

Prevalence, Severity And Associated Risk Factors Of Post-Traumatic Stress Disorder, Among Medical Students, After 2019 Albania's Earthquake

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Abstract

Background: Post-traumatic stress disorder (PTSD) is known to be the most common and most harmful mental health disorder after a disaster, such as an earthquake. We aim to study the prevalence, severity, associated risk factors, and tendencies of medical students to develop PTSD after the 2019 earthquake in Albania.

Methods: A cross-sectional study was conducted in February 2020, three months after the earthquake in Albania. 437 medical students, who were present in Tirana or the surrounding areas hit by the earthquake, responded to the survey. The instrument used in our study to measure PTSD symptoms was the self-administered questionnaire PTSD Checklist – Civilian Version. Generalized Linear Model (GLM) with Gamma log link was used to calculate mean values of PTSD symptoms scores among individuals of different categories (socio-demographic and other predictive variables).

Results: Overall, the prevalence of PTSD was found to be 17.5%. Females had a higher prevalence of PTSD than males (20.7% vs. 2.6%), $p < 0.001$. In fully-adjusted GLM (gamma log link), mean PTSD symptoms were significantly higher among female students, those living with at least another person, and those who left out of dwelling after the earthquake compared with males, those living alone, and those who stayed in after earthquake [(30.1 vs. 23.0), (29.2 vs. 23.7) and (28.1 vs. 24.6), respectively]. Conversely, mean PTSD symptoms were significantly lower among atheists compared with students of different religions [(21.1 vs. (26.4-29.2)).

Conclusions: Three months after the earthquake, the prevalence of PTSD amongst medical students was relatively high. While the overall trend across the population and its socio-demographic sub-categories have shown no or moderate levels of severity, psychosocial and clinical care (when required) should focus on risky categories, such as the female gender.

Keywords: earthquake, PTSD, severity, medical students, Albania.

Background

Earthquakes are frequent natural disasters that, in addition to causing fatalities and property damages, are also a known risk factor for mental health disorders (1). From an epidemiological point of view, such natural disasters place the population under conditions of "natural experiment", being both detrimental to the consequences and favorable to the conduct of studies. It is now well documented that the earthquake may become a major risk factor for the onset of post-traumatic stress disorder (PTSD), anxiety and depression (2,3). Exposure to the threat of death, severe injury (as in the case of an earthquake) or sexual assault can lead to the onset of chronic mental disorder, such as PTSD (4). Among other mental health problems after a disaster, PTSD is the most common and most harmful (5). PTSD is characterized by re-experiencing, intrusive memories of the traumatic event, hyperarousal and reactivity symptoms, avoidance and cognition and mood symptoms (6). Given that the number of deaths due to earthquakes alone is approximately 27,000 deaths per year (7), the impact of their frequent occurrence on the negative consequences of global mental health might be very widespread. Studies have shown that the prevalence of PTSD varies by percentages, depending on the time after exposure, the dose-response effect, and the location of the earthquake (different populations) (1,8).

In the early hours of 26 November 2021, Albania was struck by a 6.4 magnitude earthquake centered west of the Tirana Capitol, trapping dozens of sleeping men, women and children in toppled apartment buildings, hotels and houses (9). The coastal city of Durres and the town of Thumane were among the hardest hit with 51 people dead, including seven children and nine hundred injured (9). Medical students in Albania study at the University of Medicine of Tirana, and live during the academic years in the capital

Tirana. Thus, this population constituted a contingent exposed to the earthquake (risk factor). We aim to study the prevalence, associated risk factors and tendencies of the student population to develop post-traumatic stress disorder after the earthquake, at different levels of severity.

Methods

Design

A cross-sectional study was conducted in February 2020, three months after the earthquake in Albania.

Participants and sampling

All participants were medical students (general medicine, pharmacy, stomatology, public health, post-graduate specialization, nursing) at the University of Medicine Tirana. The inclusion criteria in the study were defined as below: 1. Students should have studied at the University of Medicine, Tirana 2. The students should have been present in Tirana or the surrounding areas hit by the earthquake of November 26. 3. Students must have provided their consent to be part of the study. Assuming the highest proportion (50%), 95% confidence interval (CI), and margin of error of 5%, a minimum required sample size of 384 individuals was calculated. However, 448 individuals were included in the study, which increased the power of the study. 14 individuals were excluded from the study, because their answers to the questionnaire contained a significant part of missing values. The final sample size was 434 individuals.

Concerning the sampling method, the principal investigators identified clusters of students, according to the groups in the social networks, that consisted of all the students in a class.

Next, a "convenience sampling" was applied, from which information was gathered from participants who were satisfied that they were part of the study and met the above criteria.

Instrument and data collection

The instrument used in our study to measure PTSD symptoms was the self-administered questionnaire PTSD Checklist – Civilian Version (PCL-C) (10). PCL-C has 17 items that have response options ranging from 1 'Not at all' to 5 'Extremely', with a summed total symptom severity score (range 17-85) (11). PCL-C scores can be used for a presumptive diagnosis. Based on the instructions in the Questionnaire Manual, the cut-off value was selected as 45 and above for 'referring to the psychiatrist' as a "high severity" PTSD score (11). The PCL-C questionnaire has been modified in its questions to clarify that 'earthquake' was the alleged trauma causing mental health consequences. An integrated part of the questionnaire included questions about sociodemographic data (age, gender, marital status, religious belief, type of dwelling, number of people living in a dwelling, and whether individuals have stayed inside or moved out outside after the earthquake). The questionnaire, translated and modified in the Albanian language, was pretested in a contingent of 20 students, who were not included in the study. It has been demonstrated that PCL-C is a valid and reliable measure of PTSD symptoms, even in non-clinical individuals (12). The questionnaire had face and content validity and was evaluated to have a satisfactory level of reliability. Internal consistency of the questionnaire was measured as Cronbach's alpha at value 0.894.

Data analysis

Measures of central tendency and dispersion were calculated for the numeric variables (age and PTSD symptoms score). Frequencies and the respective percentages were calculated to

describe the category variables. Chi-square and Fisher's exact tests were used to examine the differences between categorical variables. Generalized Linear Model with Gamma log link was used to calculate mean values of PTSD symptoms score among individuals of different categories (age, gender, marital status, religious belief, type of dwelling, number of people living in a dwelling, and whether individuals have stayed inside or moved out outside after the earthquake). This model was chosen because the dependent variable (PTSD symptom score) always takes positive values (17-85) and in a "theoretically low prevalence-disease" population, its distribution is positively skewed. Initially, crude (unadjusted) mean values, their 95% confidence intervals (95% CIs) and p-values were calculated. Finally, multivariable-adjusted mean values, 95% CIs and p-values were calculated. A p-value of ≤ 0.05 was considered statistically significant. Statistical analysis was conducted using Statistical Package for Social Sciences, statistical software, version 21.0.

Results

On the whole, mean age in this study sample was 21.4 ± 3.7 years. 82.5% of participants were females and 17.5% were males. (Table 1) Most students (84.8%) were single, but few were married (7.8%), living together (6.9%), and divorced (0.5%). Regarding religious beliefs, most of the participants reported that they were Muslim (60.8%), 12.9% (Catholic), 10.1% (Bektashi), 9.2% (Orthodox), 3.2% (atheists) and 3.7% referred to other beliefs. 98.2% of the individuals lived with more than one resident, 1.8% lived alone and 56.7% lived in an apartment, while 43.3% lived in a home. After the earthquake, 50.7% of the students left their homes, while 49.3% of them stayed in their homes. (Table 1)

The mean scores of PLC-C cluster of symptoms such as re-experiencing, avoidance and hyper

arousal were 11.8 ± 3.30 (range: 5-25), 11.2 ± 4.1 (range: 7-35), and 10.7 ± 4.0 (range: 5-25) respectively.

Women had a higher prevalence of PTSD than men (20.7% vs. 2.6%), $p < 0.001$. Other significant differences were that no atheists or Bektashis

suffered from PTSD, while the prevalence among other denominations ranged from 12.5% to 21.2%, $p < 0.05$. 13.1% of the students who left their homes after the earthquake had PTSD, while 21.8% of those who stayed in their homes had PTSD, $p < 0.05$.

Table 1: Distribution of socio-demographic factors overall and according to presence or absence of PTSD

Variable	Total N (%)*	PTSD N (%)*	No PTSD N (%)*	P value†
Age:	276 (63.6)	54 (19.6)	222 (80.4)	
≤21 years	158 (36.4)	22 (13.9)	136 (85.1)	0.086
>21 years				
Sex:				
Male	76 (17.5)	2 (2.6)	74 (97.4)	<0.001
Female	358 (82.5)	74 (20.7)	284 (79.3)	
Marital status:				
Single	368 (84.8)	66 (17.9)		
Married	34 (7.8)	6 (17.6)	302 (82.1)	0.930
Divorced	2 (0.5)	0 (0.0)		
Cohabitation	20 (6.9)	4 (13.3)	28 (82.4)	
			2 (100)	
			26 (86.7)	
Religious faith:				
	14 (3.2)	0 (0.0)	14 (100.0)	
Not believe	264 (60.8)	56 (21.2)	208 (78.8)	
Muslim	40 (9.2)	8 (20.0)	32 (80.0)	
Orthodox	56 (12.9)	10 (17.9)	46 (82.1)	0.010
Catholic	44 (10.1)	0 (0.0)	44 (100.0)	
Bektashi	16 (3.7)	2 (12.5)	14 (87.5)	
Other				

Living cohabitation:				
Living alone	8 (1.8)	0 (0.0)	8 (100.0)	0.361
Living with 1 or more persons	426 (98.2)	76 (17.8)	350 (82.2)	
Type of dwelling:				
Apartment	246 (56.7)	38 (15.4)	208 (84.6)	0.205
House	188 (43.3)	38 (20.2)	150 (79.8)	
Displacement due to earthquake:				
Staying in	214 (49.3)	28 (13.1)	186 (86.9)	0.017
Leaving out	220 (50.7)	48 (21.8)	172 (78.2)	

*Absolute numbers and respective percentages

†P values from Chi-square or Fisher's exact tests

Overall, mean of PTSD symptoms among study participants was 33.7 ± 11.1 mg/dl, median value was 31.0 (interquartile range: 25.0–40.0). (Table 2) In terms of severity of symptom expression for PTSD, 32.3% did not refer to any severity, 11.1% to some symptoms, 37.8% to moderate symptoms

and 18.9% to high symptoms. If we consider 45 as the cut-off value (the sum of PTSD symptom scores), and values above 45 are cases that must be visited by a specialist psychiatrist, the prevalence of PTSD was found to be 17.5%. (Table 2)

Table 2: Distribution of PTSD symptoms levels among study participants

Variables	
PTSD symptoms	
Mean	33.7
Standard deviation	11.1
Median	31.0
Interquartile range	25.0-40.0
PTSD severity levels	
No severity	140 (32.3)
Some symptoms of PTSD	48 (11.1)
Moderately to high moderate	164 (37.8)
High	82 (18.9)
PTSD	
No	158 (82.5)
Present	76 (17.5)

Mean unadjusted PTSD symptoms were significantly higher among female students, those who were living in house, those who were living with one or more persons and those who left out of dwelling after earthquake compared with males, those who were living in apartment, those who were living alone and those who stayed in

after earthquake, respectively [(35.2 vs. 26.5), (35.1 vs 32.6), (33.8 vs 25.0), (35.6 vs 31.7)]. (Table 3) Conversely, unadjusted mean PTSD symptoms were significantly lower among atheists compared with students of different religions [(25.1 vs. (29.9-35.5)].

Table 3: Association of PTSD symptoms level with socio-demographic factors (Unadjusted Generalized Linear Model with gamma log link)

Variable	Mean (95% CI)*	P**	Severity level†
Age:			
≤21 years	34.1	0.241	M
>21 years	32.9		M
Sex:			
Male	26.5 (24.7-28.3)	<0.001	N
Female	35.2 (34.1-36.3)		M
Marital status:			
Single	34.0 (33.0-35.1)	0.218	M
Married	33.1 (29.7-36.8)		M
Divorced	29.9 (18.8-44.8)		S
Cohabitation	31.3 (27.1-33.9)		M
Religious faith:			
Not believe	25.1 (21.4-29.5)	<0.001	N
Muslim	34.7 (33.4-36.0)		M
Orthodox	32.6 (29.6-35.9)		M
Catholic	35.5 (32.8-38.5)		M
Bektashi	29.9 (27.3-32.8)		S
Other	31.3 (26.9-36.3)		M

Living cohabitation::				
Living alone				
Living with 1 or more persons	25.0	(20.1-31.1)	0.007	N
	33.8	(32.8-34.9)		M
Type of dwelling:				
Apartment	32.6	(31.4-33.9)	0.016	M
House	35.1	(33.5-73.7)		M
Displacement due to earthquake:				
Staying in	31.7	(30.4-33.0)	<0.001	M
Leaving out	35.6	(34.2-37.1)		M

*Mean values, 95% confidence intervals (95%CI) from the Generalized Linear Model with Gamma log link.

** P-values from the Generalized Linear Model with Gamma log link.

†Severity level: N-no severity, S-some PTSD symptoms, M-moderate severity

In fully-adjusted GLM (gamma log link), mean PTSD symptoms persisted significantly higher among female students, those who were living with one or more persons, and those who left out of dwelling after the earthquake compared with males, those who were living alone, and those who stayed in after earthquake [(30.1 vs. 23.0),

(29.2 vs. 23.7 and (28.1 vs.24.6), respectively]. (Table 4) Conversely, mean PTSD symptoms persisted significantly lower among atheists compared with students of a specific religion [(21.1 vs. (26.4-29.2)]. In general, the mean values of all variables entered in the adjusted model are slightly lower. (Table 4)

Table 4: Association of PTSD symptoms level with socio-demographic factors (Fully adjusted Generalized Linear Model with gamma log link)

Variable	Mean (95% CI)*	P**	Severity level†
Age:			
≤21 years	26.4 (23.1-30.2)		N
>21 years	26.2 (23.1-29.6)	0.779	N
Sex:			
Male	23.0 (20.0-26.3)	<0.001	N
Female	30.1 (26.5-34.1)		M

Marital status:			
Single	25.9 (23.0-29.2)		N
Married	26.0 (22.2-30.5)		N
Divorced	27.4 (18.0-41.6)	0.420	N
Cohabitation	25.9 (22.0-30.4)		N
Religious faith:			
	21.1 (17.3-25.7)		N
Not believe	28.9 (25.3-33.0)	0.001	S
Muslim	26.5 (22.7-30.9)		N
Orthodox	29.2 (25.2-33.9)		S
Catholic	26.5 (23.1-30.3)		N
Bektashi	26.4 (22.1-31.5)		N
Other			
Living cohabitation:			
Living alone			
Living with 1 or more persons	23.7 (19.2-29.2)	0.090	N
	29.2 (29.6-32.2)		S
Type of dwelling:			
Apartment	25.3 (22.3-28.7)	0.175	N
House	27.3 (23.9-31.2)		N
Displacement due to earthquake:			
Staying in	24.6 (26.7-30.3)	<0.001	N
Leaving out	28.1 (31.0-34.5)		S

*Mean values, 95% confidence intervals (95%CI) from the Generalized Linear Model with Gamma log link.

** P-values from the Generalized Linear Model with Gamma log link.

†Severity

level: N-no severity, S-some PTSD symptoms, M-moderate severity

Discussion

Since it has been proven that PTSD symptoms diminish over time (13), we sought to evaluate

PTSD in medical students three months after the earthquake. In our study, the prevalence of PTSD among medical students was 17.5%. This was consistent with the Wenchuan study, in which the

prevalence of PTSD among the target group of students was 14.1% one year after the earthquake (a slightly lower number, also due to the passage of time) (14). The PCL-C mean scores for the investigated medical students were 33.7 ± 11.1 . Assuming the instrument was used for screening, the population tends to exhibit a moderate level of PTSD symptoms. Although at a lower value of 26.8 ± 9.5 PCL-C scores (probably due to the later time of the study in Wenchuan), the majority of students of Wenchuan also exhibit moderate levels of PTSD (14). In terms of clusters of PTSD symptoms, our study showed that re-experience symptoms prevailed over avoidance and hyperarousal symptoms. In another study of Wenchuan 3 years after the earthquake, the symptoms of avoidance prevailed over those of hyperarousal and re-experiencing (15). Such changes in the predominance of symptoms could be explained by the effect of time after the earthquake.

Younger students (less than 21 years) had a higher prevalence of PTSD than older students (more than 21 years) (19.6% vs. 13.9%), which also reflected a higher mean score of PTSD symptoms. In a similar study in Nepal, increasing the age of students between 18 and 20 increased the odds of 1.19 times for PTSD post-earthquake, but without giving a clear picture for older students (15). However, the age differences in our study were not significant.

When comparing our study with a study with similar geographical characteristics (L'Aquila, Italy), population (young adults) and time (10 months after the earthquake), we find significant consistency in the gender difference (females had a higher prevalence of PTSD than males), $p < 0.001$ (in both studies) (16). Contrary to other studies (8,17), our findings showed that living alone is associated with fewer PTSD symptoms. However, these studies had participants of older individuals, whereas our study was conducted among medical students, who may have different lifestyles and behaviors. Other reasons for

explaining this association could be the small number of individuals who lived alone or any possible information bias.

The trends for the development of mild or moderate PTSD symptoms (measured as mean scores from the fully adjusted GLM model) were among women, Muslims, Catholics, individuals who did not live alone and individuals who left home after the earthquake. These are trends for mild and moderate PTSD symptoms and not risk factors, per se. It should be noted that the fully adjusted model attenuated the average score values for many variables, shifting the classification from moderate to mild PTSD symptoms.

Surprisingly, our study found that students who did not believe in God were associated with lower levels of PTSD than students of different religions. The results of another study disproved the protective role of religious explanation in elevated exposure to earthquake-related trauma (18). Further research may be pursued in this direction by having different target populations and subpopulations, which may not only change in terms of religious beliefs, but also to the attribute and/or blameworthiness of God in the explanation of the earthquake (as a PTSD risk factor).

In terms of marital status and dwelling type, the differences were not significant, even when the dependent variable (PTSD symptoms) was treated as categorical and even as numerical (GLM model). In a similar study, the data were conflicting between a lower prevalence of PTSD in those who had left home, but a higher mean score of PTSD symptoms of them, overall, contrary to those who stayed in their dwelling (19). Meanwhile, our study evidenced significant differences regarding the prevalence and mean score of PTSD symptoms, which were apparently higher among students who left their homes. This study was done for the first time in Albania and needs to be done again to look at the persistence

of PTSD symptoms in medical students over time, with the possibility of including larger populations.

Limitations

This study may have some limitations, such as the potential for selection bias (convenience sampling), information bias (self-reported questionnaire), the low number of individuals for some categories of variables, and cross-sectional design of the study.

Conclusions

Three months after the earthquake, the prevalence of PTSD amongst medical students

was relatively high. While the overall trend across the population and its socio-demographic sub-categories have shown no or moderate levels of severity, psychosocial and clinical care (when required) should focus on risky categories, such as the female gender.

Conflict of Interest Statement

The authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication

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