

HOSTED BY



Contents lists available at ScienceDirect

## International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Original article

## Prevalence and related factors of post-traumatic stress disorder among medical staff members exposed to H7N9 patients

Liling Tang <sup>a</sup>, Lingling Pan <sup>b,\*</sup>, Liping Yuan <sup>b</sup>, Lei Zha <sup>c</sup><sup>a</sup> Nursing Department, The First Affiliated Hospital of Wannan Medical College, Wuhu, 241000, An Hui Province, China<sup>b</sup> Intensive Care Unit, The First Affiliated Hospital of Wannan Medical College, Wuhu, 241000, An Hui Province, China<sup>c</sup> Intensive Care Unit, The Second People's Hospital of Wuhu, Wuhu, 241000, An Hui Province, China

## ARTICLE INFO

## Article history:

Received 24 June 2016

Accepted 7 December 2016

Available online 11 December 2016

## Keywords:

H7N9

PTSD

PCL-C

Medical staff

Stress symptoms

## ABSTRACT

**Objective:** This study aimed to evaluate the prevalence and related factors of post-traumatic stress disorder (PTSD) symptoms among doctors and nurses who were exposed to H7N9 patients during the H7N9 influenza epidemic. To provide scientific basis for promoting the physical and psychological health of these staff members.

**Method:** The 102 medical staff workers who were exposed to H7N9 patients were recruited through convenient sampling between January 2015 and May 2016. We used a self-reported questionnaire, the PTSD Checklist-Civilian Version (PCL-C), to evaluate the PTSD symptoms among doctors and nurses from an intensive care unit ( $n = 61$ ), a respiratory department ( $n = 20$ ), and an emergency department ( $n = 21$ ). We then analyzed the related factors.

**Results:** Around 20.59% of the tested doctors and nurses showed PTSD symptoms. The sample had a mean PCL-C score of  $30.00 \pm 9.95$ . The differences in the scores of doctors and nurses with different genders, ages, professional titles, contact frequencies, trainings, and experiences were statistically significant ( $P < 0.05$ ,  $P < 0.01$ ). Moreover, t-tests and one-way analysis of variance showed that nurses received higher scores than doctors, female participants received higher scores than male participants, and the participants with low professional title and high contact frequency, aged between 20 years and 30 years, with less than five years of work experience, having not received related training and with no related experience obtained higher PCL-C scores than the others ( $P < 0.05$ ,  $P < 0.01$ ).

**Conclusion:** The PTSD level of doctors and nurses after their exposure to H7N9 patients was high, which warrant further research. Health and medical institutions should pay attention to the physical and psychological health of these staff members.

© 2016 Chinese Nursing Association. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

A novel avian-origin influenza (H7N9) virus, which had not been documented anywhere in the world, was reported in China on March 30, 2013 [1]. A total of 131 laboratory-confirmed cases of H7N9 infection had been documented as of May 21, 2013, among which 36 resulted in death [2]. The number of fatalities related to the virus continues to increase. Most H7N9 patients showed signs of rapidly progressing lower respiratory tract infection, severe acute respiratory distress, septic shock, and multi-organ failure [3], while only a few manifested moderate illnesses [4]. The H7N9

outbreak not only raised public health concerns but also caused tremendous psychological distress, particularly among doctors and nurses who were exposed to H7N9 patients because these practitioners are among the most vulnerable population during a global event.

Exposure to trauma has been associated with psychological distress and post-traumatic stress disorder (PTSD) [5]. PTSD is a state of psychological unbalance following an exposure to traumatic events; people with PTSD often re-experience traumatic events, demonstrate avoidance behavior, and become irritable [6]. PTSD is a severe anxiety disorder that can result in serious disability across several domains of functioning [7]. PTSD symptoms have also been associated with poor quality of life [8]. Kessler [9] found a 7.8% lifetime prevalence of PTSD among the general population and a higher prevalence among the high-risk population. Medical staff

\* Corresponding author.

E-mail address: [coffeeseason@163.com](mailto:coffeeseason@163.com) (L. Pan).

Peer review under responsibility of Chinese Nursing Association.

members usually work in the front lines at times of epidemics and natural disasters, such as the severe acute respiratory syndrome (SARS) outbreak, earthquakes, and other fatal epidemics. Harsh environments, depressing settings, and workload pressure can even threaten the lives and impose psychological trauma on these workers and increase their sensitivity to PTSD. Ping Wu [10] evaluated the mental health of medical staff members who were involved in the SARS outbreak and found that about 10% of the respondents had experienced high levels of PTSD symptoms since the outbreak. Meanwhile, those respondents who had been isolated, worked in high-risk workplaces such as SARS wards, or had friends or close relatives who contacted SARS were two to three times more likely to develop high levels of PTSD symptoms than those who were not exposed to the virus. In conclusion, Ping Wu suggested further examinations and interventions on the mental health of medical staff members involved in the SARS outbreak.

Several studies have explored the development of PTSD symptoms during epidemics, such as SARS and H1N1. One study reported that probable PTSD cases were significantly more prevalent among older people and residents of SARS-affected regions, thereby indicating that age and degree of exposure could be treated as significant predictors of PTSD [11]. Another study reported the prevalence of PTSD, and they found that female gender, having H1N1 influenza, having family members, friends, or acquaintances with H1N1 virus, and feared of contracting the H1N1 virus were significant predictors of PTSD [12]. However, only few studies have investigated PTSD among doctors and nurses who have been exposed to H7N9 patients. Therefore, this study aims to provide information about the prevalence and related factors of PTSD symptoms among medical staff members who have been exposed to H7N9 patients during the H7N9 influenza epidemic as well as provide a basis for offering psychological guidance to these workers.

## 2. Aims

This study aimed to explore the level of PTSD symptoms, anxiety, and depression among medical staff members, including doctors, nurses, and interns, who were exposed to H7N9 patients. The relationship between these psychological distress symptoms and the characteristics of medical staff members, including their demographics, patient contact frequency, training, and related experience, was also explored.

## 3. Materials and methods

This study received ethical approval from the human research ethics board of the Wannan Medical College.

### 3.1. Samples and procedures

The medical staff workers in Anhui Province who were exposed to H7N9 patients were recruited through convenient sampling between January 2015 and May 2016. There were 3H7N9 patients admitted in there departments during that period. One was admitted in the respiratory department, one was admitted in the intensive care unit (ICU), and one was admitted in emergency department and was then transferred to the ICU two days later because of deterioration. Only those staff members who were working in departments admitting H7N9 patients, had frequent contact with these patients, had contact with their caregivers, worked in the front lines of their clinics, and participated voluntarily in this study were included in the final sample, while those staff members who were not actively working their jobs during the study period were excluded from the sample.

### 3.2. Measures

The participants were given a demographic information form that asked for their personal information (occupation, gender, age, professional title, and years of work experience), contact frequency with H7N9 patients, related training, and related experience. Afterward, the participants were asked to complete a self-reported questionnaire, the PTSD Checklist-Civilian Version (PCL-C), which was developed by an American PTSD research center following the Diagnostic and Statistical Manual of Mental Disorders-IV [13]. This scale includes 17 items for evaluating three clusters of PTSD symptoms, including intrusive symptoms (Criterion B 1–5 title), avoidance symptoms (Criterion C 6–12 title), and hyper-arousal symptoms (Criterion D 13–17 title). The study supported the value of the PCL-C as a screening instrument for PTSD. The reliability and validity of this instrument had been proven in previous research [13,14]. The total PCL, intrusive, avoidance, and hyper-arousal scores had Cronbach's alpha coefficients of 0.94, 0.85, 0.85, and 0.87, respectively, thereby indicating high internal consistency. The test retest correlation coefficients for the total PCL scores were 0.92 ( $P < 0.001$ ) for immediate re-takers and 0.88 ( $P < 0.001$ ) for participants with one-week retest intervals. The frequency of stress symptoms occurrence during the past four weeks was rated on a five-point scale ranging from 1 (not at all) to 5 (extremely). The total score ranged between 17 and 85, with a higher score indicating a higher chance for these patients to show PTSD symptoms. A previous study [15] suggested that the prevalence of PTSD symptoms could only be ascertained if the PCL-C scores were equal or greater than 38.

### 3.3. Investigation methods

The researchers explained the purpose and significance of the survey to the head nurses of each department. The participants voluntarily completed the scale. The researchers also explained to the participants that the survey results would be used exclusively for research purposes, that the information they would provide would not be leaked, and that they should provide their informed consent. The questionnaire can be completed anonymously between five and 6 min. We distributed 108 questionnaires, among which 102 valid questionnaires were returned, thereby resulting in a 94.44% response rate.

### 3.4. Statistical analysis

Statistical analysis was performed using SPSS 19.0 for Windows. The significance level was set at  $P < 0.05$ . The PTSD scores were expressed as mean  $\pm$  SD. Independent sample t-tests were performed to compare two groups (gender, related training, and related experience) on normally distributed variables. One-way analysis of variance was performed to identify the variables that were independently and significantly associated with the PCL-C scores.

## 4. Results

A total of 102 medical staff members participated in this study, among which 26 were doctors, 62 were nurses, and 14 were interns. 20.59% of these staff members satisfied the symptomatic criteria for PTSD. Among the participants, 20 were from the respiratory department, 61 were from the ICU, and 21 were from the emergency department. In terms of training and experience, 63 had related experience in treating H7N9 patients, while 40 had received related training (Table 1). The mean total PCL-C score of the sample was  $30.00 \pm 9.95$ , and the scores ranged from 17 to 74. Among the

**Table 1**  
Demographics of the study samples ( $n = 102$ ).

	Demographics	Samples	Percentage (%)
Occupation	Doctor	26	25.5
	Nurse	62	60.8
	Internship	3	2.9
	Student nurse	11	10.8
Gender	Male	34	33.3
	Female	68	66.7
Age	20–30 years	74	72.5
	31–40 years	19	18.6
	>40years	9	8.8
Education background	Master degree	9	8.8
	Bachelor degree	49	48.0
	Three-year college diploma	43	42.2
	Secondary vocational college diploma	1	1.0
Professional title	Primary	81	79.4
	Intermediate	16	15.7
	Sub-senior	5	4.9
Department	Respiratory department	20	19.6
	ICU	61	59.8
	Emergency department	21	20.6
Contact frequency	Doctors and nurses in charge	19	18.6
	Not responsible but frequent exposure	35	34.3
	Occasionally direct exposure	25	24.5
	No direct exposure	23	22.5
Received related training	Yes	40	39.2
	No	62	60.8
Related experience	Yes	63	61.8
	No	39	28.2

**Table 2**  
Scores of PCL-C in each dimension ( $n = 102$ ).

Dimension	Mean $\pm$ SD	Order
intrusive symptoms cluster	1.90 $\pm$ 0.67	1
avoidance symptoms cluster	1.68 $\pm$ 0.58	3
hyper-arousal symptoms cluster	1.74 $\pm$ 0.65	2

three dimensions of the PCL-C, intrusive syndrome received the highest score followed by hyper-arousal syndrome (Table 2).

Demographics (occupation, gender, age, professional title, and years of work experience), frequency of contact with H7N9 patients, related training, and related experience all influenced the PCL-C scores. Statistically significant differences were observed between the scores of doctors and nurses ( $P < 0.05$  or  $P < 0.01$ ), but not between those of interns and doctors or nurses. The male and female participants also showed statistically significant differences in their PCL-C scores. The participants aged between 20 years and 30 years received the highest PCL-C scores, and statistically significant differences were observed between the avoidance syndrome and total PCL-C scores of participants aged 31 years–40 years and those aged >40 years. Those participants with low professional titles and high contact frequency obtained higher PCL-C scores than the others. Those participants who received related training received lower intrusive syndrome, avoidance syndrome, and total PCL-C scores and higher hyper-arousal syndrome scores than those who did not receive such training. Those staff members with less than five years of work experience received higher scores in all dimensions than those who were working for more than five years (Table 3).

## 5. Discussion

China had experienced two waves of the H7N9 epidemic since March 2013. The increasing number of new H7N9 cases and the high mortality rate among H7N9 patients have attracted public attention, and other countries are becoming concerned about the

further spread of the virus outside of China. The hospital environment has a high risk of spreading infectious diseases, particularly the pandemic influenza H7N9. To the best of our knowledge, this study is the first to report the stress symptoms among doctors and nurses during the H7N9 influenza epidemic. Most of these practitioners experienced various stress reactions, and 20.59% eventually developed PTSD. Those doctors and nurses who were exposed to H7N9 patients were prone to developing severe anxiety and stress symptoms. Therefore, examining the PTSD symptoms of these medical workers must be prioritized. Exposure to traumatic events is the immediate cause of PTSD and is essential in diagnosing such disorder. Poton [16] found that medical workers usually manifest the symptoms of their patients after experiencing a traumatic event, but such symptoms were always ignored. Alexander [17] suggested that those people who were repeatedly exposed to traumatic events were prone to suffering all kinds of psychological problems.

The nurses obtained higher PCL-C scores than the doctors for several reasons. First, nurses come in contact with their patients more frequently than doctors while performing their basic nursing and life care tasks. Second, many nurses have limited knowledge on H7N9. Third, nurses feel nervous, panicky, and helpless when facing epidemics. Moreover, as reported in the literature, females are 2.38–2.49 times more likely to develop lifetime PTSD than males after their exposure to similar traumatic events [18]. Accordingly, the female respondents in this study showed higher PTSD levels than the male respondents.

The younger nurses received higher PCL-C scores than their older counterparts. Specifically, those nurses with work experience of less than three years have limited knowledge, skills, and self-regulation abilities, thereby increasing their sensitivity to PTSD. By contrast, those nurses with work experience of three to five years have a sufficient level of nursing abilities, can handle many tasks, and prone to developing PTSD. This phenomenon contrasted the findings of Lavoie [19].

Those medical staff members who participated in related training and had related experiences showed lower PTSD levels

**Table 3**  
Scores of PCL-C in different characteristics of medical staff ( $n = 102$ ).

Demographics		Intrusive symptoms cluster	Avoidance symptoms cluster	Hyper-arousal symptoms cluster	Total
Occupation	Doctor	1.56 ± 0.42	1.40 ± 0.33	1.50 ± 0.51	1.47 ± 0.38
	Nurse	2.03 ± 0.73 <sup>a</sup>	1.78 ± 0.63 <sup>a</sup>	1.84 ± 0.71 <sup>a</sup>	1.86 ± 0.63 <sup>a</sup>
	Interns	1.96 ± 0.64	1.80 ± 0.55	1.76 ± 0.51	1.83 ± 0.52
Gender	Male	1.69 ± 0.51	1.49 ± 0.39	1.49 ± 0.48	1.55 ± 0.40
	Female	2.00 ± 0.72 <sup>b</sup>	1.78 ± 0.63 <sup>b</sup>	1.87 ± 0.69 <sup>c</sup>	1.87 ± 0.63 <sup>c</sup>
Age	20–30 years	2.00 ± 0.72	1.78 ± 0.62	1.85 ± 0.69	1.87 ± 0.63
	31–40 years	1.59 ± 0.50 <sup>d</sup>	1.42 ± 0.39 <sup>d</sup>	1.44 ± 0.51 <sup>d</sup>	1.48 ± 0.40 <sup>d</sup>
	>40 years	1.71 ± 0.30	1.39 ± 0.21 <sup>d</sup>	1.47 ± 0.35	1.51 ± 0.25 <sup>d</sup>
Education background	Master degree	1.60 ± 0.50	1.36 ± 0.34	1.51 ± 0.70	1.48 ± 0.46
	Bachelor degree	1.87 ± 0.67	1.64 ± 0.56	1.71 ± 0.68	1.73 ± 0.58
	Vocational college diploma	2.00 ± 0.70	1.79 ± 0.61 <sup>e</sup>	1.82 ± 0.61	1.86 ± 0.60
Professional title	Primary	1.97 ± 0.71	1.76 ± 0.60	1.83 ± 0.68	1.84 ± 0.61
	Intermediate	1.59 ± 0.43 <sup>f</sup>	1.41 ± 0.33 <sup>f</sup>	1.51 ± 0.44	1.49 ± 0.38 <sup>f</sup>
	Sub-senior	1.68 ± 0.18	1.25 ± 0.15 <sup>f</sup>	1.12 ± 0.18 <sup>f</sup>	1.38 ± 0.13 <sup>f</sup>
Department	Respiratory department	2.00 ± 0.63	1.66 ± 0.52	1.80 ± 0.56	1.80 ± 0.53
	ICU	1.84 ± 0.69	1.67 ± 0.69	1.76 ± 0.69	1.75 ± 0.61
	Emergency department	2.00 ± 0.66	1.74 ± 0.61	1.63 ± 0.65	1.78 ± 0.59
Contact frequency	Doctors and nurses in charge	2.46 ± 0.86	2.13 ± 0.76	2.15 ± 0.87	2.23 ± 0.78
	Not responsible but frequent exposure	1.96 ± 0.58	1.68 ± 0.50	1.71 ± 0.56 <sup>g</sup>	1.77 ± 0.49
	Occasionally direct exposure	1.63 ± 0.42 <sup>g</sup>	1.53 ± 0.42 <sup>g</sup>	1.63 ± 0.47 <sup>g</sup>	1.59 ± 0.39 <sup>g</sup>
	No direct exposure	1.63 ± 0.57 <sup>g</sup>	1.50 ± 0.49 <sup>g</sup>	1.58 ± 0.64 <sup>g</sup>	1.56 ± 0.52 <sup>g</sup>
Received related training	Yes	1.71 ± 0.49	1.52 ± 0.44	2.04 ± 0.69	1.59 ± 0.44
	No	2.20 ± 0.81 <sup>h</sup>	1.94 ± 0.67 <sup>h</sup>	1.55 ± 0.55 <sup>h</sup>	2.04 ± 0.67 <sup>h</sup>
Related experience	Yes	1.69 ± 0.37	1.53 ± 0.37	1.58 ± 0.49	1.59 ± 0.34
	No	2.02 ± 0.78 <sup>i</sup>	1.78 ± 0.66 <sup>i</sup>	1.84 ± 0.72 <sup>i</sup>	1.87 ± 0.68 <sup>i</sup>
Working years	<3 years	2.05 ± 0.63	1.78 ± 0.58	1.83 ± 0.56	1.88 ± 0.54
	3–5 years	1.99 ± 0.93	1.83 ± 0.72 <sup>j</sup>	1.99 ± 0.90 <sup>j</sup>	1.92 ± 0.80 <sup>j</sup>
	5–10 years	1.82 ± 0.56	1.63 ± 0.49	1.64 ± 0.48 <sup>j</sup>	1.68 ± 0.46
	>10 years	1.64 ± 0.32 <sup>j</sup>	1.36 ± 0.23 <sup>j</sup>	1.36 ± 0.38 <sup>j</sup>	1.44 ± 0.27 <sup>j</sup>

Note: <sup>a</sup>  $P < 0.05$ , compared with doctor; <sup>b</sup>  $P < 0.05$ , <sup>c</sup>  $P < 0.01$ , compared with male; <sup>d</sup>  $P < 0.05$ , compared with 20–30 years; <sup>e</sup>  $P < 0.05$ , compared with master degree; <sup>f</sup>  $P < 0.05$ , compared with primary professional title; <sup>g</sup>  $P < 0.05$ , compared with doctors and nurses in charge; <sup>h</sup>  $P < 0.05$ , compared with yes; <sup>i</sup>  $P < 0.05$ , compared with yes; <sup>j</sup>  $P < 0.05$ , compared with <3years.

than those without training and experience. This result is in line with the fact that stress symptoms are related to the degree of exposure to a stressful event [20]. However, Declercq found no relationship between the frequency of encountering critical incidents and the occurrence of PTSD symptoms [21]. Jiahong [12] found that knowledge on H1N1 and exposure to H1N1 patients could not predict stress symptoms. However, those medical staff members with different education backgrounds and were working in different departments showed no differences in their PTSD levels.

This study has several potential limitations. First, the measures of stress symptoms used in this study may be vulnerable to inherent bias because of their self-reported nature. However, the PCL-C is a validated measure of stress symptoms [22]. Second, the participants were recruited through convenient sampling, thereby introducing some bias in the sample and reducing the generalizability of the results. Third, this study adopted a limited sample, that is, we only focused on those medical staff members who were exposed to H7N9 patients in some cities of Anhui Province between January 2015 and May 2016. Future studies must adopt a larger sample, perform multicenter randomized controlled trials, and use objective and quantitative measurements to evaluate PTSD levels.

## 6. Conclusions

In sum, doctors and nurses showed high levels of PTSD after their exposure to H7N9 patients, and 20.59% of them were eventually diagnosed with PTSD. Demographics (occupation, gender, age, professional title, and years of work experience), frequency of contact with H7N9 patients, related training, and related experience were all significantly associated with the PCL-C scores. The influencing factors identified in this study may effectively define

the group of medical staff members who are at high risk of developing PTSD when facing epidemics. This study analyzed the incidence and risk factors of PTSD among medical workers after their exposure to H7N9 patients. The associated factors must be understood to develop a theoretical account of PTSD in this population and to organize prevention programs that can offer hints on how these practitioners can cope with future epidemics.

## Authors' contribution

Tang Liling, Pan Lingling, Yuan Liping: Study Design.  
Tang Liling, Yuan Liping: Data Collection.  
Pan Lingling, Zha Lei: Statistical Analysis.  
Tang Liling, Pan Lingling, Zha Lei: Data Interpretation.  
Pan Lingling: Manuscript Preparation.  
Zha Lei: Literature Search.

## Conflict of interest

The authors declare that they have no conflict of interest.

## Acknowledgements

The authors would like to thank the department of statistics in Yi Ji Shan Hospital for assistance during the statistical analyses, and the head nurses of three departments (Intensive care unit, respiratory department, emergency department) for assistance of data collection.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://>

dx.doi.org/10.1016/j.ijnss.2016.12.002.

## References

- [1] Gao R, Cao B, Hu Y, Feng Z, Wang D, Hu W, et al. Human infection with a novel avian-origin influenza A (H7N9) virus. *N. Engl J Med* 2013;368(20):1888–97.
- [2] Number of confirmed human cases of avian influenza(H7N9)reported to WHO. Geneva:World Health Organization; May 2013. <http://www.who.int/influenza/human-animal-interface/influenza-h7n9/05-Report-WebH7N9Number.pdf>.
- [3] Chen Y, Liang W, Yang S, Wu N, Gao H, Sheng J, et al. Human infections with the emerging avian influenza A H7N9 virus from wet market poultry: clinical analysis and characterisation of viral genome. *Lancet* 2013;381(9881):1916–25.
- [4] Gao HN, Lu HZ, Cao B, Du B, Shang H, Gan JH, et al. Clinical findings in 111 cases of influenza A (H7N9) virus infection. *N. Engl J Med* 2013;368(24):2277–85.
- [5] Zhou X, Song H, Hu M, Li X, Cai Y, Huang G, et al. Risk factors of severity of post-traumatic stress disorder among survivors with physical disabilities one year after the Wenchuan earthquake. *Psychiat Res* 2015;228(3):468–74.
- [6] Blake DD, Weathers FW, Nagy LM, Kaloupek DG, Gusman FD, Charney DS, et al. The development of a clinician-administered PTSD scale. *J Trauma Stress* 1995;8(1):75–90.
- [7] Roussos A, Goenjian AK, Steinberg AM, Sotiropoulou C, Kakaki M, Kabakos C, et al. Posttraumatic stress and depressive reactions among children and adolescents after the 1999 earthquake in Ano Liosia. Greece *Am J Psychiat* 2005;162:530–7.
- [8] Parker AM, Sricharoenchai T, Raparla S, Schneck KW, Bienvenu OJ, Needham DM. Posttraumatic stress disorder in critical illness survivors: a metaanalysis. *Crit Care Med* 2015;43(5):1121–9.
- [9] Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch. General Psychiat*. 1995;52(7):1048–60.
- [10] Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. *Can J Psychiat Revue. Can De Psychiat*. 2009;54(5):302–11.
- [11] Lee TM, Chi I, Chung LW, Chou KL. Ageing and psychological response during the post-SARS period. *Aging Ment Health* 2006;10:303–11.
- [12] Xu J, Zheng Y, Wang M, Zhao J, Zhan Q, Fu M, et al. Predictors of symptoms of posttraumatic stress in Chinese university students during the 2009 H1N1 influenza pandemic. *Med Sci Monit* 2011;17(7):60–4.
- [13] Ruggiero KJ, Ben KD, Scotti JR, Rabalais AE. Psychometric properties of the PTSD checklist-civilian version. *J Trauma Stress* 2003;16(5):495–502.
- [14] Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD checklist (PCL). *Behav Res Ther* 1996;34(34):669–73.
- [15] Yang X, Yang H, Liu Q. The research on the reliability and validity of PCL-C and influence factors. *China J Health Psychol* 2007;15(1):6–9.
- [16] Paton D, Smith LM. Psychological trauma in critical occupations: methodological and assessment strategies. 1996.
- [17] Alexander DA, Klein S. Ambulance personnel and critical incidents: impact of accident and emergency work on mental health and emotional well-being. *Br J Psychiat* 2001;178(178):76–81.
- [18] Fullerton CS, Ursano RJ, Epstein RS, Crowley B, Vance K, Kao TC, et al. Gender differences in posttraumatic stress disorder after motor vehicle accidents. *Am J Psychiat*. 2001;158:1486–91.
- [19] Lavoie S, Talbot LR, Mathieu L. Post-traumatic stress disorder symptoms among emergency nurses: their perspective and a 'tailor-made' solution. *J Adv Nurs* 2011;67(7):1514–22.
- [20] Bulut S, Bulut S, Tayli A. The dose of exposure and prevalence rates of post traumatic stress disorder in a sample of Turkish children eleven months after the 1999 Marmara earthquakes. *Sch Psychol Int* 2005;26(1):55–70.
- [21] Declercq F, Meganck R, Deheegher J, Hoorde HV. Frequency of and subjective response to critical incidents in the prediction of PTSD in emergency personnel. *J Trauma Stress* 2011;24(1):133–6.
- [22] Sonis J, Gibson JL, de Jong JT, Field NP, Hean S, Komproe I. Probable post-traumatic stress disorder and disability in Cambodia: associations with perceived justice, desire for revenge, and attitudes toward the Khmer Rouge trials. *JAMA* 2009;302:527–36.