Journal of Affective Disorders 243 (2019) 327–339

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Review article

Posttraumatic stress disorder following the 2008 Wenchuan earthquake: A 10-year systematic review among highly exposed populations in China

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ARTICLE INFO

Keywords:
Wenchuan earthquake
5.12
PTSD
Prevalence
China

ABSTRACT

Background: The 2008 Wenchuan earthquake was unprecedented in Chinese history both in terms of the magnitude of the quake itself and the scale of human suffering. Following the disaster, researchers reported on a wide range of mental health outcomes, especially posttraumatic stress disorder (PTSD). In this review, we assess the cumulative body of research evidence about PTSD across the first 10 years following the earthquake.

Methods: We searched the literature in the PubMed, Web of Science, and China National Knowledge Infrastructure (CNKI) databases (from May 2008 to February 2018) using Wenchuan earthquake and PTSD as keywords.

Results: We selected 58 relevant studies. Published findings from the selected period suggested a substantial burden of PTSD on highly exposed survivors. Studies have found that symptoms of PTSD have been associated with a range of risk factors, including sociodemographic factors, trauma exposure characteristics, post-disaster cognitive and emotional states, and social support. Studies have explored the factor structure of PTSD in the affected Chinese population, and researchers have developed a Chinese self-report measure of PTSD symptoms. Several treatments for PTSD have been evaluated, including some indigenous intervention methods.

Limitations: Only a relatively small number of the studies used longitudinal assessments, and the consistency and effectiveness of measurement tools for PTSD require further exploration. More rigorous investigations of the effectiveness of interventions for the prevention and treatment of PTSD are needed.

Conclusion: The 10-year body of literature is important for the future deployment of disaster relief and an increased understanding of PTSD in China.

1. Introduction

Exposure to disaster has been shown to cause general distress as well as a range of psychological symptoms, including fear and anxiety, recurring disturbing intrusive memories, and depression. These symptoms can severely impair the affected individuals' psychosocial functioning and quality of life (McMillan et al., 2017). Although the consequences of disasters may include a wide range of psychopathologies (Norris et al., 2002), posttraumatic stress disorder (PTSD) is an especially problematic disorder that is directly related to disaster-related traumatization (American Psychiatric Association [APA], 2013).

PTSD is a maladaptive, disabling reaction caused by unusual threats or catastrophic events, and it has been regarded as the most commonly studied disorder after disasters (Lowell et al., 2018; Neria et al., 2008). In 1980, the American Psychiatric Association first officially added PTSD to the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III; APA, 1980). After several versions of the modification, the fifth edition (DSM-5), which is the most recent edition, was published (APA, 2013). The DSM-5 incorporates several significant modifications to the diagnostic criteria for PTSD that provide better coverage of trauma-related clinical presentations and maintain backward compatibility with the PTSD criteria from former editions (Weathers, 2017). However, to date, it remains unclear how the modifications to the organization and definition of PTSD symptoms may impact the latent structure of PTSD; the rationality and effectiveness of this version are still under discussion (Wang et al., 2015; Weathers, 2017). Therefore, the diagnostic criteria for PTSD following all types of traumatic events, including natural disasters, warrant further exploration.

On May 12, 2008, an earthquake with a magnitude of 8.0 on the

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https://doi.org/10.1016/j.jad.2018.09.047
Received 29 May 2018; Received in revised form 27 August 2018; Accepted 15 September 2018
Available online 17 September 2018
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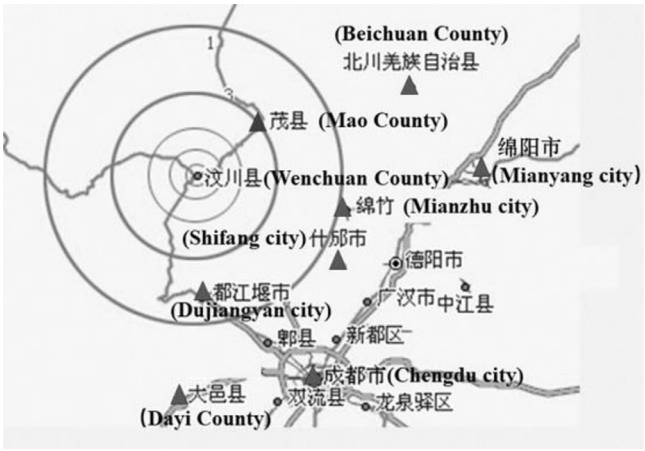

Fig. 1. The location of areas most strongly affected after the earthquake.

Table 1
Affected ranks of sampling areas.

	Hardest hit areas	Harder hit areas	Hard hit areas
Counties (Towns)	Wenchuan, Beichuan, Mao, Qingchuan, An, and Pingwu	Dayi	County: Qingshen Towns: Yongxing and Yongan
Cities (Districts)	Mianzhu, Dujiangyan, Shifang, and Peng	Baoji and Langzhong	Districts: Shuangliu and Xindu

Note: The information was retrieved from http://news.sohu.com/s2008/wenchuanshangwang/.
Mianzhu is a county-level city, so it was also called Mianzhu County in some articles.

Richter scale and a maximum intensity of 11.0 in the epicenter occurred in Sichuan Province in Southwest China. This earthquake was named after the epicenter of Wenchuan County. The Wenchuan earthquake was the most destructive earthquake since the founding of the People's Republic of China in 1949 and the deadliest since the 1976 Tangshan earthquake. According to a report issued by the Chinese Ministry of Civil Affairs in 2008, 69,227 people were killed, 374,643 were injured, another 17,923 were listed as missing, and approximately 4.8 million were left homeless as a result of the Wenchuan earthquake. China News reported that the Ministry of Civil Affairs categorized the areas affected by the Wenchuan earthquake into 3 levels (hard, harder, and hardest hit) based on the extent of destruction and/or death (Wei, 2008). The locations of the areas most affected after the earthquake are indicated in Fig. 1. In most selected articles, the samples were from the hardest hit areas, but some studies included samples from harder hit areas or hard hit areas. The affected levels of sampling areas from selected articles are listed in Table 1.

Earthquakes are among the most destructive and frequent natural disasters, causing many deaths and injuries throughout human history. Survivors of earthquakes often suffer from long-lasting panic and mental problems, including PTSD (Neria et al., 2008). The combined incidence of PTSD after earthquakes was reported to be 23.66% in a recent meta-analysis (Dai et al., 2016), indicating that earthquakes cause tremendous psychological stress for survivors. Immediately following the Wenchuan earthquake, some studies found widespread PTSD symptoms among different populations. One month after the Wenchuan earthquake, the estimated initial prevalence of PTSD was 62.8% among 409 survivors in Qingchuan County, which was one of the hardest hit areas most severely affected by the earthquake (Wang et al., 2011c). Lau et al. (2010) conducted a cross-sectional survey one month after the earthquake and found that the PTSD prevalence rate was 22.3% among 3324 secondary school students living in Chengdu, which was a hard hit disaster area. Three months after the earthquake, the prevalence rates of suspected PTSD were 47.3% in Beichuan County and Dujiangyan City (hardest hit areas) and 10.4% (93 of 898) in Langzhong County (harder hit area) and Yaan County (hard hit area; Kun et al., 2013). One year later, several studies reported PTSD prevalence estimates ranging from 21.5% to 41.0% among survivors in different areas (Cheng et al., 2015; Xu and Song, 2011; Zhang et al., 2011b). Taken together, these studies presented initial evidence that a wide range of survivors suffered from PTSD after the Wenchuan earthquake.

Many studies following the Wenchuan earthquake have explored the risk factors for PTSD, which were important for practical assessments to identify vulnerable populations (Kun et al., 2013; Wang et al., 2011c). Most researchers used self-report questionnaires to assess PTSD after the disaster because there were a large number of potential victims (Guo et al., 2017; Xu and Song, 2011). However, different researchers using the same assessment measures might choose a different cut-off criterion to determine PTSD status (e.g., Zhao et al., 2009; Xu and Song, 2011; Wen et al., 2012), so the consistency of the measurements must be discussed. In addition, most PTSD assessment instruments were translated from an English version that may not be fully applicable to the Chinese population (Wu et al., 2008). Thus, methods for assessing PTSD in Chinese cultures need be developed. The efficacy of psychological interventions is also worth noting because treatments play a crucial role in PTSD remission and recovery. The effectiveness of some traditional psychological interventions was verified after the disaster (Chen et al., 2014; Zang et al., 2013), and some interventions based on Chinese culture were also attempted (Zhu et al., 2014; Zhang et al., 2011a).

In the past decade, many studies have focused on PTSD following the 2008 Wenchuan earthquake. The objective of this review is to systematically assess the prevalence of PTSD after the Wenchuan earthquake and to review the progress in understanding PTSD after the earthquake. Below, we review the body of research literature generated in the first 10 years following the Wenchuan earthquake, focusing on epidemiology, risk factors associated with PTSD symptomatology, the factor structure of PTSD in the affected Chinese population, the usage of assessments for PTSD in China, and outcome studies of treatments for PTSD.

2. Method

Using a multistep procedure, we collected scientific articles for review that were published between May 2008 (immediately following the Wenchuan earthquake) and February 2018. First, we conducted a search for peer-reviewed literature published from May 2008 to February 2018 in the electronic databases of PubMed, Web of Science, and China National Knowledge Infrastructure (CNKI). Articles were included for initial review if they included (a) a keyword related to the Wenchuan earthquake or the Sichuan earthquake, as Wenchuan is located in Sichuan province, China and (b) keywords related to PTSD, including posttraumatic stress disorder and PTSD. To ensure the quality of these studies, we included articles from the Sciences Citation Index, Social Sciences Citation Index, Chinese Science Citation Database and Chinese Social Sciences Citation Index. This initial search generated a total of 192 articles, of which 130 were published in English, and 62 were in Chinese.

We next limited the articles according to the topics we wanted to discuss in this review, including the prevalence of PTSD and its risk factors, factor structure, assessment and treatment. Articles focusing on the biology of PTSD were excluded, as were case studies and review articles. Studies that focused on other psychiatric disorders (e.g., depression and generalized anxiety disorder) were also excluded from this review. In addition, some studies were excluded that focused on special populations, such as elderly people, the disabled or parents who lost their children. Eighty-seven articles met the standards for full-text