Iran Red Crescent Med J. 2019 October; 21(10):e95307. doi: 10.5812/ircmj.95307.

Published online 2019 October 28. **Research Article**

Prevalence of PTSD Symptoms Among Iranian Red Crescent Disaster Workers Participated in Rescue and Collection Operation of the Tehran - Yasuj Airplane Crash

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Received 2019 June 13; **Accepted** 2019 August 17.

Abstract

Background: The airplane crash is one of the most catastrophic events that may lead to extensive damage. The Tehran - Yasuj airplane crash was one of these disasters that took place on 18 February 2018 in Dena mountains in the south of Iran and resulted in the death of all 66 passengers and staff.
Objectives: This study aimed to investigate the prevalence of Post-Traumatic Stress Disorders (PTSD) among rescuers participating in the Tehran - Yasuj airplane crash operation.
Methods: This study was conducted on 210 rescuers who participated in the rescue and collection operation of the Tehran - Yasuj airplane crash. A snowball method was used for sampling. Data collection was done using the PTSD Checklist for DSM-5 (PCL-5) and structured interviews. Correlation coefficients, linear regression, and Z-test were used for data analysis.
Results: The prevalence rate of PTSd t according to PCL-5 and interview was 25%. The severity of the criteria was significantly different between different groups of education levels and duration of participation.
Conclusions: The results showed a high rate of PTSD among Iranian Red Crescent volunteers, who had participated in the rescue and collection operation. The most severe symptoms were super-alert", watchful or on guard and this severity was different according to different duration of participation in the operation and education levels

Keywords: Aircraft, Airplane, Crash, Death, Disaster, Emergency Medical Services, Post-traumatic, Iranian Red Crescent, Rescue, Stress Disorders, Wakefulness

1. Background

Traumatic events can exert aversive psychological and physiological effects on their victims, as well as first responders such as Emergency Medical Service (EMS) personnel, firefighters, and police officers (1). The first responders are often confronted with a large body of extreme and serious traumatic events on a regular basis, thus enduring high daily stress resulting from direct and indirect traumas that may induce Posttraumatic Stress Disorder (PTSD) symptoms in them (2-5). They always experience incidents that satisfy the DSM-5 stressor criterion for PTSD diagnosis, especially numbers 2 and 4 in the A criterion (6). Numerous studies have reported a high rate of PTSD prevalence among these groups of vulnerable people and showed that this problem was a major source of public and workplace-related health challenges (7-9).

Findings from cross-sectional and retrospective studies show that the prevalence of PTSD varies extremely among different groups of these responders according to the type of duty and other demographic variables (10). For example, the estimated prevalence rates were 5.4% - 57% for firefighters (11-15), 8.9% - 32% for police officers (16-22), and 4% - 64% for EMS personnel (1, 23-25), compared to the general population with 1% to 11% (26). Accordingly, a number of researchers claim that EMS personnel are at the top of exposure and its psychological and physical consequences (27, 28).

One of the most tragic and traumatic disaster events is an airplane crash that can result in vast destruction and fatality (29). The Tehran - Yasuj airplane crash is one of these disasters that took place on 18 February 2018 in Dena mountains in the south of Iran and caused the death of 66 passengers. During four months, 220 Iranian Red Crescent

Disaster Workers (RCDW), as first responders, participated in an approximately 120-day rescue and collection operation in this area. They confronted with a huge body of repeated exposure to traumatic and tragic scenes of corpses and wreckages. It is worth mentioning that the Iranian Red Crescent Organization (named Red Crescent Organization in Iran) is a non-governmental international organization with approximately 17 million volunteers and a long history of responding to disasters (30).

Despite a growing body of studies about the traumatic nature of events and their adverse impacts on first responders such as firefighters, police officers, and EMS personnel, just a few studies (31) have paid attention to the mental health of Iranian Red Crescent volunteers. On the other hand, as far as we know, no published data are yet available on thousands of government and non-government first responders, especially Iranian Red Crescent volunteers, who respond to air crashes.

2. Objectives

This study was established to determine the prevalence and severity of PTSD symptoms among RCDW within six months after the air crash and to discover possible demographics and other characteristics that predicting PTSD following the air crash.

3. Methods

3.1. Participants

The sample comprised all Iranian Red Crescent volunteers (EMS and rescue personnel) who participated in the rescue and collection operation of the Tehran - Yasuj airplane crash. As mentioned before, the Tehran - Yasuj airplane crashed on 18 February 2018 in Dena mountains in the south of Iran. In this catastrophic accident, all 66 passengers died, and because of formidable access in the mountainous region and heavy snow covering the area, the collection and identification of passenger bodies lasted four months.

Using recording data and snowball sampling, 220 persons were identified, and finally, 210 persons responded to our invitation. All the participants had at least one-day experience of exposure to threatened death, as mentioned in numbers 2 and 4 of A criterion in DSM-5. Table 1 shows the demographic data of the sample. All participants were male and were from various regions of Iran. The mean age of the group was 33.12 (SD = 8.29; range 19 - 58 years).

3.2. Measures

3.2.1. PTSD Checklist for DSM-5 (PCL-5)

The PTSD Checklist for DSM-5 (PCL-5) is a 20-item self-report measure that assesses the presence and severity of PTSD symptoms (32). It measures four symptom clusters B to E in DSM-5, including Intrusion (five items; B), Avoidance (two items; C), Negative alterations in cognition and mood (seven items; D), and Alterations in arousal and reactivity (six items; E). The items are rated from 0 (not at all) to 4 (extremely) and are summed for a total severity score (33, 34). The total score ranges from 0 to 80, with a recommended cutoff of 33 for PTSD caseness. In an initial study, scores on PCL5 showed strong internal consistency (α = 0.94), test-retest reliability (r = 0.82), and convergent (rs = 0.74 - 0.85) and discriminant (rs = 0.31 - 0.60) validity. A number of studies have supported these psychometric properties in different populations (35, 36). The Persian version of this scale was assessed in Iran for psychometric properties and yielded acceptable validity and reliability scores (37).

3.2.2. Structured Clinical Interview for DSM-5 (SCID)

The Structured Clinical Interview for DSM-5 (SCID-5) is a semi-structured interview guide for making DSM-5 diagnosis (38). The SCID is widely used in research studies, including in the traumatic stress literature. In addition, among traumatic stress professionals, the SCID's PTSD module was found to be the second most widely used clinician-administered PTSD instrument (39). Its validity and reliability were reported in a number of papers (38-40)

3.3. Procedure

Using the data records and snowball sampling, 220 Iranian Red Crescent volunteers, who had participated in the rescue and collection operation in the Tehran - Yasuj airplane crash, were identified. Six months after the end of the operation, PCL-5 was sent to them by WhatsApp network system. Finally, 210 persons responded to our invitation and completed the scale. However, eight questionnaires were removed because of incomplete data. The score of 33, as proposed by Weathers (32), was selected as the cutoff point. Then, a clinician or trained mental health professional that was familiar with the DSM-5 classification and diagnostic criteria administered the SCID to all the participants who returned the scale through phone calls. Finally, the prevalence rate of PTSD was calculated as the percentage of participants meeting the criteria of this disorder according to the SCID, which required at least one symptom from B, one from C, two from D, and two from E.

Data were analyzed using the IBM SPSS Statistics Software, version 20.0 (IBM Corp., Armonk, N.Y., USA). A de-

scriptive analysis was done to determine the characteristics of the sample. Correlation coefficients were used to assess multicollinearity and the strength of bivariate relationships. Linear regression models were used to determine the predictive value of demographic characteristics for PTSD status. The Z-test for two proportions was used to compare the prevalence rate in the present study and previous studies (1).

4. Results

4.1. Sample Demographic Data

The descriptive statistics of the scale are presented in Table 1. The sample size was 202 (100% male). The mean age of the group was 33.12 years (SD = 8.29; range 19 - 58 years). The majority of the participants (50%) were in the range of 25 to 34. The result showed that 59% of the participants were married and the average duration of participation in the rescue and collection operation was 12.77 days (SD = 22.64; range 1 - 120 days). In terms of education level, approximately half of the sample (48%) had bachelor degrees.

4.2. Data Screening for the Prevalence of PTSD and Severity of Its Criteria

In this study, 100% of the participants had experienced at least one-day exposure to the traumatic event of an airplane crash according to criterion A in DSM-5. As presented in Table 1, the mean total scores in PCL-5 was 14.33 (SD = 12.85; range 0 - 66). The highest and the lowest mean scores were in subscales E (5.22 $\pm$ 5.04 with six items; mean score 0.9) and D (3.45 $\pm$ 4.54 with seven items; mean score 0.49), respectively. Table 2 shows the top and bottom items in terms of mean scores in the present study. Item 17 with score 2.02 and item 13 with score 0.31 gained the maximum and minimum mean scores among the 20 items, respectively. All four lowest scores (Table 2) were related to D criterion items. There was no significant difference between participants in various groups of marital status and work degree in terms of total and subscales scores.

As presented in Table 1, there were significant differences in the mean scores of total scale and B, D, and E criteria between various groups of education level. Moreover, the scores of all criteria were significantly different between various groups of the duration of participation. This was the case for the variable of age only in the C criterion. In the variable of education, the maximum total score was related to the bachelor degree group (16.67 $\pm$ 13.71), and the minimum score was related to up to high school degree group (8.83 $\pm$ 8.3). The maximum and minimum total scores in the variable of the duration of participation were related to 41 - 60 days (36.25 $\pm$ 16.92) and up to 20 days (12.61 $\pm$ 12.39) groups, respectively. In the case of prevalence rate, there was no significant difference between different groups of participants according to marital status, education level, age, and work degree (Table 3).

Postulating score 33 as the cutoff point according to PCL-5, as proposed by Weathers et al. (32), the prevalence rate of PTSD was 11% (Table 3). Using SCID-5, 25% of the sample met the criteria for PTSD. As presented in Table 4, the prevalence rate of PTSD in this study was significantly different from the majority of the epidemiologic studies in other first responders.

Univariate logistic regression for demographic variables showed that only the duration of participation variable significantly predicted probable PTSD (PCL-5 scores) severity (F (1,199) = 35.62 and P = 0.001; total R^2= 0.15, P = 0.01, Beta= 0.39, T = 11.04, and P = 0.0001). The other variables such as, marital status, education level, age, and work degree, did not reveal any significant predictive value for the severity and prevalence of PTSD.

5. Discussion

The current study was designed, for the first time, to investigate the prevalence of PTSD among RCDW participated in an airplane crash operation and some factors related to such stress symptoms using a screening scale and structured clinical interviews. As far as we know, this study is unique in its kind. We found a significant difference between the estimated prevalence of PTSD according to screening (11%) and assessment (25%) tools; because of the deep and professional assessment of patients in interviews as a golden standard, it seems that the 25% prevalence is more reliable (43, 44).

Although previous studies of PTSD found rates ranging from 1% to 10% in the general population (26, 45), this study showed a rate of 25% in the RCDW group according to interviews. Therefore, this study showed a higher prevalence rate of PTSD in the RCDW group than in the general population. This first responder group of people was working in a long-time operation and experienced daily traumatic events and deathful stress. Experiencing a repeated exposure (from 3 to 120 days) to hardship, destroyed and disintegrated bodies, scary and horrible scenes, directly deathful threat because of cold and snowy weather, and other traumatic experiences could justify this prevalence rate.

Previous studies (Table 4) also reported the prevalence rate of PTSD from 15 to 65% in EMS personnel (1, 24, 41), 5.4% to 57% in firefighters (12, 13, 42), and 9% to 32% in police

Table 1. Sample Descriptive Data[a]

Variables	Number	B	C	D	E	Total
Marital status						
Married	118 (59)	3.66 (3.97)	1.27 (1.84)	3.83 (5.13)	5.60 (5.68)	14.45 (16.5)
Single	83 (41)	4.44 (4.37)	1.41 (1.83)	3.19 (4.07)	5.30 (4.58)	14.33 (12.85)
Total		4.12 (4.21)	1.35 (1.83)	3.45 (4.54)	5.42 (5.04)	14.38 (13.71)
T	201	1.3	0.54	0.99	0.41	0.06
P value		0.2	0.59	0.32	0.68	0.95
Education						
Up to high school	48 (24)	2.73 (2.98)	0.88 (1.47)	1.85 (2.85)	3.37 (93.22)	8.83 (8.3)
Technician	35 (17)	3.91 (.397)	1.14 (1.6)	3.37 (4.51)	5.53 (5.47)	14.18 (14.17)
Bachelor	97 (48)	4.78 (4.58)	1.57 (1.2)	4.06 (4.88)	6.07 (5.33)	16.48 (14.62)
Postgraduate	21 (11)	4.57 (4.65)	1.76 (2.1)	4.43 (5.41)	6.9 (5.33)	16.67 (15.6)
Total	201	4.12 (4.21)	1.35 (1.83)	3.45 (4.54)	5.42 (5.04)	14.38 (13.71)
F		2.73	2.06	2.98	3.96	3.96
P value		0.045	0.10	0.03	0.009	0.009
Age groups						
18-24	28 (14)	2.57 (2.91)	0.57 (1.07)	2.21 (3.66)	4.82 (5.74)	10.18 (12.03)
25-34	100 (50)	4.23 (3.84)	1.42 (1.9)	4.01 (5.15)	5.88 (5.1)	15.63 (14.31)
35-44	53 (26)	4.60 (5.08)	1.34 (1.74)	3.13 (3.67)	5.36 (4.48)	14.43 (12.86)
44+	20 (10)	4.45 (4.8)	2.1 (2.34)	3.25 (4.31)	4.15 (5.15)	13.95 (14.77)
Total		4.12 (4.21)	1.35 (1.83)	3.45 (4.54)	5.42 (5.04)	14.38 (13.71)
F		1.57	2.92	1.30	0.83	1.16
P value		0.2	0.035	0.27	0.48	0.33
Duration of participation (days)						
Up to 20	180 (89)	3.59 (3.82)	1.7 (1.67)	2.93 (4.01)	4.88 (4.75)	12.61 (12.39)
20 - 40	7 (3)	9 (6.81)	2.43 (2.22)	3.71 (2.87)	7 (4.93)	22.14 (13.829)
41 - 60	4 (2)	10.5 (3.32)	3.25 (3.4)	10.75 (8.42)	11.75 (4.11)	36.25 (16.92)
60+	10 (5)	7.6 (3.69)	3.1 (2.33)	9.7 (6.11)	11.4 (5.27)	31.8 (15.33)
Total		4.12 (4.21)	1.35 (1.83)	3.45 (4.54)	5.42 (5.04)	14.38 (13.71)
F		10.79	6.33	12.33	8.58	12.31
P value		0.0001	0.0001	0.0001	0.0001	0.0001
Work degree						
Degree 1[b]	37	4.92 (4.2)	1.51 (2.13)	3.77 (4.7)	6.03 (5.71)	16.42 (14.2)
Degree 2[c]	82	4.04 (3.8)	1.28 (1.72)	3.24 (4.36)	5.3 (5.02)	13.87 (12.71)
Degree 3[d]	49	3.92 (4.84)	1.41 (1.20)	3.91 (5.35)	5.83 (4.98)	15.08 (13.2)
Total	168	4.2 (4.21)	1.37 (1.88)	3.55 (4.72)	5.62 (5.14)	14.38 (14.01)
F		0.7	0.21	0.35	0.31	0.44
P value		0.5	0.81	0.7	0.73	0.64

[a] Values are expressed as No. (%).
[b] Less than three years.
[c] 3 - 6 years.
[d] More than six years.

officers (17, 20, 21). As mentioned previously and as far as we know, no published data are yet available on first responders, especially Iranian Red Crescent volunteers who participated in the rescue operation in the air crash disaster events. However, compared to the prevalence rate of the disorder among other first responders (e.g., firefighters, police officers, and EMS personnel), the prevalence rate in this group seems to be moderate. As mentioned, this rate increased with respect to increasing the length of participation in the rescue and collection operation. In other words, if we consider the different rates of PTSD according to the length of participation in the operation, the preva-

Table 2. Top and Bottom Items in the Study Sample

Items	5 Top Items		
	Mean	SD	Subscale
17	2.02	1.47	E
1	1.21	1.1	B
4	1.04	1.24	B
8	0.85	1.07	D
18	0.831	1.10	E
	5 Bottom Items		
13	0.31	0.73	D
11	0.34	0.63	D
12	0.41	0.84	D
14	0.45	0.80	D
5	0.48	0.84	B

lence rate of this group may be the same as prevalence in other groups. In summary, we can say that considering different variables, this rate is approximately the same as the rate of other first responder people.

According to present study (Tables 1 and 2), the most sever symptom (according to 20 items of scale) in this group of people were being "super-alert", watchful or on guard (2.2). Among all criterion, the criterion of E with mean of 0.90 (5.42 from 6 items) was also the most severe criterion. The criterion B with mean of 0.89 and Criterion of D with mean of 0.49 were at second and the bottom points of severity according to scale, respectively. These findings, to some extent, are consistent (46) and inconsistent (1, 47-50) with previous studies. This ambiguity could be justified by different types of traumatic events (47). In other words, different types of traumatic events could increase different criteria scores for their victims.

Finally, the findings of this investigation revealed that the severity of criteria could be significantly different between different groups of participants according to education and duration of participation variables. Accordingly, people with higher education levels and longer duration of participation reported a higher prevalence rate of disorder. These findings are consistent with previous studies (2, 51, 52). The higher rate of prevalence among the more educated group may be related to the longer duration of participation in the operation because more skilled people contributed more to exploration activities. In spite of these reported correlations, linear regression showed that the duration of participation variable was the only significant predictor of PTSD in RCDW. In other words, the longer they stayed there, the more they were affected by PTSD. Therefore, the rate of disorder was approximately more than 80% in people with more than 40 days of participation in the operation. The participants were working in an area with a huge number of traumatic scenes, and as mentioned before, they experienced a repeated exposure (from 3 to 120 days) to hardship, destroyed and disintegrated bodies, scary and horrible scenes, directly deathful threat because of cold and snowy weather, and other traumatic experiences, which could justify this prevalence rate.

5.1. Conclusions

In conclusion, the present study made a significant contribution to research on PTSD, especially in first responder personnel participating in disaster and traumatic events by investigating the prevalence rate of PTSD among RCDW within six months after an air crash. The results showed a high rate of PTSD (25%) among RCDW and also showed the duration of participation variable as a strong predictor for this rate. To the best of our knowledge, this is the first study in this area.

Acknowledgments

This research was supported by the Social Determinants of Health Research Center, Yasuj University of Medical Sciences. We thank the participants in this study who made this study possible by sharing their information through responding to questions.

Footnotes

Authors' Contribution: Shirali Kheramin and Iman Shakibkhah conceived and designed the study, supervised the conduct of the study and data collection. Shirali Kheramin collected the data. Iman Shakibkhah wrote the first and final draft of the manuscript and involved in data management and analysis. Majid Ashrafganjooie Revised the final draft and took responsibility for the final version. All authors contributed to reviewing and revising the manuscript.

Conflict of Interests: The authors declare that they have no conflict of interest.

Ethical Approval: This study was approved by the Yasuj University of Medical Sciences Ethics Committee, Yasuj, Iran.

Funding/Support: The authors declare no financial support.

Patient Consent: The participants provided written informed consent for the publication of this report.

Table 3. Prevalence of PTSD in the Sample According to the Scale and Interviews

	Number (%)	Scale		SCID-5	
		Positive	Percent	Positive	Percent
Marital status					
Married	118 (59)	14	9.8	29	24.6
Single	83 (41)	8	11.9	21	25.3
Total	202	22	11	50	24.9
Pearson χ^2		0.22		0.014	
P value		0.4		0.91	
Education					
Up to high school	48 (24)	1	2.1	7	14.6
Technician	35 (17)	5	14.7	7	20
Bachelor	97 (48)	13	13.4	31	32
Postgraduate	21 (11)	3	14.3	5	23.8
Total	201	22	11	50	24.9
Pearson χ^2		5.2		5.78	
P value		0.16		0.12	
Age groups					
18 - 24	28 (14)	2	7.1	5	17.9
25 - 34	100 (50)	11	11.1	25	25
35 - 44	53 (26)	7	13.2	14	26.4
44+	20 (10)	2	10	6	30
Total	201	22	11	50	24.9
Pearson χ^2		0.7		0.78	
P value		0.87		0.34	
Duration of participation (days)					
Up to 20	180 (89)	14	7.8	37	20.6
20 - 40	7 (3)	1	14.3	2	28.6
41 - 60	4 (2)	2	50	4	100
60+	10 (5)	5	50	7	70
Total	201	22	11	50	24.9
Pearson χ^2		23.68		24.82	
P value		0.002		0.0001	

Table 4. Comparison of Prevalence Rates Reported in the Present Study (According to Interviews) and Previous Studies (Z-Test)

Study	First Responder Groups	Sample Size	Percentage	Z-Test	P Value
Present study 1	RCDW group	202	22		
Present study 2		202	25		
Jonsson et al. (41)	EMS	223	15	2.56	0.01
Kharamin et al. (1)	EMS	110	47	3.95	0.001
Jacoub et al. (24)	EMS	189	64.5	7.86	0.00001
Kim et al. (12)	Firefighter	39562	5.4	12.19	0.0001
Bezabh (42)	Firefighter	603	19.9	1.53	0.12
Alghamdi (13)	Firefighter	200	57	6.52	0.0001
Marchand (17)	Police	83	9	3.05	0.002
Robinson (21)	Police	100	13	2.40	0.02
Asmundson (20)	Police	138	32	1.41	0.16

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