Predictors of symptoms of posttraumatic stress in Chinese university students during the 2009 H1N1 influenza pandemic

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Background:
The university environment poses a high risk of spreading infectious diseases, particularly the 2009 pandemic influenza H1N1, as it is a mass gathering place for youth. This study aimed to evaluate the predictors of stress symptoms among Chinese university students during the 2009 H1N1 influenza pandemic.

Material/Methods:
We used a self-reported questionnaire, the PTSD (posttraumatic stress disorder) Checklist-Civilian Version (PCL-C) to evaluate the stress symptoms among Chinese university students from Heilongjiang (n=455), Beijing (n=106), Shanghai (n=419) and Sichuan (n=102). We then analyzed the predictors of stress symptoms.

Results:
The proportion of university students enrolled in this study who met symptomatic criteria for PTSD was 2% (22 students). The mean PCL-C total score in the sample was 22.09±8.01. The correlational analyses revealed a significant positive relationship between the PCL-C total score and area, and university grade (P<0.01). Moreover, a negative relationship was found between the PCL-C total score and gender, having H1N1 influenza, having family members, friends or acquaintances having H1N1 influenza, and being afraid of H1N1 influenza (P<0.01). The regression analyses showed that in North China, female gender, having H1N1 influenza, having family members or acquaintances with H1N1 influenza, and being afraid of H1N1 influenza were significant predictors of the stress symptoms.

Conclusions:
In North China, female gender, having H1N1 influenza, having family members, friends, or acquaintances with H1N1 influenza, and being afraid of H1N1 influenza were significant predictors of the stress symptoms.

key words: H1N1 influenza • PTSD • PCL-C • students • stress symptoms • predictors

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BACKGROUND

The novel H1N1 Influenza outbreak in April 2009 was unprecedented in several respects including the new virus, the season of origin (spring, not late fall), and the cohort at risk for infection and death (children and young adults, not infants and the elderly) [1–4]. The pandemic H1N1 2009 virus is currently the dominant influenza strain in most parts of the world [5–8]. By March 2010, almost all countries had reported cases of infection and over 17,700 related deaths had been reported to the World Health Organization [9–12].

Posttraumatic stress disorder (PTSD) is a severe anxiety disorder that can result in severe disability across several domains of functioning [13-15]. PTSD usually occurs after exposure to any event that results in psychological trauma; however, most people so exposed do not develop PTSD [14,15]. To the best of our knowledge only 1 study has explored PTSD public during an epidemic [12]. That study reported the prevalence of probable PTSD cases was significantly higher in older people and in residents of severe acute respiratory syndrome (SARS)-prevalent regions, indicating that exposure degree and age might be significant predictors of PTSD. The H1N1 influenza pandemic was unusual in that most people could not avoid being affected in some way, since television news, the internet and newspapers were filled with the reports of infection and death related to it [1,5,6,11]. The outbreak of H1N1 influenza caused not only extraordinary public health concerns but also tremendous psychological distress, particularly among youth, as they are among the most easily affected group during a global event [10]. Universities are mass gathering places for youth, which has a high risk of spreading infectious diseases, particularly the 2009 pandemic influenza H1N1 [8,12,13]. Therefore, an opportunity arises for exploring PTSD in the context of an epidemic.

The present study was designed to explore 2 research questions regarding stress symptoms among Chinese university students during November-December 2009. First, what is the severity and prevalence of stress symptoms among the students? Second, are there predictors of distress in this sample? Regarding this question, it was hypothesized that greater overall stress symptom severity would be predicted by female gender, residence in North China (where more influenza H1N1 cases were reported in China), lower university grade, having less knowledge about H1N1 influenza, not receiving the vaccine, having H1N1 influenza, having family members, friends or acquaintances having H1N1 influenza, contacting people infected with H1N1 influenza, and being afraid of H1N1 influenza. The findings of this study will be important in planning for future outbreaks of emerging infectious diseases, especially in university students.

MATERIAL AND METHODS

This study received ethics approval from the Tongji University Human Research Ethics Board.

Samples and procedures

The subjects were recruited from 4 provinces of China, including Heilongjiang, Beijing, Shanghai and Sichuan during November-December 2009. The 4 provinces provide an adequate representation of socioeconomic status and geographical location of mainland China (Figure 1). In North China, Beijing is a relatively developed area, while Heilongjiang is less developed. Similarly, in South China, Shanghai is a developed area, while Sichuan is a developing. University students attending various classes in one of the major classroom buildings on campus in the above 4 provinces were recruited in this study to complete a questionnaire designed by the primary authors. The sample sizes from Heilongjiang, Beijing, Shanghai and Sichuan were 455, 106, 419, and 102, respectively. Demographics for the study samples from North China and South China are presented in Table 1. The procedure for sampling classes was not random because availability of university students depended on instructor permission and scheduling considerations.
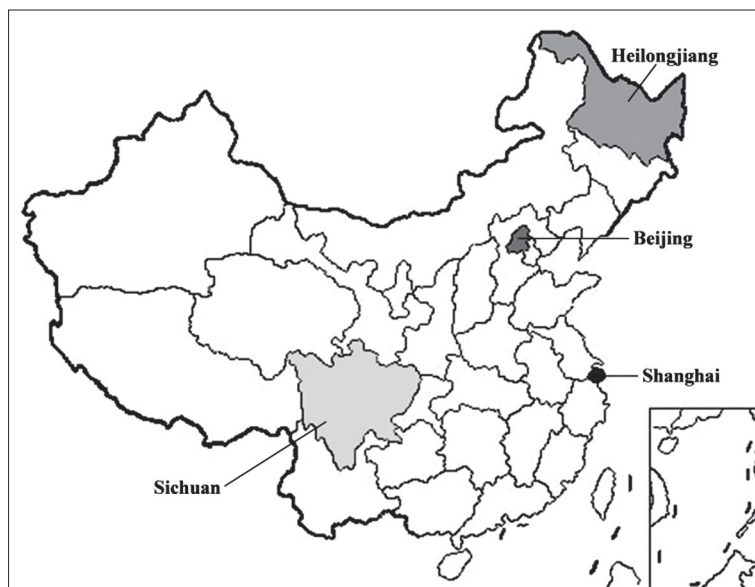
Figure 1. The Sample Provinces of China in this study.

Table 1. Demographics for the study samples from South China and North China.

	Demographics	Samples from South China (n=521)	Samples from North China (n=561)
Gender	Male	53.4% (278)	59.2% (332)
	Female	46.6% (243)	40.8% (229)
Age		20.4±1.2	20.1±1.0

Measures

All participants completed a 17-item self-reported questionnaire, the PTSD Checklist-Civilian Version (PCL-C), which assesses the intrusive, avoidant, and arousal *Diagnostic and Statistic Manual of Mental Disorders-IV* PTSD symptom clusters [14,15]. The frequency of stress symptoms occurrence during the past 4 weeks was rated on a 5-point scale ranging from 1 "not at all," through 3 "moderately," to 5 "extremely." This measure can be scored continuously by summing the values of each response or dichotomously using an algorithm that considers a corresponding response of "moderately" or greater as a symptom and follows the *Diagnostic and Statistic Manual of Mental Disorders-IV* diagnostic rules requiring at least 1 symptom from the intrusive symptoms cluster, 3 symptoms from the avoidance symptoms cluster and 2 symptoms from the hyper-arousal symptoms [14]. In the present study, the prevalence of symptoms consistent with a diagnosis of PTSD was ascertained using the recommended algorithm [15], whereas the relationship between participants' characteristics and the burden of psychologic symptoms was ascertained using the PCL score as a continuous variable.

Statistical analysis

The difference of gender composition was analyzed with the χ^2 test while age was sampled with the two-sample T test. P values <0.05 were considered as statistically significant. Reliability was assessed by using intraclass correlation coefficients and Pearson correlation coefficients. The scores of PTSD Reaction Index were expressed as mean±SD. In preparation for regression analyses examining predictors of stress symptoms, correlations (Pearson r) were calculated between hypothesized predictors and the PCL-C total score. The possible predictors were area (0=in South China; 1=in North China), gender (0=female;1=male), university grade (1=first year; 2=second year; 3= third year; 4= fourth year), having knowledge about H1N1 influenza (1= a lot; 2= some; 3= a little; 4= none), received vaccine (0= yes; 1= no), having H1N1 influenza (1= yes, still in treatment; 2= yes, but recovered; 3= no), having family members, friends or acquaintances having H1N1 Influenza (1= family members; 2= friends; 3= acquaintances; 4= no), contacting people infected with H1N1 influenza (0= yes; 1= no), being afraid of H1N1 influenza (1= very; 2= somewhat; 3= not). The significantly correlated variables for the PCL-C total score were entered simultaneously as predictors in the regression analyses.

RESULTS

There were 1082 people who participated in this study: 521 from South China and 561 from North China. No gender or age difference was observed between the 2 groups. (P>0.05, Table

1). Overall, the proportion of university students enrolled in this study who met symptomatic criteria for PTSD was 2% (22 students). Two of the 22 students had ever been infected with H1N1 Influenza. The mean PCL-C total score in the sample was 22.09, with a standard deviation of 8.01 and scores ranging from 17 to 58 (minimum possible score= 17; maximum= 58).

As exposure degree and age have been shown to be related to the prevalence of PTSD in public, the potential predictors explored in this study include area, university year (first year, second year, etc.), having H1N1 influenza, having family members, friends or acquaintances having H1N1 influenza, and contacting people infected with H1N1 influenza. In addition, gender, having knowledge about H1N1 influenza, and being afraid of H1N1 influenza were also included. The correlational analyses revealed a significant positive relationship between the PCL-C total score and area, and university grade (P<0.01, Table 2). In addition, a negative relationship between the PCL-C total score and gender, having H1N1 influenza, having family members, friends or acquaintances having H1N1 influenza, and being afraid of H1N1 influenza was also found in this study (P<0.01, Table 2). However, no correlation was found between PCL-C total score and having knowledge about H1N1 influenza, receiving the vaccine, and contacting people infected with H1N1 influenza (P>0.05, Table 2).

The regression analyses revealed that in North China, female gender, having H1N1 influenza, having family members, friends or acquaintances having H1N1 influenza, and being afraid of H1N1 influenza were significant predictors of the stress symptoms among Chinese university students during the 2009 H1N1 influenza (P<0.01, Table 3).

DISCUSSION

Children and young adults are the cohort at highest risk for H1N1 infection and death [5,6,8,16]. In addition, they are the most easily affected group during a global event [12,13]. However, no information is available about the stress symptoms among youth during the 2009 H1N1 influenza pandemic. The university environment has a high risk of spreading infectious diseases, particularly the 2009 pandemic influenza H1N1, as it is a mass gathering place for youth [12,13]. To the best of our knowledge, the present study is the first to report stress symptoms among university students during the 2009 H1N1 influenza pandemic. In general, many students experienced a variety of stress reactions to the 2009 H1N1 influenza, and about 2.0% of students developed PTSD.

As predicted, in North China, female gender, having H1N1 influenza, having family members, friends or acquaintances

Table 2. Pearson correlations among the PCL-C total score and possible predictors.

Variable	1	2	3	4	5	6	7	8	9	10
1. PCL-C total score	–	–0.09**	0.31**	0.08**	–0.02	–0.01	–0.14**	–0.15**	–0.04	–0.11**
2. Gender		–	–0.06	0.16	0.54	–0.01	0.02	0.08*	0.04	–0.12**
3. Area			–	–0.23**	–0.09**	–0.05	–0.06	–0.17**	0.03	0.11**
4. College grade				–	0.03	–0.08*	–0.01	–0.08**	–0.06*	0.04
5. Having knowledge about H1N1 Influenza					–	0.16**	0.05	0.07*	0.02	0.01
6. Taking vaccine						–	0.09**	–0.05	0.05	–0.01
7. Having H1N1 Influenza							–	0.06	0.14**	0.01
8. Having family members, friends, or others known having H1N1 Influenza								–	0.15**	–0.07*
9. Contacting people infected H1N1 Influenza									–	–0.04
10. Afraid of H1N1 Influenza										–

* $P<0.05$; ** $P<0.01$.

Table 3. Simultaneous regression analyses for predictors of posttraumatic stress symptoms.

Predictor variable	B	SE B	β	Model R2	Model F statistic
Gender	–1.37	0.45	–0.09*	0.17	F=37.52, P<0.001
College grade	1.71	0.31	0.16*		
Area	5.52	0.47	0.34*		
Having H1N1 Influenza	–4.49	1.09	–0.12*		
Having family members, friends, or others known having H1N1 Influenza	–0.75	0.28	–0.08*		
Afraid of H1N1 Influenza	–2.20	0.38	–0.17*		

* $P<0.01$.

having H1N1 influenza and being afraid of H1N1 influenza were significant predictors of stress symptoms in the current study. This result is in line with the facts that stress symptoms are related to the degree of exposure to a stressful event [17]. In addition, as reported, females are in general 2.38–2.49 times more likely to develop lifetime PTSD than men after exposure to similar traumas [18]. However, having knowledge about H1N1 influenza, receiving the vaccine, and contacting people infected H1N1 influenza were not predictors of the stress symptoms. University students of higher grade had more stress symptoms, which was contrary to our previous prediction. It is possible that university students of higher grades may be much more worried about the potential for 2009 H1N1 influenza to affect them directly when they begin their careers [14].

Several potential limitations of this study must be mentioned. First, the participants were not recruited by random sampling procedures, and therefore there may be some bias in the sample that reduces the ability of the results to be generalized. Second, the measures of stress symptoms used in the present study may be vulnerable to various types of inherent bias as it is a self-report instrument. However, the PCL-C has been widely proven to be a well validated measure of stress symptoms [19–21].

The current study supports other work indicating that individuals exposed to disasters only through media reports can also experience significant distress [20]. Despite this study's methodological shortcomings, it extends research in this area by showing the stress symptoms and the significant predictors of the symptoms among Chinese university students during the 2009 H1N1 influenza pandemic. Moreover, this study may contribute to understanding stress reactions among university students who were involved in the H1N1 influenza outbreak. Most importantly, the predictors found in this study may be extremely effective in defining the high risk group of the university students in similar influenza epidemics. Organizations will need to develop an integrated administrative and psychosocial response to the psychological challenges that are caused by future outbreaks of this nature [22].

CONCULSIONS

In conclusion, in North China, female, having H1N1 influenza, having family members, friends, or others known having H1N1 influenza, and afraid of H1N1 influenza were significant predictors of the stress symptoms.

Acknowledgements

Conflict of interest

The authors declare that they have no conflict of interest.

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