



Post-traumatic stress disorder and its risk factors in bereaved Tibetan adolescents 3 years after the 2010 Yushu earthquake, a cross-sectional study in China[☆]

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ABSTRACT

Objectives: This study examined the incidence of symptomatological post-traumatic stress disorder (PTSD) in bereaved Tibetan adolescents 3 years after the 2010 Yushu earthquake, then to identify possible and relational risk factors of PTSD by a cross-sectional study.

Methods: A total of 867 bereaved Tibetan adolescents seriously impacted by the 2010 earthquake were investigated. Symptomatological PTSD was evaluated by the PTSD Checklist–Civilian Version. And coping styles were evaluated by the Coping Styles Scale. Exposure of trauma to the 2010 Yushu earthquake was evaluated by a checklist about earthquake containing sociodemographic variables.

Results: 3 years after the Yushu earthquake, 24.4% of the bereaved Tibetan adolescents had symptomatological PTSD. The results also indicated that coping styles and disaster-related experiences after the 2010 earthquake were connected with PTSD among survivors. When the 2010 earthquake struck, those having symptomatological PTSD were more probably to be buried/injured/amputated, and to witness burial/injury/death, and to have property damage. An individual who adopted positive coping skill was probably to have less symptomatological PTSD.

Conclusions: The results showed that the existence of PTSD in bereaved Tibetan adolescents in the Yushu earthquake was very prevailing after 3 years. Effective psychological rescue work should be carried out, especially targeting bereaved Tibetan adolescents with more severe PTSD.

Introduction

Natural disasters are more possible to influence humans living in less developed countries and regions, where massive people have died of various disasters (Wang et al., 2000), and which caused general environmental devastation, great social burden and economic damage. An earthquake is one of a natural-disaster that is relatively easy to happen in China. In China, half of the deaths from natural hazards have been induced by earthquakes since 1950, which could lead to widespread and long-term adverse effects (Hou et al., 2016; Jin, 2014). In addition, a higher risk of psychological incidence was observed in survivors such as PTSD (Ofiaz, Hatipoglu, & Aydin, 2008).

Yushu County located in Qinghai Province of China experienced a

magnitude 7.0 earthquake on April 14, 2010, causing 2698 deaths, 12,135 injured, 270 missing and 200,000 displaced (Liu et al., 2016). The Yushu earthquake took place in the Qinghai Tibetan Autonomous Prefecture, living a large number of Tibetan populations, was the first serious natural hazard happening in China during the past 50 years in a high altitude. Many Tibetan adolescents experienced bereavement in the event, but the effects of this earthquake on adolescents has been largely ignored by researchers.

PTSD is as a psychological disease, which likely appears after exposure to one or more traumatic events. It is characterized re-exposure to catastrophic events, avoidance and emotional numbness, and the experience increases excitement three core symptoms (DSM, 2013). Due to poor cognitive ability and poor adaptability, adolescents are

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more possible to suffer psychological distress after experiencing an earthquake (Cenat & Derivois, 2014). Some studies have reported increased PTSD among adolescents after earthquakes. For instance, Hsu et al. showed that 21.7% of 323 adolescent students demonstrated PTSD 6 weeks after suffering the Taiwan earthquake (Hsu, Chong, Yang, & Yang, 2002). Similarly, Liu et al. showed that the screened PTSD incidence was 11.2% 4 months after the Wenchuan earthquake (Liu et al., 2010). In addition, 3 years after the 2010 China's Yushu earthquake, 17.8% of the Tibetan adolescents were reported symptomatological PTSD (Liu, Fu, Liu, & Jiang, 2016). As described above, the current research mainly focused on adolescent PTSD, especially in China, and few studies have paid enough attention to PTSD among bereaved adolescents. Some research showed that relatives' death resulted in a progress of complex bereavement responding, such as depression (Bryant, 2013), bereavement-related PTSD (Prigerson et al., 2009). Adolescents have lost relatives in sudden earthquake, and such bereavement may lead to secondary trauma and make bereaved adolescents more susceptible to psychological mental disorders (Iwadare et al., 2014). Taking these situations into consideration, it is necessary to study the PTSD consequences of the bereaved adolescents with severe earthquakes in China.

To date, Liu et al. showed the PTSD incidence in Tibetan bereaved adolescents was 19.3% 4 years after experiencing the Yushu earthquake (Liu, Chen, Ma, et al., 2016). Except disasters impacting on psychological health, studies have shown that parts of effects may depend on some demographic features like age and gender, as well as other risk factors such as coping styles, the level of social support (Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012). Ying et al. reported that age and gender were PTSD's risk factors (Ying, Wu, Lin, & Chen, 2013). Wu et al.'s study found that female and low level of social support both related to PTSD (Wu, Xu, & He, 2014). In Zhang et al.'s study, meaningful risk factors linked with symptomatological PTSD involved: higher exposure of earthquake, older age, and female (Zhang & Ho, 2011). Karstoft et al. showed that coping style had significant correlation with PTSD after combat exposure (Karstoft, Armour, Elklit, & Solomon, 2015). To what extent do these results lend itself to bereaved Tibetan adolescents of the China's Yushu earthquake in 2010?

This study's aim was to examine the incidence of symptomatological PTSD among bereaved Tibetan adolescent survivors 3 years after suffering the 2010 Yushu earthquake, then to identify risk factors connected with PTSD, via performing a cross-sectional investigation. The results of this study could be conducive to cross-cultural comparisons and longitudinal comparisons, and also increase our perceptive of PTSD in Tibetan adolescents.

Methods

Design and participants

Jiegu town was the severely most affected most severely region by the earthquake according to documents promulgated by Central People's Government of the People's Republic of China (PRC). A cross-sectional investigation was performed among bereaved Tibetan adolescents recruited from five of the worst-hit middle schools located in Jiegu town. A convenience sampling design was used to select participants. Adolescents age between 11 and 18 years old in each five middle schools were selected for participation. Subjects with medical or neurological illness, and alcohol or substance dependence, vision problems or verbal communication or psychotropic medicine using the past 2 weeks were excluded. The actual samples obtained reached a total of 867 bereaved Tibetan adolescents in this study.

The survey was performed by trained research assistants from West China Hospital who invited participants completing the socio-demographic variables, the PTSD Checklist–Civilian Version (PCL-C), earthquake exposure checklist, Coping Styles Scale (CSS) in the classroom. In addition, two local teachers who were proficient in Chinese

and Tibetan were trained to help the students understand questionnaires if they were not clearly understood. This work was carried out in the classrooms in April 2013, which was about 3 years after the disaster.

The study protocol was authorized by the following departments: the West China Hospital of Sichuan University Biomedical Research Ethics Committee, the Education Bureau of Yushu Prefecture in Qinghai Province, the Education Bureau of Yushu County, and the Local School Administrative Department. All participants and their guardians agreed to participate after being notified the objective of the investigation as well as the right of rejecting participation.

Measurement

Symptomatological PTSD

Symptomatological PTSD was evaluated by the self-reporting instrument PCL-C (Hovens et al., 1994). The instrument measured re-experiencing (RE, containing 5 items), avoidance (AV, containing 7 items), arousal (AR, containing 5 items) the three symptom clusters of PTSD, totaling 17 items. Symptomatological PTSD's severity was scored from one ("none") to five ("extremely heavy"). The total scores fluctuated between 17 and 85 points, with higher of which indicating more serious symptomatological PTSD. The scale was widely used to evaluate symptomatological PTSD in Chinese adolescents, with great reliability and validity. Since earlier study has been shown that a total score of 44 across all items of the PCL-C as the threshold (Li et al., 2010), this study adopted total score ≥ 44 was diagnosed as PTSD. An early study using this threshold reported Cronbach's alpha of the whole scale was 0.86 (Liu, Chen, Ma, et al., 2016). In our study, the Cronbach's alpha of the whole scale was 0.88.

Coping styles

Coping style was evaluated by a 30-item Coping Style Scale (CSS). In China, it was diffusely applied to middle school students for measuring coping style (Liu, Fu, Liu, & Jiang, 2016). The scale measures two dimensions of six coping styles. Two coping styles, problem-solving skill (PS, containing 8 items) and resorting (RS, containing 7 items), belong to positive coping. Three coping styles, withdrawing (WD, containing 5 items), abreacting (AB, containing 4 items), imagining (IM, containing 3 items) and tolerating (TO, containing 3 items), belong to negative coping. The participants were needed to present their coping frequency using 5 response options between 0 and 5. The average of all homologous item scores was every corresponding coping style score. In present study, the Cronbach's alpha of the whole scale was 0.88.

Demographic characteristics and earthquake exposure

A measuring instrument for traumatic exposure to the Yushu earthquake consisted of two sections, which was developed by Tian et al. (Tian, Wong, Li, & Jiang, 2014). Section one evaluated demographic features, such as gender, age, and grade. In section two, measured trauma characteristics via a 13-item self-reported checklist to assess disaster relevant experience during the earthquake event, covering burials, physical injuries, or handicaps in the adolescents, and injuries/deaths in family members/friends/teachers, witnessing of a burial/injury/death, the degree of property damage. A high level of earthquake exposure was defined as when adolescents were positive for one or more of the variables buried, disabled, or deaths of family members in the earthquake or three or more of other exposure variables.

Data analysis

We used SPSS version 22.0 for data analysis and quality control was performed before analysis. Calculated descriptive statistics for all demographic, earthquake exposure variables, and PTSD prevalence. Since the scores of all variables obeyed the normal distribution, the mean and standard deviation (SD) were used to describe the score of the symptomatological PTSD. We used a *t*-test of single-sample or an analysis of variance (ANOVA) to judge continuous variables' differences. Bivariate logistic regression analysis was conducted to judge of symptomatological PTSD's independent risk factors. When the *P* value was less than 0.05 was considered statistically significant (two-tailed).

Results

Participants' characteristics and earthquake exposure

Overall, of the 867 bereaved Tibetan adolescents, there were 411 (49.5%) males and 456 (52.5%) females. The mean (SD) of adolescents average age was 15.57 (1.50), between the ages of 13 and 18. More than half of the adolescents were junior high school students (85.8%). Of the total adolescents, 353 (40.7%) were buried, injured, and amputated during the event, and 579 (66.7%) witnessed burial, injury, death. Suffering severe or extremely severe family property damage adolescents were 30.4% and 26.3% respectively. Moreover, 564 (65.0%) adolescents adopted a negative coping style after earthquake (Table 1).

Symptomatological PTSD

Considering screening criteria (44-point threshold) for PTSD, the incidence of symptomatological PTSD among bereaved Tibetan adolescents was 24.4% at 3 years after the 2010 earthquake in Yushu. The mean (SD) of the total PCL-C score was 36.24 (11.79). The mean (SD) of the RE, AN, and AR were 12.13 (4.30), 13.01 (5.01), and 11.11 (4.57), respectively. Table 2 listed the five items for the highest and lowest scores.

Factors affecting symptomatological PTSD

The analysis showed no statistical difference in symptomatological PTSD, RE, AV, and AR between male and female participants. Similarly,

grade also had no relation to RE, AV, AR, and PCL-C scores. The burial/injury/amputation, and witnessing of burial/injury/death had only relation to RE and AV, AR scores. The different level of property damage had significantly relation to RE, AV, and AR scores, and the PTSD severity (Table 3).

The consequences of the bivariate logistic regression analysis assessing risk factors for symptomatological PTSD were displayed in Table 4. Grade (OR, 1.892 [95% CI, 1.109–3.226], *P* = 0.019), positive coping styles (OR, 0.627 [95% CI, 0.424–0.927], *P* = 0.019), negative coping styles (OR, 2.854 [95% CI, 1.91–4.266], *P* < 0.001), witnessed burial, injury, or death (OR, 1.45 [95% CI, 1.01–2.083], *P* = 0.044) and property damage (OR, 1.374 [95% CI, 1.207–1.565], *P* < 0.001) was significantly relevant to PTSD. However, only the variable of positive coping styles was a significant protective factor for PTSD. Correlation between variables such as age, gender, and experience of being buried/injured/amputated revealed no statistical significance (*P* > 0.05).

Discussion

Our research performed three years after the earthquake in Yushu has enabled us to realize more about the psychological sequelae of bereaved Tibetan adolescents related to a large-scale disasters occurring in developing countries. Symptomatological PTSD was evaluated by valid measurement tool in the study. This study showed that 24.4% of bereaved Tibetan adolescents having possible PTSD, which was higher than Liu et al.'s finding that announced the PTSD incidence rate in bereaved Tibetan adolescent was 19.3% 4 years after the 2010 Yushu earthquake in China. In a recent Sichuan earthquake study, the incidence of possible PTSD among survivors of bereavement at 6 months and 18 months were 38.9% and 16.8%, respectively (Hu et al., 2016). At the same intervals, the incidence rate of PTSD in bereaved Tibetan adolescent in Yushu earthquake decreased less than that of bereaved survivors in Sichuan earthquake. Additionally, Boelen et al. announced that the PTSD incidence in bereaved children was 23% 14 months after the Turkey earthquake, which was lower than our finding (Boelen & Spuij, 2013). The incidence rate of PTSD in bereaved Tibetan adolescents at 3 years after suffering the 2010 earthquake reported in ours study was still at a high level, which may be due to the following possible reasons. (1) An earthquake can cause inestimable and unexpected destruction of personal property and human life. Due to poor cognitive ability and poor adaptability, adolescents were more vulnerable to suffering from psychological distress, such as PTSD (Maeda, Kato, & Maruoka, 2009). (2) Bereavement related to disasters may lead to an imbalance in family composition and utility (Cao et al., 2013). The previous research confirmed that the bereavements were more possibility to have PTSD symptoms than non-bereaved when experiencing an earthquake (Dell et al., 2011). Bereavement had a facilitating effect on psychiatric distress. (3) In China, the policy of "One couple, one child" has been lasting for many years, which led to a single family structure and fewer family members. Thus, sudden bereavement can lead to break the balance of family structure (Hu et al., 2016). And support from adolescent family members was reduced and may perceive extraordinarily helplessness and hopelessness. (4) The Yushu earthquake occurred in the Tibetan Autonomous Prefecture, living a large number of Tibetan population, most of them being Buddhists who had unique perspective on the death of family members. Some research reported that race was a predictor of psychological disorders (Milan, Zona, Acker, & Turcios-Cotto, 2013; Spooon, Hodges, Murdoch, & Nugent, 2009) and Tibetan ethnic adolescent tended to be more suffering from PTSD than the Han and in responding to devastating earthquakes (Xiang et al., 2010). (5) Although the Chinese government, non-governmental organizations and other international organizations immediately had took effective aid measures after the disaster, rescue work and rehabilitation work carried out less efficient because of unique conditions for high altitude and low-oxygen environment (Hao, Li, & Yao, 2013; Peng, 2011; Xu et al., 2013), which had led to more fear

Table 1
Characteristics of the participants and earthquake exposure.

Variables	N (%)
Demographic characteristics	
Gender	
Male	411 (47.4%)
Female	456 (52.5%)
Age(years)	
< 14	104 (12.0%)
≥ 14	763 (87.9%)
Grade	
Junior	745 (85.8%)
Senior	122 (14.1%)
Disaster-related experiences	
Buried/injured/amputated	353 (40.7%)
Witnessed burial/injury/death	579 (66.7%)
Property damage	
Light	143 (16.5%)
Mild	51 (5.9%)
Moderate	181 (20.9%)
Severe	264 (30.4%)
Extremely severe	228 (26.3%)
Coping style	
Positive	302 (34.8%)
Negative	564 (65.0%)

Table 2
Items with the five highest and lowest scores on the PCL-C (N = 867).

Five items with the highest scores	Mean (SD)	Five items with the lowest scores	Mean (SD)
Getting depressed when reminded of the event	3.18 (1.27)	Trouble recalling important aspects of what happened during the trauma	1.65 (0.99)
Difficulty tolerating and/or easily startled by loud noises	2.81 (1.40)	Feeling emotionally numb	1.67 (1.08)
Having upsetting memories about the trauma	2.73 (1.19)	Losing interest in things you used to enjoy	1.75 (1.09)
Feeling constantly alert or always on the lookout for danger	2.33 (1.37)	Difficulty falling or staying asleep	1.81 (1.15)
Feeling as if the trauma were happening again	2.25 (1.27)	Feeling as if your future will be cut short	1.82 (1.15)

Table 3
Total and subscale scores of PTSD in different subgroups.

Variables	TPCL-C Mean (SD)	RE Mean (SD)	AV Mean (SD)	AR Mean (SD)
Demographic characteristics				
Gender				
Male (411)	36.38 (12.48)	12.25 (4.40)	13.22 (5.39)	10.91 (4.59)
Female (567)	36.13 (11.14)	12.02 (4.20)	12.82 (4.63)	11.28 (4.54)
P value (t statistics)	0.76 (0.31)	0.45 (0.76)	0.25 (1.15)	0.24 (-1.18)
Age (years)				
< 14 (104)	36.95 (11.80)	12.35 (4.25)	13.23 (4.92)	11.38 (4.41)
≥ 14 (763)	36.15 (11.79)	12.1 (4.31)	12.98 (5.02)	11.07 (4.59)
P value (t statistics)	0.58 (0.55)	0.63 (0.48)	0.52 (0.64)	0.52 (0.65)
Grade				
Junior (745)	12.18 (4.37)	13.30 (5.11)	11.19 (4.61)	36.67 (12.01)
Senior (122)	11.8 (3.83)	11.25 (3.85)	10.61 (4.28)	33.66 (10.03)
P value (t statistics)	0.354 (0.93)	0 (4.24)	0.20 (1.28)	0.01 (2.63)
Disaster-related variables				
Buried/injured/amputated				
No (514)	12.06 (4.01)	12.70 (5.01)	10.75 (4.32)	35.51 (11.71)
Yes (353)	12.23 (4.69)	13.46 (4.97)	11.62 (4.86)	37.31 (11.84)
P value (t statistics)	0.58 (-0.55)	0.03 (-2.22)	0.01 (-2.78)	0.03(-2.22)
Witnessed burial/injury/death				
No (288)	11.86 (4.05)	12.39 (4.98)	10.58 (4.18)	34.83 (11.40)
Yes (579)	12.26 (4.41)	13.32 (4.99)	11.36 (4.73)	36.95 (11.93)
P value (t statistics)	0.19 (-1.31)	0.01 (-1.35)	0.02 (-2.38)	0.01 (-2.51)
Property damage				
Light (143)	33.38 (10.42)	11.09 (4.25)	12.34 (4.82)	9.95 (4.02)
Mild (51)	33.51 (9.28)	11.31 (3.77)	12.29 (4.02)	9.90 (2.97)
Moderate (181)	33.85 (10.63)	11.06 (4.00)	12.04 (4.52)	10.76 (4.53)
Severe (264)	36.72 (11.35)	12.38 (3.96)	12.96 (4.69)	11.37 (4.60)
Extremely severe (228)	39.99 (13.36)	13.5 (4.63)	14.42 (5.72)	12.07 (4.94)
P value (F statistic)	0 (10.97)	0 (11.99)	0 (7.30)	0 (6.35)
Coping style				
Positive	35.33 (11.58)	11.71 (4.21)	12.88 (4.83)	10.74 (4.59)
Negative	37.99 (11.98)	12.94 (4.34)	13.26 (5.32)	11.79 (4.45)
P value (t statistics)	0.002 (3.18)	0 (4.06)	0.29 (1.05)	0.001 (3.26)

Table 4
Logistic regression analysis of PTSD symptoms among bereaved Tibetan adolescent (N = 867).

Variables	B	Wald	df	P	OR	95% CI (OR)	
Age (0 < 14; 1 ≥ 14)	0.292	1.406	1	0.236	1.34	0.826	2.172
Gender (1 = Male, 2 = Female)	0.241	2.092	1	0.148	1.272	0.918	1.763
Grade (0 = Junior; 1 = Senior)	0.638	5.48	1	0.019*	1.892	1.109	3.226
Positive coping style	-0.467	5.467	1	0.019*	0.627	0.424	0.927
Negative coping style	1.049	26.168	1	0.00***	2.854	1.91	4.266
Buried/injured/amputated (0 = No; 1 = Yes)	0.13	0.573	1	0.449**	1.139	0.813	1.597
Witnessed burial/injury/death (0 = No; 1 = Yes)	0.372	4.053	1	0.044*	1.45	1.01	2.083
Property damage (1 = Light; 2 = Mild; 3 = Moderate; 4 = Severe; 5 = Extremely severe)	0.318	22.952	1	0.00***	1.374	1.207	1.565
Constant	-4.842	68.318	1	0.00***	0.008		

* P < 0.05.
** P < 0.01.
*** P < 0.001.

and anxiety among the victims. (6) Tibetan adolescents living in the plateau area have less contacted with the outside world. Conservative thinking, poor health aid, poor education and poor living settings may lead to symptoms of PTSD lasting for many years.

Ours study's results also revealed that the highest frequency item in PCL-C pertained to RE, which was different from Liu et al.'s research on

the similar topic for 4 years after the earthquake, but was almost consistent with Liu et al.'s (Liu, Fu, Liu, & Jiang, 2016) another research about Tibetan adolescent 3 years after earthquake. Such variability may partly be explained by changes in study time. Eksi et al. reported that adolescents' RE symptoms decreased with time, and AV symptoms lasted longer (Eksi & Braun, 2009). This study was performed about

3 years after the earthquake in Yushu, which may explicate that bereaved Tibetan adolescents have more RE symptoms than Liu et al.'s research (Liu, Chen, Ma, et al., 2016).

Additionally, regardless of the PCL-C or any symptom clusters, the results revealed no statistical difference between gender, which was consonant with the relevant research (Contractor et al., 2013; Kilpatrick et al., 2003; Liu, Chen, Ma, et al., 2016; Liu, Fu, Liu, & Jiang, 2016). The result demonstrated that there was no significant difference in PTSD symptoms between male and female when bereaved Tibetan adolescents faced similar catastrophic events. However, some studies have reached the opposite conclusion. They supported that female was a sensitive factor in predicting symptomatological PTSD of adolescent after earthquakes (Ma et al., 2011; Ye et al., 2011). Possible explanations for such inconsistency may be attributed to the four main reasons. Firstly, the sensitivity of the measurement tools varied, leading to differences in results. Secondly, all adolescents believing in Buddhism and the influence of Buddhism may lead to the same level of acceptance of traumatic events for males and females. Thirdly, in view of the long-held belief that women were more vulnerable to disasters, setting up psychological health service centers and mental relief training projects by the Ministry of Civil Affairs of the PRC may give more attention to female psychology and give more social support. Finally, with the economic development and social progress, the improvement of the socioeconomic status of women led to the reduction of the vulnerability of females in the face of disaster. Similarly, there was no difference in TPCL-C and RE, AV, and AR scores between age < 14 and age ≥ 14. Additionally, the TPCL-C and AV were also no differences by grade. The RE and AR symptoms were more possible to appear in junior high school students. This result revealed that the impacts of grade and age were not the identical, which was consonant with Liu et al.'s research (Liu, Fu, Liu, & Jiang, 2016). As Liu said, since adolescents came from nomad families, the interpretation of this phenomenon may be that age differences not necessarily represented grade differences.

We also found that being buried/injured/amputated, and witnessing burial/injury/death, degree of property damage, all of those were related to the symptoms of TPCL-C and RE, AV, and AR, which was consonant with related research (Hu et al., 2016; Liu, Chen, Ma, et al., 2016; Trickey et al., 2012; Zhang et al., 2012). Previous research had demonstrated that children with more severe exposure had greater anxiety and more symptoms of PTSD in a trauma event (Trickey et al., 2012; Zhang et al., 2012), particularly such huge trauma of witnessing family members' death. Because of witnessing deaths of family members, adolescents were often compunction by their inability to implement rescue, which could promote the progress of PTSD among bereaved adolescents.

In addition, bivariate logistic regression analysis results revealed that grade, negative coping style, witnessing burial/injury/death, degree of property damage all were risk factors of symptomatological PTSD, while only positive coping style was protective factor. Although there were no differences in the TPCL-C and RE, AV, AR scores between junior students and senior students, however, bereaved Tibetan adolescents from senior school were more likely to develop PTSD than bereaved Tibetan adolescents from junior school, which was consonant with early research (Kolltveit et al., 2012; Liu et al., 2011). Consisted with related study (Ofiaz et al., 2008; Sotto, Azari, Riley III, & Bimstein, 2008) negative coping style was a risk factor, while positive coping style was a protective factor. As Liu (Liu, Fu, Jing, & Chen, 2016) said that a person who was more prone to utilize positive coping skills was often adept at drawing from defeat and would actively seek the support from others, which may defend them from suffering PTSD. On the contrary, individuals inclined to adopt negative coping skills were more likely to undergo psychological illness, such as PTSD (D'Amico, Marano, Geraci, & E. L., 2013). Many early research had been indicated that property damage was a meaningful predictor for the severity of PTSD (Chan et al., 2011; Zhang, Liu, Jiang, Wu, & Tian, 2014), which was consistent with our study. Property damage during a disaster could put

even more massive economic pressure on families and have medium-terms and long-terms negative impact on the psychological well-being of adolescents. However, Fan et al.'s study showed that property damage and child survivors' PTSD were not relevant after 2008 earthquake in Wenchuan (Fan, Zhang, Yang, Mo, & Liu, 2011). Moreover, another study indicated that property damage had no significant association with severity of psychiatric symptoms (Liu, Fan, & Liu, 2013). To determine the correlation between home damage and PTSD needs embedded studies. Regardless of whether property damage affected the progress of PTSD, disaster survivors should be helped to reconstruct and reinforce their houses to ease the psychological pressure and prevent mental illness.

Conclusion

In conclusion, the present study evaluated the PTSD incidence in bereaved Tibetan adolescents, and comprehensively evaluated risk factors of PTSD after the Yushu earthquake. On one hand, these results may help to confirm bereaved Tibetan adolescents at increased risk of symptomatological PTSD in order to conduct customized and suitable psychological health interventions. On the other hand, this study's results were conducive to enriching the subsistent evidences on the longstanding psychological health impacts of earthquakes. The present study discovered that, after 2010 earthquake in Yushu, the PTSD incidence in bereaved Tibetan adolescent was high and decreased more slowly, which indicated that it was necessary to carry out psychological health research, particularly in sensitive populations. Additionally, our findings provided strong evidence that negative coping style was an essential risk factor of the progress of PTSD in bereaved Tibetan adolescent, which had potential clinical implications for improved the effectiveness of psychotherapy and nursing of these conditions.

Limitations

A few of limitations were stated in this study. First, relatively small sample size was included and then further confirmation in large cohorts of participants will be very useful. Second, as the study focused on bereaved Tibetan adolescent lived in a hardest-hit region, the results may not be practical to other adolescent or younger children. Further research is requisite to enroll different samples from different regions exposure in an earthquake. Third, assessment of symptomatological PTSD using self-reporting instrument may lead to overestimation or underestimation of our results compared with psychiatrist's clinical diagnosis. Fourth, in addition to disaster-related experiences, poverty loss and negative coping style, some hereditary susceptibility and elasticity factors should be taken into account. Finally, this was a cross-sectional investigation study, and lacked of strong evidence to identify causal relationships with PTSD and observe dynamic variation of PTSD. Future research will require deeper exploration of risk factors for PTSD through longitudinal data.

Disclosure statement

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