake. The investigation process was completed within 1 week to control for effects of time. The initial assessments were made using self-report measures, including the CRIES, PTCI and SSRS. Subjects with a CRIES score greater than 30 were considered as possible PTSD cases, and subsequently underwent a clinical diagnostic interview with a trained psychiatrist to establish DSM-IV diagnosis of PTSD.

The investigation was conducted by 18 interviewers; all but three of them are psychiatrists with at least 5 years' experience in general psychiatric practice. All interviewers participated in a 2-day training programme to ensure that they understand the questionnaires and scales appropriately.

2.3. Measures and diagnosis

2.3.1. Demographic data

The questionnaire contained items relating to demographic variables, including age, sex, level of education, and school attended.

2.3.2. Earthquake experiences

The exposure to traumatic events was assessed with questions asking, for example, if the subject was buried during the earthquake, the duration of being buried, the type of injury suffered, hospitalisation, amputation, losses of their parents, classmates and teachers, property damage, and if they saw someone wounded or dying during the earthquake.

2.3.3. Post-trauma stress symptoms

The CRIES scale was used to assess symptoms of post-trauma stress (Smith, 2003). The CRIES is a 13-item scale adapted from the IES-8 (Dyregrov et al., 1996), with four items measuring intrusion, four items measuring avoidance, and five new items measuring arousal that correspond to the diagnostic criteria of DSM-IV. Each item is answered on a 4-point scale in terms of 'Not at all' , 'Rarely', 'Sometimes', and 'Often' and these are scored as 0, 1, 3, and 5, respectively. The total score ranges from 0–65, and indicates the severity of post-traumatic stress. The CRIES has been used in children as young as 8 years old (Stallard et al., 1999). The validity and reliability of the Chinese version of the CRIES for measuring psychological distress has been assessed by Wu and Chan (Wu and Chan, 2003). They reported a high Cronbach's α for all three subscales: intrusion (0.89), avoidance (0.85) and hyperarousal (0.83).

2.3.4. Posttraumatic Cognitions Inventory (PTCI)

The 36-item PTCI is a child-friendly, self-report inventory designed following three types of trauma-related cognition (Foa et al., 1999): negative cognitions about the self, negative cognitions about the world, and self-blame. The items of the inventory are rated from 1 (Totally disagree) to 7 (Totally agree), with higher scores indicating stronger endorsement of negative cognitions. The PTCI has demonstrated good internal consistency (0.86 –0.97), 1-week test-retest reliability (0.74 –0.89), and 3-week test-retest reliability (0.80–0.86) (Foa et al., 1999). The Chinese version has shown good internal consistency, test-retest stability, concurrent validity and discriminative validity (Su and Chen, 2008).

2.3.5. Social Support Rating Scale (SSRS)

The SSRS was used to assess the current level of overall social support (e.g., from parents, teachers, relatives and friends) received by the subject. It includes 10 items that measure objective support, subjective support and support use. The questionnaire has been shown to have good validity and reliability in Chinese populations (Xiao, 1998; Tan et al., 2004).

2.3.6. Diagnosis of PTSD

The Schedule for Affective Disorders and Schizophrenia for School-Age Children (Kiddie-SADS-Present and Lifetime Version; K-SADS-PL, Version 1.0 of October 1996) (R. Klein et al., New York State Psychiatric Institute, unpublished) was used to diagnose PTSD. This is a semi-structured instrument for diagnosing DSM-IV childhood mental disorders that has been used in several studies with Chinese samples (Chong, et al., 1999; Wu, et al., 2007). Subjects were asked about the occurrence of symptoms potentially associated with DSM-IV diagnosis of PTSD, including core symptoms of PTSD, for example, re-experiencing, avoidance, emotional numbing and hyperarousal.

2.4. Statistical analyses

We first described the characteristics of study participants, which included basic demographic data and earthquake experiences, including emotional and physical suffering. Spearman correlation analysis was used to analyse the interrelationships among the subscales of the PTCI, SSRS and CRIES. Multiple linear regression and logistic regression models were used to identify factors influencing CRIES scores and the PTSD diagnosis, that is, CRIES scores and PTSD diagnosis as dependent variables, age, sex, being buried/injured during the earthquake, severity of parents' injury, having classmates who died, house destroyed, witnessed someone buried/wounded or dying and social support level as independent variables. Two classification and regression tree (CART) models were used to screen those at high risk of PTSD by the identified risk indicator. The regression tree model and classification tree model were fitted for continuous variable (PTCI) and categorical variable (PTSD), respectively.