



Research article

Perceived stress and coping strategies after unsuccessful cardiopulmonary resuscitation among pre-hospital emergency technicians: A multicenter cross-sectional study

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ARTICLE INFO

Keywords:

Perceived stress

Coping strategies

Unsuccessful cardiopulmonary resuscitation

Emergency medical services

ABSTRACT

Background: Effective stress management after unsuccessful cardiopulmonary resuscitation (CPR) requires the determination of perceived stress and identification and reinforcement of effective coping strategies. Therefore, the present study was conducted to determine perceived stress and coping strategies after unsuccessful CPR for the first time among Iranian pre-hospital emergency technicians.

Methods: A cross-sectional, descriptive, correlational, multicenter study was conducted in 2022. The research population included all pre-hospital emergency technicians working in 44 urban, road, and aerial pre-hospital emergency stations in 22 counties of Ilam Province, west of Iran. A total of 374 technicians worked in these stations, which were included in the study by census method according to the inclusion criteria. The data collection tools were the Questionnaire of perceived stress after unsuccessful CPR and Brief Coping Orientation to Problems Experienced (COPE) Inventory. The collected data were analyzed with SPSS software version 27 using descriptive and analytical statistics (Pearson correlation test, multiple linear regression analysis, independent sample T-test, and ANOVA) at a significance level of $p \leq 0.05$.

Results: The perceived stress was at a moderate level with a mean score of 65.56 ± 14.21 . Among six coping strategies, problem-focused coping had the highest (3.01 ± 0.59) and denial had the lowest mean value (1.94 ± 0.79). Perceived stress had a significant direct relationship with 5 coping strategies, including problem-focused coping, support-focused coping, emotion-focused coping, self-distraction, and religion ($p < 0.05$). The strongest relationship was found between perceived stress and self-distraction followed by emotion-focused coping. According to the results of multiple regression analysis, emotion-focused coping and self-distraction had predictive roles.

Conclusion: The participants used different coping strategies to cope with the stress of unsuccessful CPR. The most common coping mechanisms used by the participants were problem-focused, emotion-focused, and support-focused coping. Pre-hospital emergency officials can assist pre-hospital emergency technicians in coping with occupational stress, including the stress of unsuccessful CPR, through organizing educational courses, teaching effective coping strategies, and offering support programs.

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Received 20 June 2023; Received in revised form 2 May 2024; Accepted 15 May 2024

Available online 18 May 2024

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1. Introduction

Emergency medical services (EMS) play an important and determining role in the health care system since the interventions can draw the line between life and death [1]. Repeated daily exposure to injury-causing events and the subsequent deaths is an inevitable part of the professional life of pre-hospital emergency personnel [2].

Out-of-hospital cardiac arrest (OHCA) is among the missions associated with certain sensitivities and complexities. Pre-hospital emergency technicians have a determining role in the management of OHCA. The outcome of cardiac arrest has a direct relationship with the time of initiating basic life support and cardiopulmonary resuscitation (CPR) [3]. Some patients with cardiac arrest die in spite of receiving CPR, which is known as unsuccessful CPR. Unsuccessful CPR may lead to stress, and unpleasant feelings like frustration, anger, guilt, hopelessness, being unprofessional, among CPR personnel [4].

The cumulative and repeated exposure of intensive care unit (ICU) nurses to unsuccessful CPR affects their ability to manage negative feelings, results in mental disorders, and reduces their mental health [5].

Increased levels of mental stress after unsuccessful CPR, also known as post-code stress, can activate maladaptive coping behaviors in association with the signs and symptoms of post-traumatic stress disorder (PTSD), which has significant impacts on the mental health of the personnel [6]. Stress may increase the risk of depression [7,8]. High levels of stress can affect the well-being of the personnel and safety of the patients in the long term. Therefore, the personnel may try to use different coping strategies like learning from experience, verbalizing with others, group sessions, emotional support, and avoidant coping [9]. In other words, the methods that the personnel use for stress management can be categorized as negative or positive management, active or reactive management, and therapeutic or non-therapeutic management. People may respond to stress in different ways considering their personal characteristics and mental potential. Moreover, some people may simultaneously use different methods for stress management [10].

After reviewing the literature, it has been found that previous studies on perceived stress and coping strategies following unsuccessful CPR have mostly focused on nurses, especially ICU nurses [5,9,11], and no study has evaluated and determined the relationship between perceived stress and coping strategy after unsuccessful CPR among pre-hospital emergency technicians, especially in Iran. In this regard, the present study was conducted to investigate and determine perceived stress and coping strategies after unsuccessful CPR and their relationship among pre-hospital emergency technicians in Ilam Province, west of Iran, for the first time.

2. Methods

2.1. Study design, setting, and participants

A cross-sectional, descriptive, correlational, multicenter study was conducted from July to August 2022. The research population included all pre-hospital emergency technicians working in 44 urban, road, and aerial prehospital emergency stations in 22 counties of Ilam Province. A total of 374 technicians worked in these stations, which entered the study by census method according to the inclusion criteria. The inclusion criteria were at least 6 months of experience in field work and scene response, having at least one unsuccessful CPR experience, absence of severe mental disorders, lack of family problems like divorce and death of beloved ones or close friends within the past three months, and willingness to participate in the study.

2.2. Evaluation tool

In accordance with the study objectives, two questionnaires (Perceived Stress after unsuccessful CPR and Brief Coping Orientation to Problems Experienced (BCOPE) Inventory) along with a demographic form were used for data collection.

2.2.1. Demographic form

This demographic form included 14 questions on demographic characteristics including age, marital status, education level, work experience, number of shifts per month, serving county, type of station, employment status, history of attending CPR training courses, unsuccessful CPR experience, number of unsuccessful CPR experiences, date of last unsuccessful CPR experience, history of mental disorders, history of family problems like divorce or death of beloved ones or close friends.

2.2.2. Questionnaire of Perceived Stress after unsuccessful CPR

This is a 20-item self-report questionnaire. Each item was answered on a five-point Likert scale from 1 (does not bother me at all) to 5 (bothers me a lot). The total score of the questionnaire ranged from 20 to 100. Higher scores indicated higher perceived stress levels. Based on the scoring range of this questionnaire individuals were divided into three equal categories to determine the level of perceived stress: scores from 20 to 46.7 indicate low perceived stress, scores from 46.8 to 73.4 indicate moderate perceived stress, and scores from 73.5 to 100 indicate high perceived stress. Considering the objectives of the study, the draft of the questionnaire was developed by the researchers using a literature review (Cole et al. (2001), McMeekin et al. (2017)) for use among pre-hospital emergency technicians [5,12]. The face and content validity of the questionnaire were confirmed through receiving the comments of 12 subjects, including 4 nursing faculty members, 3 emergency medicine faculty members, and 5 EMS technicians working in pre-hospital emergency stations. The reliability of the questionnaire was assessed using the internal consistency method with a Cronbach's alpha of 0.96.

2.2.3. Brief COPE

The original version of this inventory known as the Cope Operations Preference Enquiry (COPE) with 60 items in 15 subscales (4 items per subscale) was developed by Carver in 1989 according to different coping models. A short version of this inventory was developed by Carver et al., in 1996, which included 28 items in 14 subscales (2 items per subscale) [13]. Each item is rated on a 4-point Likert scale from 1 (I haven't been doing this at all) to 4 (I've been doing this a lot). For each subscale (coping strategy), the sum score of items divided by their number indicates the degree to which the respondent has been engaging in that coping style. The coping strategy with the highest mean score is the main coping strategy used by the person, indicating that the person uses this coping strategy most commonly in the process of coping. The Persian version of the COPE Inventory customized for the Iranian population with 23 items and 6 subscales, including problem-focused coping (7 items), support-focused coping (4 items), self-distraction (4 items), religion (2 items), denial (2 items), and emotion-focused coping (4 items), was used in the present study. This version was translated and validated by Hashemian Moghadam in 2019 as a Psychology PhD dissertation [14]. In the present study, the reliability of the questionnaire was assessed using the internal consistency method. A Cronbach's alpha coefficient of 0.80, 0.74, 0.69, 0.73, 0.68, and 0.74 was calculated for problem-focused coping, support-focused coping, emotion-focused coping, self-distraction, religion, and denial, respectively.

2.3. Data collection

After obtaining the required permissions to access the research sites (urban, road, and aerial pre-hospital emergency stations), data was collected using the aforementioned questionnaires. In each station, a liaison was selected for distributing and collecting the questionnaires. The questionnaires were handed to the eligible pre-hospital emergency technicians through the first author and the liaison of each station. After explaining the objective and methodology of the study, the participants were asked to complete the questionnaires.

2.4. Ethical considerations

This study was part of an emergency nursing MSc thesis approved by the Nursing School of Alborz University of Medical Sciences, Karaj, Iran. Ethical clearance was obtained from the Ethics Committee of Alborz University of Medical Sciences (IR.ABZUMS.REC.1401.042). All ethical considerations were considered in this study. The research samples (pre-hospital emergency technicians) participated in the study voluntarily. Before the study, they were informed of the methodology and objectives of the study. All participants signed informed consent to participate in the study. Moreover, completing and returning the questionnaire was considered as consent to participation. The questionnaires were completed anonymously and the participants' data were confidential.

Table 1
Distribution of pre-hospital emergency technicians by demographic characteristics (n = 359).

Demographic Variable	n	(%)
Marital Status		
Single	180	50.1
Married	179	49.9
Level of education		
Diploma	3	0.8
Associates	186	51.8
Bachelors	164	45.7
Masters	6	1.7
Type of station		
Urban	151	42.1
Road	202	56.3
Aerial	6	1.7
History of attending CPR training courses		
Yes	307	85.5
No	52	14.5
Age (years)		
20–30	200	55.7
31–40	118	32.9
41–60	41	11.4
Work experience (years)		
1–5	170	47.4
6–10	87	24.2
11–15	72	20.1
15–30	30	8.4
Number of unsuccessful CPR experiences		
1–5	176	49.0
6–10	67	18.7
11–20	56	15.6
21–100	60	16.7

2.5. Statistical analysis

After data collection, the first author entered the data into the SPSS software. Statistical analysis was done by a statistician that was not a member of the research team. The data were analyzed using descriptive and analytical statistics. First, the demographic characteristics of the research population and the main variables were determined using mean and standard deviation. Based on the Kolmogorov-Smirnov normality test, the variables had a normal distribution. Therefore, parametric tests were used. The Pearson correlation was applied to evaluate the relationship between the perceived stress and coping strategy after unsuccessful CPR. A multiple linear regression model was administered to predict perceived stress based on the coping strategy. Regression analysis was performed using the simultaneous method (enter). The independent sample T-test and ANOVA were used to analyze perceived stress and coping strategies based on the demographic characteristics of the participants. Data analysis was done using SPSS software version 27. The level of significance was set at $p \leq 0.05$.

3. Results

In the present study, out of 374 subjects (total number of the research population), 370 subjects met the inclusion criteria and were invited to join the study. Finally, 359 subjects completed the questionnaires (response rate = 97 %). The mean age of the participants was 31.52 ± 6.80 years. The mean work experience of the subjects was 6.99 ± 5.31 years. Moreover, 181 (50.4 %) were single, 186 (51.8 %) had an associate degree, and 164 (45.7 %) had a bachelor's degree. Considering the structure of the pre-hospital emergency in Iran in which all technicians are male, all participants were male in the present study (Table 1).

The mean perceived stress after unsuccessful CPR was 65.56 ± 14.21 . More than half of the participants experienced moderate stress levels, only 11.7 % reported low stress levels, and 32 % reported high stress levels (Table 2).

According to Table 3, problem-focused coping had the highest and denial had the lowest mean value among coping strategies (3.01 versus 1.94).

Table 4 shows the results of Pearson correlation analysis between perceived stress and coping strategy after unsuccessful CPR. According to the results, a significant direct correlation was found between perceived stress and five coping strategies, including problem-focused, support-focused, and emotion-focused coping, self-distraction, and religion ($p < 0.05$). The strongest correlation was between perceived stress and self-distraction with a correlation coefficient of 0.377, followed by emotion-focused coping with a correlation coefficient of 0.327. No significant correlation was found between perceived stress and denial ($p > 0.05$).

In the present study, multiple linear regression analysis with simultaneous method (enter) was used to predict perceived stress based on the coping strategy. According to the results, after evaluation of the regression analysis assumptions, ANOVA statistics, and the coefficient of determinant (R^2), a value of 12.79 was calculated for the F statistic ($p < 0.05$). Therefore, the regression model was suitable and the predictor variables were correlated with the criterion variable (perceived stress) and could significantly predict the perceived stress. R^2 shows the variance of the criterion variable as explained by predictor variables. The adjusted R^2 value was 0.179, indicating that predictor variables, i.e., coping strategies, explained 17.9 % of the variance of perceived stress. According to the results of multiple regression analysis, the predictive roles of emotion-focused coping and self-distraction were confirmed; therefore, it could be concluded that these two strategies had a significant positive effect on perceived stress and could predict it ($p < 0.05$). Self-distraction had the strongest effect on perceived stress (coefficient = 0.29) followed by emotion-focused coping (coefficient = 0.18) (Table 5).

Table 6 illustrates the perceived stress and coping strategies after unsuccessful CPR based on the demographic characteristics of pre-hospital emergency technicians participating in this study.

4. Discussion

For effective stress management after unsuccessful CPR in pre-hospital emergency technicians, it is necessary to determine their perceived stress and enhance effective coping strategies. Therefore, the first objective of the present study was to determine perceived stress after unsuccessful resuscitation. According to the results, more than half of the participants had moderate stress levels. Since this study was the first study of perceived stress after unsuccessful resuscitation among pre-hospital emergency technicians, no similar studies were found for comparison. However, the results of other studies conducted on nurses, especially emergency department (ED) and ICU nurses, confirm the findings. For example, Hudzaifah and Fitriani (2019) found that 56 % of the ED and ICU nurses experienced moderate levels of stress after unsuccessful CPR in Indonesia [11]. McMeekin et al. (2017) studied 490 ICU nurses recruited from the American Association of Critical Care Nurses (AACNs) and found high stress levels and post-traumatic stress disorder (PTSD)

Table 2
Perceived stress after unsuccessful CPR in pre-hospital emergency technicians.

Perceived stress	Score Range	n (%)	Mean (SD)	Range ^a (Min-Max)
Low	20–46.7	42 (11.7)	65.56 ± (14.21)	30–96
Moderate	46.8–73.4	202 (56.3)		
Severe	73.5–100	115 (32)		

SD: standard deviation.

^a Minimum–Maximum.

Table 3
Coping strategies after unsuccessful CPR in pre-hospital emergency technicians.

Coping strategies	Mean (SD)	Range ^a (Min–Max)
Problem-focused coping	3.01 ± (0.59)	1–4
Support-focused coping	2.60 ± (0.64)	
Emotion-focused coping	2.68 ± (0.61)	
Self-distraction	2.42 ± (0.61)	
Orientation to religion	2.59 ± (0.87)	
Denial	1.94 ± (0.79)	

SD: standard deviation.

^a Minimum–Maximum.

Table 4
Correlation between perceived stress and coping strategies in pre-hospital emergency technicians.

Coping Strategies	Perceived Stress	
	r	p-value
Problem-focused coping	0.224	<0.001
Support-focused coping	0.108	0.040
Emotion-focused coping	0.327	<0.001
Self-distraction	0.377	<0.001
Orientation to religion	0.162	0.002
Denial	0.034	0.359

r: Pearson's correlation coefficient.

Table 5
Prediction of perceived stress according to coping strategies using multiple linear regression analysis.

Predictor variables	B	SE	β	t	Sig.	95 % CI for B	Collinearity Statistics	
							Tolerance	VIF
Constant (c)	36.55	4.57	–	8/00	<0.001	27.560 to 45.532	–	–
Problem-focused coping	1.79	1.45	0.07	1.24	0.218	–1.060 to 4.637	0.65	1.55
Support-focused coping	–1.26	1.26	–0.06	–1/00	0.316	–3.740 to 1.213	0.71	1.41
Emotion-focused coping	4.26	1.35	0.18	3.14	0.002	1.593 to 6.919	0.70	1.44
Self-distraction	6.79	1.40	0.29	4.85	<0.001	4.033 to 9.545	0.67	1.49
Religion	0.38	0.88	0.02	0.43	0.666	–1.345 to 2.102	0.81	1.24
Denial	–1.00	0.94	–0.06	–1.06	0.290	–2.858 to 0.856	0.84	1.19

Multiple linear regression (simultaneous (Enter) method); Variance inflation factor (VIF) cutoff value: 2.

B: Unstandardized coefficients; SE: Standard error; β : Standardized coefficients; Coefficient of Determination (R^2 : 0.214).

Adj R^2 : 0.179; F: 12.79; Durbin-Watson (DW): 1.72; $P \leq 0.05$.

symptoms after unsuccessful cardiopulmonary resuscitation [5]. Unsuccessful resuscitation may result in adverse, persistent mental effects in the resuscitation personnel. Moreover, inappropriate reactions following unsuccessful resuscitation and lack of mental support and follow-up can direct the EMS personnel down a negative path [15]. In other words, the exposure of resuscitation personnel to a patient's death following resuscitation can lead to emotional stress and have a significant impact on their mental health [6,11]. A study found that unsuccessful resuscitation attempts in out-of-hospital cardiac arrest (OHCA) incidents affected the professional quality of life of participants, particularly in terms of mental health [16]. Therefore, the personnel try to use coping strategies [9]. Hence, the second objective of the present study was to determine coping strategies used after unsuccessful CPR attempts. Among six coping strategies, the results showed that problem-focused coping had the highest mean value, indicating that it was the most common applied strategy, followed by emotion-focused coping and support-focused coping. Religion had a moderate value, and self-distraction and denial had the lowest mean values. McMeekin et al. (2017) found that acceptance, self-distraction, instrumental support, self-blame, behavioral disengagement, and denial were the most common coping strategies in descending order used by critical care nurses after unsuccessful CPR [5]. Hudzaifah and Fitriani (2019) also found that 58 % of the ED and critical care nurses used adaptive coping strategies and 42 % used maladaptive coping strategies after unsuccessful CPR [11]. The ICU nurses that participated in a study by Mahmoud et al. (2021) used several coping strategies, among which religion had the highest and substance use and self-blame had the lowest mean scores relative to other strategies. Therefore, the results of this study emphasized the role of religion, religious rituals, and spiritual beliefs as effective coping strategies against stressors [9]. Minnie et al. (2014) conducted a study to evaluate the strategies used by the EMS personnel following exposure to daily traumatic events. They found that emotion-focused coping, problem-focused coping, mental disengagement, denial, and alcohol and substance use were the most common coping strategies in descending order used by the participants. The prevailing attitude of "boys don't cry" among the EMS personnel, who were mainly men, made them

Table 6
Perceived stress and coping strategies after unsuccessful CPR in pre-hospital emergency technicians by demographic characteristics.

Variables		Perceived Stress level	Problem-focused coping	Support-focused coping	Emotion-focused coping	Self-distraction	religion	Denial
Marital Status	Single	65.51 ± 14.44	2.39 ± 0.61	1.91 ± 0.66	2.01 ± 0.67	1.79 ± 0.65	1.84 ± 0.76	1.38 ± 0.62
	Married	65.60 ± 14.01	2.42 ± 0.62	2.02 ± 0.65	2.13 ± 0.59	1.80 ± 0.59	1.91 ± 0.72	1.38 ± 0.61
	t	0.07	0.55	1.68	1.76	0.15	0.78	0.05
Level of education	p-value	0.947	0.582	0.094	0.079	0.878	0.438	0.958
	Diploma	52.00 ± 4.36	2.00 ± 1.00	2.00 ± 1.00	2.00 ± 1.00	2.00 ± 1.00	2.00 ± 1.00	1.66 ± 0.58
	Associates	64.74 ± 14.86	2.37 ± 0.63	1.91 ± 0.65	2.01 ± 0.68	1.75 ± 0.57	1.85 ± 0.72	1.35 ± 0.58
Type of station	Bachelors	66.97 ± 13.38	2.45 ± 0.59	2.01 ± 0.66	2.15 ± 0.59	1.86 ± 0.66	1.91 ± 0.75	1.42 ± 0.66
	Masters	59.33 ± 13.46	2.50 ± 0.55	2.33 ± 0.82	2.00 ± 0.15	1.67 ± 0.52	1.50 ± 0.84	1.17 ± 0.41
	F	2.06	0.98	1.21	1.49	1.15	0.70	0.85
History of attending CPR training courses	p-value	0.105	0.400	0.308	0.218	0.327	0.552	0.466
	Urban	66.58 ± 14.15	2.45 ± 0.65	1.98 ± 0.70	2.07 ± 0.59	1.85 ± 0.64	1.92 ± 0.74	1.36 ± 0.59
	Road	64.62 ± 14.29	2.37 ± 0.58	1.95 ± 0.64	2.06 ± 0.66	1.77 ± 0.60	1.84 ± 0.74	1.40 ± 0.62
Age (years)	Aerial	71.50 ± 11.03	2.67 ± 0.52	2.00 ± 0.63	2.17 ± 0.75	1.50 ± 0.84	1.67 ± 0.82	1.50 ± 0.84
	F	1.36	1.37	0.10	0.08	1.57	0.67	0.28
	p-value	0.258	0.257	0.909	0.924	0.210	0.510	0.754
Work experience (years)	Yes	66.21 ± 14.30	2.42 ± 0.61	1.97 ± 0.66	2.11 ± 0.61	1.81 ± 0.60	1.87 ± 0.73	1.38 ± 0.61
	No	61.75 ± 13.12	2.35 ± 0.62	1.92 ± 0.65	1.83 ± 0.71	1.73 ± 0.72	1.88 ± 0.78	1.37 ± 0.63
	t	2.10	0.77	0.48	3.03	0.76	0.11	0.21
Number of unsuccessful CPR experiences	p-value	0.036 ^a	0.442	0.632	0.003 ^a	0.448	0.916	0.837
	20–30	64.12 ± 14.53	2.37 ± 0.63	1.92 ± 0.68	1.97 ± 0.66	1.72 ± 0.64	1.84 ± 0.75	1.36 ± 0.58
	31–40	67.76 ± 12.84	2.45 ± 0.56	2.00 ± 0.61	2.17 ± 0.54	1.86 ± 0.54	1.88 ± 0.72	1.44 ± 0.65
Type of station	41–60	66.24 ± 15.76	2.49 ± 0.68	2.07 ± 0.69	2.27 ± 0.63	2.05 ± 0.67	2.05 ± 0.74	1.34 ± 0.66
	F	2.52	1.10	1.18	6.14	5.82	1.44	0.82
	p-value	0.82	0.333	0.309	0.002 ^a	0.003 ^a	0.239	0.440
Level of education	1–5	64.65 ± 14.79	2.37 ± 0.61	1.95 ± 0.67	1.97 ± 0.64	1.73 ± 0.64	1.88 ± 0.74	1.35 ± 0.59
	6–10	65.62 ± 12.95	2.36 ± 0.63	1.95 ± 0.68	2.05 ± 0.65	1.82 ± 0.58	1.77 ± 0.73	1.45 ± 0.64
	11–15	65.36 ± 13.43	2.44 ± 0.63	1.94 ± 0.60	2.18 ± 0.56	1.78 ± 0.56	1.89 ± 0.70	1.39 ± 0.62
Type of station	15–30	71.03 ± 15.53	2.67 ± 0.48	2.13 ± 0.68	2.43 ± 0.57	2.20 ± 0.61	2.10 ± 0.80	1.37 ± 0.67
	F	2.31	2.31	0.72	5.67	5.12	1.53	0.53
	p-value	0.077	0.077	0.541	0.001 ^a	0.002 ^a	0.206	0.662
History of attending CPR training courses	1–5	63.72 ± 14.32	2.39 ± 0.64	1.98 ± 0.67	1.95 ± 0.66	1.72 ± 0.60	1.90 ± 0.75	1.35 ± 0.61
	6–10	65.34 ± 14.29	2.33 ± 0.59	2.01 ± 0.62	2.15 ± 0.61	1.90 ± 0.61	1.93 ± 0.72	1.49 ± 0.64
	11–20	68.36 ± 13.12	2.41 ± 0.63	2.02 ± 0.67	2.04 ± 0.54	1.88 ± 0.69	1.80 ± 0.75	1.32 ± 0.58
Age (years)	21–100	68.60 ± 14.15	2.55 ± 0.53	1.82 ± 0.68	2.35 ± 0.58	1.87 ± 0.60	1.82 ± 0.73	1.40 ± 0.64
	F	2.67	1.53	1.28	6.57	2.14	0.46	1.06
	p-value	0.047 ^a	0.207	0.282	<0.001 ^a	0.096	0.713	0.365

t = Independent sample T test.

F = ANOVA.

^a P ≤ 0.05.

cautious about expressing emotions. Moreover, the EMS personnel indicated that injuries involving children traumatized them the most. They experienced avoidance symptoms after exposure to traumatic events and applied emotion-focused coping to deal with their emotions. Furthermore, 45 % of the participants used talking to colleagues after an incident as a key mechanism to manage their stress and emotions [2]. Since EMS personnel and healthcare providers experience stress and anxiety after cardiac arrest incidents,

exchanging experiences and referring them for emotional support follow-up can be effective in reducing their stress and anxiety [6]. This is while a review of the literature showed that after highly unpleasant missions, the EMS personnel refrained from talking to colleagues to avoid showing personal weakness, possible consequences of the mistakes, and imposing “unnecessary” emotional burdens on colleagues, which could lead to emotional isolation in the long term, especially in the male personnel [17]. Munyanziza et al. (2021) conducted a study to evaluate workplace stressors and coping strategies of ICU nurses in Rwanda. The results showed that alcohol consumption, receiving emotional support from friends, using the distraction technique and making jokes about the situation, receiving comfort from religious rituals, and spiritual beliefs were among the main coping strategies used by the nurses. The least common coping strategies were self-blame and recreational activities (sports, TV, music) [18]. It seems that adopting humor can mitigate critical situations for the EMS personnel [19]. Moreover, humor can be effective in reducing occupational stress [20]. Although black humor is a sort of emotional avoidance that may be helpful in distancing the EMS personnel from bad experiences [19], it may jeopardize receiving emotional support from family and friends in the long term [21]. Fathi and Simamora (2019) also found that religion and positive reframing (emotion-focused coping) was the most common coping strategy in nurses followed by instrumental support and planning (problem-focused coping). Among these strategies, problem-focused methods were considered to be more effective due to concentrating on solving the problem [22]. Adopting effective coping strategies is helpful in stressful situations [10], and failure to use such strategies may lead to the aggravation of emotional fatigue in the personnel [23]. Therefore, the third objective of the present study was to determine the relationship between perceived stress and coping strategies after unsuccessful CPR. According to the results, perceived stress had a significant direct correlation with five coping strategies, including problem-focused coping, support-focused coping, emotion-focused coping, self-distraction, and religion. The strongest relationship was between perceived stress and self-distraction followed by emotion-focused coping. According to the results of multiple regression analysis, among six coping strategies, two strategies, namely self-distraction and emotion-focused coping, could predict perceived stress. These two strategies had a positive effect on perceived stress. Self-distraction had the greatest effect on perceived stress, followed by emotion-focused coping. Mahmoud OE (2021) also found a significant correlation between perceived stress and coping strategy in ICU nurses. They reported that religion and self-distraction coping strategies were helpful in stressful events. Multiple regression analysis was significant for all items, and perceived stress was significantly affected by behavioral disengagement, acceptance, and self-blame [9]. This is while McMeekin et al. (2017) found no significant correlation between coping behaviors and perceived stress after unsuccessful CPR in ICU nurses. A weak correlation was found between postcode stress and the severity of PTSD symptoms. Four coping behaviors (denial, distraction, self-blame, and behavioral disengagement) were significant predictors of the severity of PTSD symptoms. The severity of postcode stress and PTSD symptoms varied with the availability of institutional support [5]. The difference between the results of the above study and the present study may be due to differences between the work conditions of EMS personnel and ICU nurses.

A review of the literature shows that coping strategies can be categorized into adaptive (effective) and maladaptive (ineffective) strategies. Adaptive coping strategies are associated with less perceived stress and maladaptive coping strategies are associated with negative health outcomes [9]. Evidence suggests that maladaptive coping strategies are associated with lower health and well-being levels of the pre-hospital emergency personnel. In this regard, Rojas et al. (2022) found that in German emergency medicine services personnel (EMSP), the use of self-criticism was associated with higher levels of stress, depression, physical and mental symptoms, and PTSD symptoms and lower job satisfaction. This is while the personnel with higher acceptance showed fewer PTSD symptoms. Therefore, self-criticism can be considered as a maladaptive coping strategy [17]. Self-criticism requires repeated negative assessments of one's abilities and decisions. Therefore, it has a close relationship with thought rumination as an inclination towards repetitive mental concentration on negative feeling experiences and their causes and outcomes [24]. On the other hand, self-efficacy has a significant positive correlation with active and problem-focused coping and a significant negative correlation with emotion-focused coping [25]. Furthermore, avoidant coping strategies like denial and substance use are associated with reduced mental health and increased PTSD symptoms in the long term [26]. Despite the negative consequences, EMS personnel adopt avoidant coping strategies in order to reduce emotional pressure immediately [27]. According to the results of a study by Mahali and Almutairi (2020), pre-hospital emergency technicians may benefit from social support to receive emotional support and soothe themselves once they are exposed to stressful events [28]. Furthermore, social support has an important role in coping with chronic stress as a form of key, helpful coping strategy [29]. According to Wagner et al. (2016), the timing of receiving social support is an important factor, so that receiving it before injury could improve resilience against PTSD, while it seems that receiving it after the trauma increases post-traumatic growth [30].

Based on the results of this study, the levels of experienced stress were within the moderate range in both technicians who had participated in CPR training courses and those who had not; however, technicians who had not participated in CPR training courses experienced less stress levels.

In technicians with older age, emotion-focused coping and self-distraction had a higher average. Also, in technicians with more work experience and a higher number of unsuccessful CPR, emotion-focused coping strategy had a higher average.

Since all the technicians in this study were male, the assessment of perceived stress levels and coping strategies after unsuccessful CPR did not exist based on gender; however, a study on ambulance personnel in Norway (2022) showed that men experienced more symptoms of depression and PTSD compared to women. Additionally, symptoms of PTSD in single or unmarried individuals were higher than in married individuals [31].

Some of the factors that affect the perceived level of stress and coping strategies after unsuccessful CPR include: age (older individuals are more capable of performing tasks and responsibilities, therefore they experience lower levels of stress and use more adaptive coping strategies); educational level (higher educational attainment leads to better stress management and adaptability in work, ultimately allowing individuals to better control and manage their experienced stress); and participation in emergency training

courses (which has a positive impact on the ability to control and manage stress) [11].

5. Study limitations

This study had several limitations. First, although this study was the first study in Iran and had a multicenter design, its research population only comprised pre-hospital emergency technicians of Ilam Province, west of Iran. Therefore, its results cannot be easily extrapolated to other parts of Iran or other countries. Hence, it is recommended that more extensive, multicenter studies be designed and conducted considering the prevailing social and cultural conditions to compare the data and evaluate the relationship between the main study variables (perceived stress and coping strategies after unsuccessful CPR). Second, this study had a cross-sectional design and data collection was done during two months. It is recommended to design and implement longitudinal and interventional studies to gain a better and more comprehensive understanding of the relationship between the main research variables in pre-hospital emergency technicians. Third, the self-report nature of the questionnaire and the mental status of the participants during completing the questionnaire may have affected the results, which was beyond the control of the researchers. In this regard, there is a need for more qualitative studies. Fourth, another limitation of this study was the lack of gender diversity among the participants. All subjects included in this study were male. Consequently, we could not analyze the research variables from a gender perspective. In this regard, there is a need for more future research to explore gender differences.

6. Conclusion

The level of perceived stress after unsuccessful CPR was moderate in more than half of the pre-hospital emergency technicians that participated in the study. The participants used different coping mechanisms to cope with the stress. The most common coping mechanisms used by the participants were problem-focused, emotion-focused, and support-focused coping. Considering the significant relationship between perceived stress and coping strategies, methods like organizing training courses, teaching effective coping strategies, and offering support programs can be used by the EMS personnel to cope with occupational stress, including the stress of unsuccessful CPR. This study investigated perceived stress, coping strategies after unsuccessful CPR, and their relationship among pre-hospital emergency technicians of Ilam Province for the first time. Although this study was conducted in Ilam Province, pre-hospital emergency technicians across the world are always at risk of stress after unsuccessful CPR. Therefore, the results of this study may be beneficial for similar international professional groups.

Ethical approval

Ethical clearance was obtained from the Ethics Committee of Alborz University of Medical Sciences (IR.ABZUMS.REC.1401.042). All participants signed informed consent to participate in the study.

Funding

This research did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

Data will be made available on request.

Additional information

No additional information is available for this paper.

CRedit authorship contribution statement

Meysam Babakhani: Writing – original draft, Data curation, Conceptualization. **Maryam Aghabarary:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Data curation, Conceptualization. **Roohangiz Norouzinia:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to extend our sincere gratitude to all the participants in this study. We would also like to express our appreciation to Alborz University of Medical Sciences for approving this research (research code 4919).

Abbreviations

AACNs	American Association of Critical-Care Nurses
CPR	Cardio Pulmonary Resuscitation
COPE Inventory	Coping Orientation to Problems Experienced Inventory
ED	Emergency Department
EMS	Emergency Medical Services
EMSP	Emergency Medicine Services Personnel
ICU	Intensive Care Unit
OHCA	Out-of-Hospital Cardiac Arrest
PTSD	Post-Traumatic Stress Disorder

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e31418>.

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