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REVIEW ARTICLE

Disaster Psychiatry in Taiwan: A Comprehensive Review

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Natural disasters have caused millions of deaths worldwide, and hundreds of millions of people have suffered from various types of physical or mental traumas. Disasters change patterns of thinking and the concept of security among members of a community, which highlights the importance of mental rehabilitation in disaster psychiatry. Mental rehabilitation is not only a short-term intervention, but also involves long-term follow-up and referral of cases to regular psychiatric management. We used PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) to search for papers related to the Chi-Chi Earthquake and the Morakot Typhoon published between January 2001 and November 2011. We found that 33 articles are involved in seven topics. The most common disaster-related psychiatric diagnoses were major depressive episodes and posttraumatic stress disorder. The prevalence of posttraumatic stress disorder ranged from 8.0% to 34.3% in Taiwan after the 1999 Earthquake. However, lifetime and current prevalence for psychiatric disorders ranged from 1% to 74%, affecting women twice more than men. Because disasters are becoming increasingly common, it is vital to train a sufficient number of specialists with guidelines for standard clinical treatment, and to create a standard operating procedure for reducing traumatic conditions.

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1. Introduction

In the past two decades, natural disasters have caused millions of deaths worldwide, and hundreds of millions of people have suffered from various types of physical or mental traumas. The 9/11 terrorist attacks in the United States in 2001 caused worldwide panic; the 2004 Richter scale 9 earthquake and tsunami in South Asia resulted in hundreds of thousands of casualties in coastal areas, and the 2008 earthquake in Sichuan, China, claimed hundreds of thousands of casualties. In the past 10 years, Taiwan has been hit with various small-scale disasters such as traffic accidents, airplane crashes including crashes of China Airlines and Singapore Airlines, train derailment of the Alishan Railway, as well as the collapse of the Pingtung Bridge and the Lincoln Mansions in Taipei County. In addition, Taiwan has experienced several large-scale disasters, including the catastrophic destruction produced by the Chi-Chi Earthquake in 1999, the Severe Acute Respiratory Syndrome epidemic in 2003, the 8/8 floods in southern Taiwan in 2009, and the Morakot Typhoon, which resulted in the tragic

destruction of Xiaolin village. Because of their geographic location, many Asian countries are at a higher risk for natural disasters. According to statistical data from the Red Cross Society, Asia is more disaster-prone than any other areas in the world.¹ Repeated disasters alter thinking patterns and the concept of security within a community. The recent onslaught of disasters highlights the need for disaster psychiatry and the importance of mental rehabilitation.²

2. The classification of disaster

Neria et al classified disasters into three categories: (A) man-made disasters, (B) technological disasters, and (C) natural disasters, which affect millions of people around the world every year. Natural disasters (e.g., earthquakes and hurricanes) and man-made disasters (e.g., traffic accidents, acts of terrorism, and wars) can cause psychological trauma with long-lasting consequences.^{3–6}

The impact of a mass disaster or man-made trauma on an individual is a composite of two major elements: (A) the catastrophic event itself and effects of media coverage and (B) the vulnerability of the individual affected by the event. Affected individuals may include survivors, rescue workers, and vulnerable populations affected by media coverage.^{7–9}

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3. The relationship between psychiatric disorders and disaster

Many studies^{10–14} have shown evidence of psychological sequelae in disaster survivors, including posttraumatic stress disorder (PTSD), major depressive episodes (MDE), substance abuse, sleep disorders, anxiety, panic attacks, and other symptoms. The most common disaster-related psychiatric diagnoses are MDE and PTSD, which are closely associated,^{2–5,12–26} and this continues to gain attention in trauma outcome research.⁴ In addition, rescue workers such as nurses, firefighters, and soldiers incur a high prevalence of psychiatric disorders after disaster rescue. These individuals would also benefit from mental rehabilitation.^{7,27–30}

4. PTSD in disaster survivors

A systematic review of PTSD following disasters by Neria et al⁶ concluded that the post-disaster burden of PTSD is substantial.

According to the *Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV)* diagnostic criteria, PTSD has three core psychopathologies: (A) reexperience, (B) numbness and avoidance, and (C) hyper-arousal. The *DSM-IV* diagnostic criteria for PTSD allow clinicians to specify whether the disorder is chronic (if the symptoms have lasted 3 months or more) or exhibits delayed onset (if the onset of symptoms was 6 months or more after the stressful event).

5. The prevalence of PTSD in disaster survivors

The prevalence of PTSD ranged from 8.0% to 34.3% in Taiwan after the 1999 earthquake,^{15,16} measured about 25% in Turkey after the 1999 earthquake,³¹ and was reported to reach as high as 74% in Armenia after the 1988 earthquake.³² In a systematic review of the literature, Andrews et al³³ found that delayed-onset PTSD in the absence of any previous symptoms is rare, whereas a delayed onset that represented an exacerbation or reactivation of prior symptoms accounted for 38.2% and 15.3% of military and civilian cases of PTSD, respectively. Generally, the lifetime and immediate prevalence rates for psychiatric disorders range anywhere from 1% to 74%,^{34–38} affecting women twice more than men. Furthermore, women report more symptoms of anxiety and depression than men.^{36,37}

6. Publications related to disaster in Taiwan acquired from a from a PubMed search

We used PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) to search for papers related to the Chi-Chi Earthquake and the Morakot Typhoon, published between January 2001 and November 2011, and found 33 in total. The topics of articles cover: (A) prevalence of and risk factors for psychiatric disorders in different groups, (B) establishment of screening tests, (C) quality of life in survivors, (D) suicide rates following the disaster, (E) the effects of coping strategies in rescue workers, (F) the direct and indirect causes of and risk factors for PTSD and major depressive disorder (MDD) using structural equation modeling, and (G) various other topics. Table 1^{1,3–5,7,15–21,23–25,27,29,30,36–38,42–53} summarizes the research articles on the Chi-Chi Earthquake and the Morakot Typhoon related to psychiatry.

7. The theory of mental rehabilitation post-disaster

Reconstruction of life after a disaster can be a challenging process. Mental rehabilitation is a part of life reconstruction and requires a planned, comprehensive approach. Several years after the impact of the disaster, the prevalence of most psychiatric disorders will

decline; however, rates of substance abuse and suicide have been shown to increase.^{3,24} Mental rehabilitation is not only important as a short-term intervention, but also as a long-term follow-up mechanism. It can also prove useful in identifying cases that should be referred for further psychiatric management. Hobfoll's Conservation of Resources (COR) model has been well substantiated by previous studies on natural disasters.³⁹ According to Hobfoll's COR stress theory,^{4,40} resource loss is an important determinant of individual stress, physical and mental health, and vulnerability to developing PTSD. Brewin et al⁴¹ also found that although the effect sizes of all risk factors were modest, factors operating during or after the trauma such as trauma severity, lack of social support, and additional life stress, had somewhat stronger effects than did pre-trauma factors.

Multiple risk factors may combine to result in psychiatric illness. According to Hobfoll's COR theory, resource loss is an important determinant of individual stress and physical and mental health, including PTSD. Our hypothesis states that an individual reaches a subthreshold of psychiatric illness and then develops the illness due to a decreasing availability of resources, an accumulation of risk factors, and/or a major stressful event. Furthermore, unresolved, subclinical psychiatric symptoms caused by a disaster or major life event may increase a survivor's sensitivity to future stresses. When faced with either stressful life events or trauma such as brain damage or deprivation of internal or external resources, individuals may become more vulnerable to psychiatric impairment and disorders such as PTSD. Our hypothesis states that an individual might reach a subthreshold for PTSD and then develop the illness due to a decreased availability of resources, an accumulation of risk factors such as personality traits or poor social interactions, or a major stressful life event. Furthermore, unresolved subclinical psychiatric symptoms caused by a disaster may increase a survivor's sensitivity to future stressors.⁷

8. The establishment of a standard operating procedure

Although the types of disasters faced in modern times may vary, it is vital to train a sufficient number of specialists and to develop a standard operating procedure (SOP) for reducing unfavorable conditions when a disaster occurs.⁷ Su et al⁷ endeavored to establish an SOP based on experience with mental rehabilitation efforts following the Chi-Chi Earthquake. They demonstrated that an Emergency Operation Center (EOC) should be set up as quickly as possible, generally within 1–8 h. The EOC should provide the central government with updates on the situation, as the scale of the EOC will depend on the degree of the emergency. Within 24–48 h, the EOC should assess the actual damage and coordinate "battle resources" such as manpower and equipment with the supporting teams in order to serve the real needs in the disaster area. Multiple rescue teams, including the administrative team, the public health and medical teams, and the engineering and rescue-worker teams, should be involved during the urgent initial stages. An emergency management system should be established to effectively intervene immediately after a disaster. Systematic mental rehabilitation should then be performed 1–3 months after the disaster.

9. Clinical guidelines for post-disaster mental rehabilitation in Taiwan

Su et al⁷ offered a 14-part draft of potential clinical guidelines. The Taiwanese Department of Health also endeavored to publish a post-disaster mental rehabilitation book. Expert consensus concludes that every mental health rescue worker should receive 24 h of training on various topics, including: (1) the service concept of

Table 1 Summary of psychiatric articles related to the Chi-Chi earthquake or the Morakot typhoon (PubMed search, Jan 2001–Nov 2011)

Author(s)	Year	Study period after earthquake	Subjects	Purpose	Method
Chen et al ¹⁷	2001	Within 1 mo	525 residents	Screening for psychiatric morbidity and posttraumatic symptoms among survivors in the early stages	Purposeful sampling
Chen et al ⁴²	2001	Within 2 y	210 residents	The Chinese version of the Davidson Trauma Scale, a preliminary study for validation	Translation, back-translation, and concurrent validity
Chang et al ¹⁸	2002	6 mo later	171 pregnant residents	Psychiatric morbidity and pregnancy outcome in a disaster area	Purposeful sampling
Hsu et al ²⁰	2002	6 wk later	323 student residents	PTSD among adolescent earthquake victims in Taiwan	Purposeful sampling
Liao et al ²⁸	2002	2 mo later	1104 rescue workers serving in the area hit by the earthquake	Association of psychological distress with psychological factors in rescue workers	Purposeful sampling
Lin et al ⁴³	2002	1 y later	368 residents (268 residents ≥ 65 y old)	Geriatric survivors	Purposeful sampling
Shih et al ²⁹	2002	Within 1 y	46 nurses who worked in a hospital in the community	The impact of the 9-21 earthquake experiences on Taiwanese nurses as rescuers	Purposeful sampling
Yeh et al ³⁰	2002	Within 16 d	187 young, male military personnel who served as rescue workers	Characteristics of acute stress symptoms and nitric oxide concentrations in young rescue workers in Taiwan	Purposeful sampling
Chang et al ³⁶	2003	5 mo later	84 male firefighters	Posttraumatic distress and coping strategies among rescue workers	Purposeful sampling
Chou et al ³⁷	2003	21 mo later	461 residents	Establishment of a disaster-related psychological screening test	Population survey
Kuo et al ²¹	2003	2 mo later	120 bereaved survivors	Prevalence of psychiatric disorders and risk factors for PTSD and major depressive disorder among bereaved survivors	Purposeful sampling
Yang et al ²⁵	2003	3 mo later	663 victims	Psychiatric morbidity and posttraumatic symptoms among earthquake victims in primary care clinics	Purposeful sampling
Chou et al ¹⁵	2004a	21–24 mo	461 residents	Quality of life and related risk factors in Taiwanese earthquake survivors with different psychiatric disorders	Purposeful sampling
Chou et al ¹⁶	2004b	4–6 mo	4223 residents	Relationship between quality of life and psychiatric impairment	Purposeful sampling
Guo et al ⁴⁴	2004	1 mo	252 rescue workers	Prevalence of PTSD among professional and nonprofessional rescue workers involved in the 1999 Chi-Chi earthquake	Purposeful sampling
Lai et al ¹⁹	2004	10 mo	252 residents	Full and partial PTSD among earthquake survivors in rural Taiwan	Random selection from two rural communities
Chou et al ³	2005	4–6 mo	442 residents	Development of psychiatric disorders among residents post-earthquake	Population survey
Yang et al ⁴⁵	2005	During a 7-y period	—	Time-related trends of increased suicide rates	Time-series analysis
Seplaki et al ⁴⁶	2006	Before and after the earthquake	1160 older individuals	Variability in resilience to depressive symptoms in the aftermath of the 1999 earthquake	Longitudinal survey with interviews
Wu et al ²⁴	2006	33–36 mo	405 residents	Quality of life and related risk factors in earthquake survivors diagnosed with different psychiatric disorders	Population survey
Chen et al ⁴⁷	2007	2 y later	6412 earthquake survivors whose houses were destroyed	Prevalence and risk factors of posttraumatic stress symptoms and psychiatric morbidity	Purposeful sampling
Chou et al ⁴	2007	6 mo, 2 y, and 3 y later—total three times	442, 461, and 405 residents	Dynamic population survey for risk factors for PTSD and major depression; prevalence of different psychiatric disorders 6 mo, 2 y, and 3 y after the earthquake	Population survey
Kuo et al ⁴⁸	2007	1 y later	272 victims from temporary housing units	Incidence of PTSD among and the psychological health status of earthquake victims 1 y after the event	Purposeful sampling
Tsai et al ²³	2007	3 y later	1756 respondents	Prospective evaluation of the relationship between the clinical course of posttraumatic stress symptoms and quality of life	Fixed cohort follow-up
Chang et al ²⁷	2008	—	193 firefighters	Modification effects of coping strategies on the relationship between rescue effort and psychiatric morbidity in earthquake rescue workers	Purposeful sampling
Wu et al ⁴⁹	2009	—	705 adolescent (Chi-Chi earthquake)	Examination of two models: (1) traditional social support (2) supportive and detrimental social relations model	Using structural equation modeling (SEM)
Su et al ⁵	2010	3 y later	1756 respondents (post-Chi-Chi earthquake)	Predicting the longitudinal course of PTSD in survivors 3 y following a catastrophic earthquake using multivariate data presented 6 mo after the earthquake	Population-based survey
Tang et al ⁵⁰	2010	3 mo later	271 adolescents	Direct and indirect causes of PTSD, MDD, and risk factors using a SEM model (Morakot typhoon)	SEM
Yen et al ⁵¹	2011	—	271 adolescents	MASC-T	To construct validity of MASC-T Chinese version
Yang et al ⁵²	2011	3 mo later	271 adolescents (post-Morakot typhoon) school-based survey	Prevalence rates of PTSD, its associated factors and co-occurring psychological problems	Cluster sampling
Su et al ⁷	2011	3 y later	4223 post-Chi-Chi earthquake respondents	Designing a standard operating procedure for psychiatric service	Population survey
Chen et al ⁵³	2011	1 y later	120 Taiwanese aboriginal people aged ≥ 55 y old	Risk factors associated with PTSD symptoms in a middle- and old-age population who experienced Typhoon Morakot	Purposeful sampling

Modified and updated from Chou et al⁴ and Su et al⁷ with permission.

MASC-T = Chinese version of the Multidimensional Anxiety Scale for Children; MDD = major depressive disorder; PTSD = posttraumatic stress disorder; SEM = structural equation modeling.

post-disaster mental health; (2) administration and procedure: (a) linkage of post-disaster service and resource offers, (b) sensitivity to culture and religion; (3) intervention of post-disaster mental health service, include mental rescue lessons, high-risk group screening and suicide prevention as well as group therapy; and (4) clinical practice.

10. Conclusion

The frequency of disasters in modern times has highlighted the value of disaster psychiatry and the importance of mental rehabilitation. It is necessary to strengthen professional awareness regarding the treatment of posttraumatic stress disorder, depression, and panic disorder. A two-stage rapid screening strategy may also prove effective, despite the typical limitations on resources following a disaster. In a two-stage survey method, the initial questionnaire can help identify high-risk groups and keep track of these individuals for mental rehabilitation,³⁷ which can be an effective labor-saving method. It is also vital to train a sufficient number of specialists on the guidelines for clinical intervention and to create an SOP for mitigating traumatic conditions when any disaster occurs.

References

- Kokai M, Fujii S, Shinfuku N, Edwards G. Natural disaster and mental health in Asia. *Psychiatry Clin Neurosci* 2004;**58**:110–6.
- Lo AH, Chen CC, Chou FH, Chang HT. The comparison of prevalence of post-traumatic stress symptoms between post-Chi-Chi earthquake survivors and post-Morakot flood survivors. *Taiwan J Psychiatry (Taipei)* 2011;**25**:167–79.
- Chou FH, Su TT, Chou P, Ou-Yang WC, Lu MK, Chien IC. Survey of psychiatric disorders in a Taiwan village population six months after a major earthquake. *J Formos Med Assoc* 2005;**104**:308–17.
- Chou FH, Wu HC, Chou P, Su CY, Tsai KY, Chao SS, Chen MC, et al. Epidemiologic psychiatric studies on post-disaster impact among Chi-Chi earthquake survivors in Yu-Chi, Taiwan. *Psychiatry Clin Neurosci* 2007;**61**:370–8.
- Su CY, Tsai KY, Chou FH, Liu RY, Lin WK. A three-year, follow-up study of the psychosocial predictors of delayed and unresolved PTSD in Taiwan Chi-Chi earthquake survivors. *Psychiatry Clin Neurosci* 2010;**64**:239–48.
- Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: a systematic review. *Psychol Med* 2008;**38**:467–80.
- Su CY, Chou FH, Tsai KY, Lin WK. The establishment of a standard operation procedure for psychiatric service after an earthquake. *Disasters* 2011;**35**:587–605.
- Sapir DG. Natural and man-made disasters: the vulnerability of women-headed households and children without families. *World Health Status Quarterly* 1993;**46**:227–33.
- Chou FH: *The Follow Up Study on Psychiatric Diseases among 921 Earthquake Survivors* (a doctoral thesis). College of Public Health, National Yang-Ming University, Taipei, Taiwan: National Yang Ming University, 2003.
- Rubonis AV, Bickman L. Psychological impairment in the wake of disaster: the disaster-psychopathology relationship. *Psychol Bull* 1991;**109**:384–99.
- Maj M, Starace F, Crepet P, Loblance S, Veltro F, De Marco F, Kemali D. Prevalence of psychiatric disorders among subjects exposed to a natural disaster. *Acta Psychiatr Scand* 1989;**79**:544–9.
- Goenjian AK, Steinberg AM, Najarian LM, Fairbanks LA, Tashjian M, Pynoos RS. Prospective study of posttraumatic stress, anxiety, and depressive reactions after earthquake and political violence. *Am J Psychiatry* 2000;**157**:911–6.
- Green BL, Lindy JD, Grace MC, Leonard AC. Chronic posttraumatic stress disorder and diagnostic comorbidity in a disaster sample. *J Nerv Ment Dis* 1992;**180**:760–6.
- McFarlane AC, Papay P. Multiple diagnoses in posttraumatic stress disorder in the victims of a natural disaster. *J Nerv Ment Dis* 1992;**180**:498–504.
- Chou FH, Chou P, Su TT, Ou-Yang WC, Chien IC, Lu MK, Huang MW. Quality of life and related risk factors in a Taiwanese village population 21 months after an earthquake. *Aust NZ J Psychiatry* 2004;**38**:358–64.
- Chou FH, Chou P, Lin C, Su TT, Ou-Yang WC, Chien IC, Su CY, et al. The relationship between quality of life and psychiatric impairment for a Taiwanese community post earthquake. *Qual Life Res* 2004;**13**:1089–97.
- Chen CC, Yeh TL, Yang YK, Chen SJ, Lee IH, Fu LS, Yeh CY, et al. Psychiatric morbidity and post-traumatic symptoms among survivors in the early stage following the 1999 earthquake in Taiwan. *Psychiatry Res* 2001;**105**:13–22.
- Chang HL, Chang TC, Lin TY, Kuo SS. Psychiatric morbidity and pregnancy outcome in a disaster area of Taiwan 921 earthquake. *Psychiatry Clin Neurosci* 2002;**56**:139–44.
- Lai TJ, Chang CM, Connor KM, Lee LC, Davidson JR. Full and partial PTSD among earthquake survivors in rural Taiwan. *J Psychiatr Res* 2004;**38**:313–22.
- Hsu CC, Chong MY, Yang P, Yen CF. Posttraumatic stress disorder among adolescent earthquake victims in Taiwan. *J Am Acad Child Adolesc Psychiatry* 2002;**41**:875–81.
- Kuo CJ, Tang HS, Tsay CJ, Lin SK, Hu WH, Chen CC. Prevalence of psychiatric disorders among bereaved survivors of a disastrous earthquake in Taiwan. *Psychiatr Serv* 2003;**54**:249–51.
- Liu A, Tan H, Zhou J, Li S, Yang T, Wang J, Liu J, et al. An epidemiologic study of posttraumatic stress disorder in flood victims in Hunan China. *Can J Psychiatry* 2006;**51**:350–4.
- Tsai KY, Chou P, Chou FH, Su TT, Lin SC, Lu MK, Ou-Yang WC, et al. Three-year follow-up study on the relationship between posttraumatic stress symptoms and quality of life among earthquake survivors in Yu-Chi, Taiwan. *J Psychiatr Res* 2007;**41**:90–6.
- Wu HC, Chou P, Chou FH, Su CY, Tsai KY, Ou-Yang WC, Su TT, et al. Survey of quality of life and related risk factors for a Taiwanese village population 3 years post-earthquake. *Aust N Z J Psychiatry* 2006;**40**:355–61.
- Yang YK, Yeh TL, Chen CC, Lee CK, Lee IH, Lee LC, Jeffries KJ. Psychiatric morbidity and posttraumatic symptoms among earthquake victims in primary care clinics. *Gen Hosp Psychiatry* 2003;**25**:253–61.
- Wang X, Gao L, Shinfuku N, Zhang H, Zhao C, Shen Y. Longitudinal study of earthquake-related PTSD in a randomly selected community sample in north China. *Am J Psychiatry* 2000;**157**:1260–6.
- Chang CM, Lee LC, Connor KM, Davidson JR, Lai TJ. Modification effects of coping on post-traumatic morbidity among earthquake rescuers. *Psychiatry Res* 2008;**158**:164–71.
- Liao SC, Lee MB, Lee YJ, Weng T, Shih FY, Ma MH. Association of psychological distress with psychological factors in rescue workers within two months after a major earthquake. *J Formos Med Assoc* 2002;**101**:169–76.
- Shih FJ, Liao YC, Chan SM, Duh BR, Gau ML. The impact of the 9-21 earthquake experiences of Taiwanese nurses as rescuers. *Soc Sci Med* 2002;**55**:659–72.
- Yeh CB, Leckman JF, Wan FJ, Shiah IS, Lu RB. Characteristics of acute stress symptoms and nitric oxide concentration in young rescue workers in Taiwan. *Psychiatry Res* 2002;**112**:59–68.
- Tural U, Coskun B, Onder E, Corapcıoğlu A, Yildiz M, Kesepara C, Karakaya I. Psychological consequences of the 1999 earthquake in Turkey. *J Trauma Stress* 2004;**17**:451–9.
- Armen G. A mental health relief programme in Armenia after the 1988 earthquake: implementation and clinical observations. *Br J Psychiatry* 1993;**163**:230–9.
- Andrews B, Brewin CR, Philpott R, Stewart L. Delayed-onset posttraumatic stress disorder: a systematic review of the evidence. *Am J Psychiatry* 2007;**164**:1319–26.
- Breslau N, Davis GC, Andreski P, Peterson E. Traumatic events and post-traumatic stress disorder in an urban population of young adults. *Arch Gen Psychiatry* 1991;**48**:216–22.
- Carr VJ, Lewin TJ, Webster RA, Hazell PL, Kenardy JA, Carter GL. Psychosocial sequelae of the 1989 Newcastle earthquake: I. Community disaster experiences and psychological morbidity 6 months post-disaster. *Psychol Med* 1995;**25**:539–55.
- Chang CM, Lee LC, Connor KM, Davidson JR, Jeffries K, Lai TJ. Posttraumatic distress and coping strategies among rescue workers after an earthquake. *J Nerv Ment Dis* 2003;**191**:391–8.
- Chou FH, Su TT, Ou-Yang WC, Chien IC, Lu MK, Chou P. Establishment of a disaster-related psychological screening test. *Aust NZ J Psychiatry* 2003;**37**:97–103.
- Tainaka H, Oda H, Nakamura S, Tabuchi T, Noda T, Mito H. Workers' stress after Hanshin-Awaji earthquake in 1995—symptoms related to stress after 18 months [in Japanese; English abstract]. *Sangyo Eiseigaku Zasshi* 1998;**40**:241–9.
- Sumer N, Karanci AN, Berument SK, Gunes H. Personal resources, coping self-efficacy, and quake exposure as predictors of psychological distress following the 1999 earthquake in Turkey. *J Trauma Stress* 2005;**18**:331–42.
- Hobfoll SE. Conservation of Resources: a new attempt at conceptualizing stress. *Am Psychol* 1989;**44**:513–24.
- Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for post-traumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol* 2000;**68**:748–66.
- Chen CH, Lin SK, Tang HS, Shen WW, Lu ML. The Chinese version of the Davidson Trauma Scale: a practice test for validation. *Psychiatry Clin Neurosci* 2001;**55**:493–9.
- Lin MR, Huang W, Huang C, Hwang HF, Tsai LW, Chiu YN. The impact of the Chi-Chi earthquake on quality of life among elderly survivors in Taiwan: a before and after study. *Qual Life Res* 2002;**11**:379–88.
- Guo YJ, Chen CH, Lu ML, Tan HK, Lee HW, Wang TN. Posttraumatic stress disorder among professional and non-professional rescuers involved in an earthquake in Taiwan. *Psychiatry Res* 2004;**127**:35–41.
- Yang CH, Xirasagar S, Chung HC, Huang YT, Lin HC. Suicide trends following the Taiwan earthquake of 1999: empirical evidence and policy implications. *Acta Psychiatr Scand* 2005;**112**:442–8.
- Seplaki CL, Goldman N, Weinstein M, Lin YH. Before and after the 1999 Chi-Chi earthquake: traumatic events and depressive symptoms in an older population. *Soc Sci Med* 2006;**62**:3121–32.
- Chen CH, Tan HK, Liao LR, Chen HH, Chan CC, Cheng JJ, Chen CY, et al. Long-term psychological outcome of 1999 Taiwan earthquake survivors: a survey of a high-risk sample with property damage. *Compr Psychiatry* 2007;**48**:269–75.

48. Kuo HW, Wu SJ, Ma TC, Chiu MC, Chou SY. Posttraumatic symptoms were worst among quake victims with injuries following the Chi-chi quake in Taiwan. *J Psychosom Res* 2007;**62**:495–500.
49. Wu CH, Chen SH, Weng LJ, Wu YC. Social relations and PTSD symptoms: a prospective study on earthquake-impacted adolescents in Taiwan. *J Trauma Stress* 2009;**22**:451–9.
50. Tang TC, Yen CF, Cheng CP, Yang P, Chen CS, Yang RC, Huang MS, et al. Suicide risk and its correlate in adolescents who experienced typhoon-induced mudslides: a structural equation model. *Depress Anxiety* 2010;**27**:1143–8.
51. Yen CF, Tang TC, Yang P, Chen CS, Cheng CP, Yang RC, Huang MS, et al. A multidimensional anxiety assessment of adolescents after Typhoon Morakot-associated mudslides. *J Anxiety Disord* 2011;**25**:106–11.
52. Yang P, Yen CF, Tang TC, Chen CS, Yang RC, Huang MS, Jong YJ, et al. Post-traumatic stress disorder in adolescents after Typhoon Morakot-associated mudslides. *J Anxiety Disord* 2011;**25**:362–8.
53. Chen YL, Lai CS, Chen WT, Hsu WY, Wu YC, Wang PW, Chen CS. Risk factors for PTSD after Typhoon Morakot among elderly people in Taiwanese aboriginal communities. *Int Psychogeriatr* 2011;**23**:1686–91.