Perceived stress and coping strategies among emergency department nurses and emergency medical services staff during the fifth wave of COVID-19 in Iran: A cross-sectional correlational study

Z. Salami [a], N. Mozaffari [b], M.A. Mohammadi [c,*]

[a] *Emergency Care Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran*
[b] *Department of Critical Care Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran*
[c] *Department of Medical-Surgical Nursing, School of Nursing And Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran*

A R T I C L E I N F O

A B S T R A C T

Background and Purpose: Emergency department (ED) nurses and emergency medical services (EMS) staff as the main parts of care on the front line of treatment during the outbreak of COVID-19 experienced great challenges in their work and life, which caused them a lot of stress. Since limited studies have investigated perceived stress and coping strategies among ED nurses and EMS staff in Iran, this study was conducted to investigate perceived stress and coping strategies among ED nurses and EMS staff during the outbreak of the fifth wave of COVID-19 in Ardabil, Iran.
Materials and methods: This descriptive-analytical cross-sectional study was conducted on 327 ED nurses and EMS staff in 2021. The samples were selected by convenient sampling method, and data were collected by demographic and perceived stressors and coping strategies against the outbreak of COVID-19 questionnaires. Data were analyzed by SPSS (version 22) using descriptive (frequency, percentage, mean, and standard deviation) and analytical (Pearson correlation, *t*-test, and ANOVA) statistical tests and multiple linear regression analysis.
Results: The most stressful factors were related to the transmission of the disease to the family and seeing the death of COVID-19 patients in front of their eyes. The most commonly used coping strategies were strict personal protective measures for all hospitalized patients and the use of clothes that the hospital prepared separately to reduce the transmission of the virus. The results of multiple linear regression showed employees' emotions ($\beta = 0.429$, $p < 0.001$), gender ($\beta = 0.225$, $p < 0.001$), coping strategies ($\beta = 0.209$, $p < 0.001$), stress-reducing factors ($\beta = 0.124$, $p = 0.014$), worry ($\beta = -0.182$, $p < 0.001$), and workplace ($\beta = -0.149$, $p = 0.045$) were effective predictors of perceived stress.
Conclusion: Coping methods such as following strict personal protective measures, using special clothes, and seeing the recovery status of patients and colleagues were effective factors in reducing the perceived stress of health workers. Therefore, it is necessary to provide health workers with training on coping strategies and psychological support in the current crisis and possible epidemics in the future.

1. Introduction

The coronavirus disease (COVID-19) originated in Wuhan, China in late December 2019. Since then, this virus has spread to the whole world (Chegini et al., 2021). On January 30, 2020, the World Health Organization announced the occurrence of the new coronavirus as a global health emergency (Rana et al., 2020). The increase in the number of confirmed cases and deaths caused by this disease has caused a health crisis among patients and health workers (Chang et al., 2006;

Windarwati et al., 2021). The COVID-19 pandemic has changed the work habits and routines of nurses. Nurses are required to care for patients with this virus while wearing uncomfortable personal protective equipment (PPE) (Lee et al., 2022). Since nurses are the main element of care and are always at the forefront of health care, they face great challenges such as the reduction of nursing care capacity, changes in daily life, and the emergence of unrealistic expectations from patients (Li et al., 2021). As a result of this critical situation, emergency nurses, including emergency department (ED) nurses and emergency medical

* Corresponding author.
E-mail addresses: z.salami@arums.ac.ir (Z. Salami), n.mozaffari@arums.ac.ir (N. Mozaffari), m.mohammadi@arums.ac.ir (M.A. Mohammadi).

services (EMS) nurses, as the first people who have direct contact with patients, experience a higher level of stress than other nurses (Alanazi et al., 2021; Habibi Soola et al., 2022; Mirzaei et al., 2022; Vagni et al., 2020).

Perceived stress causes various problems, the most important of which is the quitting of jobs by nurses, so measuring perceived stress is considered a major challenge for nurses (Wheeler & Riding, 1994). Previous studies of the healthcare workers (HCWs) working during past epidemics have similarly shown an increased psychological burden among HCWs (Khalid et al., 2016). Caregivers on the front line of COVID-19 are susceptible to various mental illnesses due to the risk of being exposed to the virus. There are also concerns about infection and lack of personal protective equipment (Azizpour et al., 2021). A cross-sectional study conducted on the medical personnel in China showed that among 512 personnel, about 164 personnel (32.03 %) had direct contact with a patient infected with COVID-19, and the prevalence of anxiety was 12.5 % (C.-Y. Liu et al., 2020). In another study conducted on hospital doctors and nurses in Wuhan, China, during the spread of the COVID-19 disease, it was shown that medical care workers had experienced symptoms of depression (50.4 %), anxiety (44.6 %), insomnia (34 %), and pain (71.5 %). Based on the results obtained from this research, women and people in direct contact with patients infected with COVID-19 reported a higher level of the mentioned psychological symptoms (Lai et al., 2020). In Koh et al.'s study, more than half of the nurses (54 %) reported stress (Koh et al., 2005).

Handberry et al.'s study showed that the COVID-19 pandemic had indirect effects on the increase of EMS missions, such as cardiac events and drug use, and this caused more fatigue and stress in these people (Handberry et al., 2021). A recent *meta*-analysis examining the psychological impact of COVID-19 on HCWs showed the high prevalence of anxiety, depression, stress, and insomnia among health workers. Also, the results of this study indicated that the high prevalence of stress can be explained by uncertainty about the future of the epidemic, unavailability of vaccines, increased workload, lack of social support, and fear of family transmission (Batra et al., 2020). Perceived stress is a mental and physical condition that can have destructive effects and is often caused by a person's inability to meet the needs, resources, and abilities required by an employee.

In Iran, nurses make up 80 % of the health system employees. In addition, 80 % of the work is placed on the shoulders of nurses. It is essential to use appropriate strategies in dealing with highly stressful situations and complex working conditions of COVID-19 epidemic (Habibi Soola et al., 2022; Mirzaei et al., 2022). The institutional response of nurses to this complex crisis was only based on their personal protection and biosecurity measures. No attention was paid to its unprecedented consequences on the mental health of the health personnel.

Epidemics not only cause illness and death but also cause prolonged grief, fear, despair, hopelessness, sleep disturbances, and post-traumatic stress, leading to significant social, occupational, and interpersonal dysfunction (Franco Coffré & Leví Aguirre, 2020). Objective measures may reduce psychological stress, including effective infection control, personal protective measures, and clear organizational policies and protocols, which may help reduce stress in medical staff. Recognition and appreciation of the work and effort of the medical professionals, hospital management, government, and society have a positive effect on the stress experienced by medical workers during epidemics (H. Cai et al., 2020). Therefore, mental health measures are important to support nurses during the epidemic (Zhang et al., 2020). Since no study has investigated perceived stress and coping strategies among emergency nurses and emergency medical workers in Iran, this study was conducted to determine perceived stressors and coping strategies in pre-hospital and hospital emergency nurses in Ardabil city, Iran.

2. Materials and methods

This descriptive-correlational cross-sectional study was conducted from August 20 to November 20 on 327 emergency department nurses (N = 232) and emergency medical services staff (N = 94) who were recruited by convenience sampling method. Ardabil city has 5 teaching hospitals and 16 emergency medical services centers. Inclusion criteria were nurses with at least 3 months of working experience in the emergency department or emergency medical services centers since the start of the pandemic and having a bachelor's or a master's degree for nurses and an associate's degree or a bachelor's degree in emergency medicine for the EMS staff. Exclusion criteria included self-reported psychological problems (depression, anxiety, PTSD, and recent crisis in life) and lack of written consent to participate in the study. Of these, 320 emergency department nurses and 120 EMS staff of Ardabil city were included in the study according to the inclusion criteria. The selection of the research sample was done by the researcher visiting the hospital emergency departments and pre-hospital emergency centers during several stages. In each visit, the researcher entered the study centers while observing the principles of personal protection, and after explaining the research purpose and declaring the consent of the emergency nurses and EMS staff to participate in the research, he obtained written informed consent from them. Then, he explained the contents of the questionnaire and the method of completing it. By coding the questionnaire in the form of research units, the confidentiality of their information was assured. Considering the suitability of the clinical conditions of the ward to complete the questionnaire, sufficient time was considered to complete the questionnaire.

2.1. Data collection

Data collection tools included a demographic information form with 13 questions (age, work history, gender, marital status, education level, history of receiving vaccines yes/no, history of contact with COVID 19 yes/no, workplace, type of job, work situation, concern about COVID-19 (very much, little, no concern), type of shift, type of hospital) and the perceived stressors and coping strategies for facing the outbreak of COVID-19 questionnaire.

This questionnaire was designed for the first time by Lee et al. (2005). This questionnaire was revised by Khalid, and the answers were scored on a scale of 0–3 (Khalid et al., 2016). This questionnaire was used for the first time in Iran. After obtaining permission from the main designer of the questionnaire, Dr. Lee, the English version of this questionnaire was translated into Persian by two independent translators. To determine the content validity index and ratio, the questionnaire was given to 14 faculty members of Ardabil University of Medical Sciences. The content validity index (CVI) was evaluated separately by experts through the three criteria of simplicity, appropriateness, and certainty based on a four-point scale (simple, quite simple, somewhat complex, and complex) for each question. The respective ranks were given. Finally, the CVI was estimated to be 0.89. This questionnaire contains 72 questions in five areas. 1) The feelings of personnel during the outbreak of COVID-19 with 15 questions based on a 4-point Likert scale. Each question has a yes or no answer. Those whose answer was yes indicated the intensity of their feelings with a 4-point Likert scale: 0 = never, 1 = very little, 2 = moderate, 3 = very much. Cronbach's alpha coefficient of emotion dimension was 76 % in the study of Khalid et al. and 80 % in the present study. 2) Perceived stressors of facing the outbreak of COVID-19 with 20 questions on a 4-point Likert scale. This dimension measures 20 stressful factors among the personnel. Each question contains a yes or no answer. Those whose answer was yes rated the intensity of stressors with a 4-point Likert scale: 0 = very little, 1 = a little, 2 = medium, 3 = very much. Cronbach's alpha after stress-causing factors was reported to be 83 % in Khalid's study and 92 % in the present study. 3) The factors that prevent the tension of facing the outbreak of COVID-19 with 14 questions on a 4-pointLikert scale. This dimension measures 14 stress-

relieving factors. Each question is marked with a 4-point Likert scale as 0 = ineffective, 1 = mild impact, 2 = moderate impact, and 3 = high impact. Cronbach's alpha coefficient of this dimension was 86 % in Khalid's study and 87 % in the present study. 4) Strategies to deal with the tension of facing the outbreak of COVID-19 with 13 questions on a 4-point Likert scale. This dimension includes 13 questions that measure the strategy of the personnel. Each question contains a yes or no answer. Those who answered yes measured the intensity of their answer on a 4-point Likert scale: 0 = never, 1 = sometimes, 2 = often, 3 = always. Cronbach's alpha coefficient after coping strategies was 78 % in Khalid's study and 83 % in the present study. 5) Motivational factors for facing future riots with 10 questions on a 4-point Likert scale. This dimension includes 12 motivational factors for future riots. The answer is rated on a 4-point Likert scale from 0 = not important, 1 = important, 2 = some-what important, and 3 = very important. Cronbach's alpha coefficient of this dimension of the questionnaire was 91 % in Khalid's study and 91 % in the present study.

Data were analyzed by SPSS-V14 software. The level of perceived stress, employees' feelings, stress-reducing factors, coping strategies, and motivational factors in hospital emergency nurses and EMS staff were analyzed using descriptive statistics. The relationship between perceived stress and demographic characteristics was investigated using the independent *t*-test, ANOVA, and Pearson correlation. Predictors of perceived stress were investigated using multiple linear regression.

2.2. Ethical considerations

The study protocol was approved by the Ethical Committee of Ardabil University of Medical Sciences (IR.ARUMS.REC.1400.140). The approval documents for obtaining the internal license were presented to the managers of hospitals and pre-hospital emergency rooms of medical training centers in Ardabil city. Written informed consent was obtained from all participating ED nurses and EMS staff. Participation of nurses was voluntary. In addition, confidentiality and anonymity issues were detailed in the form.

3. Results

The results showed that the majority of the participants were female (56.6 %) and married (58.1 %). The average age and work experience of hospital emergency nurses and EMS staff were 5.66 ± 31.64 and 5.31 ± 7.62, respectively. The educational qualification of the majority of the participants was bachelor's degree (91.4 %), and the majority of the participants were working in the hospital emergency (71.3 %). In terms of contact method, 272 hospital emergency nurses and EMS staff had direct contact with COVID-19 patients. The level of concern of the majority of the participants (55 %) was high. Further, 285 frontline health personnel had a history of receiving the COVID-19 vaccine, and the majority of the participants had a rotating shift. Other demographic characteristics are shown in Table 1.

Table. 2 shows the final scores of employees' emotions, perceived stress, stress reduction factors, coping strategies, and motivational factors in the two occupational groups participating in this study, which were obtained from the "MERS-COVID staff questionnaire". As shown in the table, the emergency nurses scored lower than EMS workers in all aspects of the questionnaire. Therefore, it can be stated that the level of employees' emotions, perceived stress, stress reduction factors, coping strategies and motivational factors are higher in the EMS staff than emergency nurses, and this difference in the dimensions of employees' emotions and stress reduction factors was significant. The most stressful factors were related to the transmission of the disease to the family and seeing the death of COVID-19 patients in front of our eyes. The least stressful factors were related to screening after contact with patients and conflict between self-security and sense of duty. The most commonly used coping strategies were strict personal protective measures in front of all hospitalized patients and the use of clothes that the hospital

Table 1
Demographic characteristics of ED nurses and EMS staff in Iran (n = 327).

	variables	Mean-SD	n	(%)
Age		31.86 ± 5.73		
Work experience		7.62 ± 5.31		
Gender				
	Male		142	43.4
	Female		185	56.6
Marital Status	Single		137	41.9
	Married		190	58.1
Educational levels	Associate		12	3.7
	Bachelor's		299	91.4
	Master		16	4.9
Vaccine	*Yes*		285	87.2
	No		42	12.8
Contact COVID 19	*Yes*		272	83.2
	No		55	16.8
Workplace	EMS		94	28.7
	ED		233	71.3
Type of employment	Official		151	46.2
	Contract		58	17.7
	Contractual		28	8.6
	Projective		90	27.5
Work position	Supervisor		4	1.2
	Nurse		289	88.4
	Responsible for the center		8	2.4
	Responsible for shifts		26	8.0
Worry	very much		52	15.9
	Much		180	55.0
	Low		81	24.8
	Without worry		14	4.3
Type of shift	Morning work		36	11.0
	Evening		6	1.8
	Night work		97	29.7
	Circulation		188	57.5
Type of hospital whit prehospital	EMS		94	28.7
	Heart		123	37.6
	Neurology		32	9.8
	Children		16	4.9
	Urology and eyes		31	9.5
	Trauma		31	9.5

Table 2
Description of study variables and their comparison in ED nurses and EMS staff (n = 327).

Variable	ED Nurses Mean (SD)	EMS Staff Mean (SD)	Total participants Mean (SD)	Min	Max	P value
Staff feelings	22.08 (6.88)	26.61 (6.92)	23.36 (7.19)	6.00	41.00	P < 0.001
Perceived stress	37.88 (12.33)	40.25 (10.11)	38.51 (11.79)	4.00	60.00	0.09
Factors reduce stresses	24.90 (7.08)	27.47 (6.41)	25.60 (7.01)	7.00	42.00	0.002
Coping strategy	21.84 (6.58)	21.60 (5.77)	21.74 (6.37)	6.00	39.00	0.81
Motivational factors	21.31 (7.44)	22.73 (5.94)	21.73 (7.01)	2.00	30.00	0.10

prepared separately to reduce the transmission of the virus. The least used coping strategies included letting go of emotions by shouting and asking for help from the family doctor and other professionals in stressful situations. Also, the participants mentioned seeing the recovery status of patients and colleagues as the most effective factors in reducing the stress of Corona.

The results related to the perceived stress in frontline health workers are shown in Table 3. There was a statistically significantly negative correlation with gender and a statistically positive correlation with

Table 3
Association between perceived stress and demographic characteristics (n = 327).

	variables	Mean-SD	P Value
Age [a1] p = 0.453		38.51 (11.79)	r = -0.42
Work experience [a] p = 0.572		38.51 (11.79)	r = -0.32
Gender [b]	Male	36.91 (11.85)	t = -2.168
	Female	39.75 (11.60)	p = 0.031
Marital Status [b]	Single	38.40 (10.92)	t = -0.144
	Married	38.60 (12.40)	p = 0.885
Educational levels [c]	Associate	30.50 (11.38)	F = 3.706
	Bachelor's	38.63 (11.82)	p = 0.26
	Master	42.37 (8.92)	
Vaccine [b]	Yes	38.28 (11.90	t = -1.268
	No	40.39 (10.90)	p = 0.287
Contact COVID 19 [b] p = 0.543	Yes	38.69 (11.90)	t = 0.609
	No	37.63 (11.23)	
Workplace [b]	EMS	40.25 (10.11)	t = 1.695
	ED	37.81 (12.35)	p = 0.091
Type of employment [c]	official	38.22 (11.67)	F = 0.837
	contract	39.63 (11.06)	p = 0.437
	Contractual	35.67 (14.56)	
	Projective	39.17 (11.51)	
Work position [c]	Supervisor	38.0000	F = 0.288 p = 0.886
	Nurse	38.5398	
	Responsible for the center	38.3750	
	Responsible for shifts	38.8846	
Worry [c]	very much	43.75 (12.33)	F = 22.344 p < 0.001
	Much	40.79 (10.05)	
	Low	32.34 (11.03)	
	Without worry	25.57 (12.19)	
Type of shift [c]	Morning work	40.36 (12.22)	F = 4.162
	Evening	25.80 (14.48)	p = 0.003
	Night work	41.27 (10.03)	
	in circulation	37.15 (12.09)	
Type of hospital whit prehospital [c]	EMS	40.12 (9.98)	F = 1.381 p = 0.231

Table 3 (*continued*)

variables	Mean-SD	P Value
Heart	37.80 (12.51)	
Neurology	38.09 (13.83)	
Children	41.62 (7.83)	
Urology and eyes	39.22 (11.46)	

[1a]Pearson r correlation, [b] *t* test for independent group, [c] Analysis of variance.

anxiety and type of shift (p-value < 0.05).

Multiple linear regression analysis was performed using perceived stress as the dependent variable and employees' emotions, stress reduction factors, coping strategies, motivational factors, and general characteristics as independent variables. The Durbin Watson test score was 1.71, which resulted in a range of 1.5–2.5. Thus, there was no linear relationship in the data. The variance inflation factor was between 1.07 and 3.28, while the tolerance ranged from 0.31 to 0.92 without multi-collinearity among the independent variables. Independent variables accounted for 47 % of the variance of the final model (F = 17.460, p < 0.001). Therefore, significant predictors of perceived stress were staff's feelings (β = 0.429, p < 0.001), gender (β = 0.225, p < 0.001), coping strategies (β = 0.209, p < 0.001), stress-reducing factors (β = 0.124, p = 0.014), worry (β = -0.182, p < 0.001), and workplace (β = -0.149, p = 0.045) (Table 4).

4. Discussion

This study aimed to investigate the perceived stress and coping strategies among emergency medical workers and emergency nurses of educational and medical centers in Ardabil province (northwest of Iran) during the outbreak of the fifth wave of COVID-19.

The results showed that hospital emergency nurses scored lower than EMS staff in all aspects of the questionnaire, and this difference was significant in the dimensions of employees' feelings towards the care of COVID-19 patients and stress reduction factors. Due to the fact that nurses have the most and longest contact with patients infected with COVID-19, they are on the front line of dealing with the COVID-19 disease, are at a greater risk of encountering this disease, and have been more affected by the epidemic of this virus (Shanafelt et al., 2020).

Table 4
Influence of study variables on perceived stress.

Variables	Beta	t	Sig	95 % CI Lower Bound	Upper Bound
(Constant)		2.025	0.044	0.399	27.751
Staff feelings	0.429	8.752	0.001	0.545	0.861
Factors reduce stresses	0.124	2.469	0.014	0.042	0.376
Coping strategy	0.209	4.486	0.001	0.217	0.555
Motivational factors	0.084	1.734	0.084	−0.019	0.301
age	0.008	0.121	0.904	−2.072	2.344
sex	0.225	3.644	0.001	2.462	8.240
Marital status	0.053	1.103	0.271	−0.952	3.382
Employment status	−0.004	−0.063	0.950	−1.082	1.015
Work Position	−0.047	−1.076	0.283	−2.521	0.739
Work experience	−0.065	−1.259	0.209	−0.372	0.082
Type of shift	−0.055	−1.261	0.208	−1.720	0.377
Workplace	−0.149	−2.017	0.045	−7.659	−0.095
Type of hospital	0.046	0.865	0.388	−0.430	1.104
Contact COVID 19	−0.020	−0.466	0.642	−3.322	2.050
Worry	−0.182	−3.979	0.001	−4.325	−1.463
Vaccine	−0.008	−0.176	0.861	−2.939	2.458

Durbin-Watson: 1.71, R^2 = 0.474, F (17.460), P < 0.001 A Dependent variable: Total perceived stress.

Since health care workers, especially emergency nurses who work directly with patients and witness the suffering and death of patients, are under higher influence of psychological and work pressure (Habibi Soola et al., 2022; Mirzaei et al., 2022). Therefore, since emergency nurses spend more time with patients than EMS staff in the health care system and play a key role in the control and treatment of emerging diseases, it is understandable that the level of feelings towards the care of COVID-19 patients is lower among emergency nurses (Khoshnood et al., 2021).

Moreover, emergency nurses reported that they used factors effective in reducing the stress of the COVID-19 pandemic to a lesser extent than EMS staff. Our results showed that there was a significant difference between ED nurses and EMS staff in three stress reduction factors, which include more use of personal protective equipment, more use of guidelines prepared in infection control and not infecting friends and family outside the workplace, and more cooperation. The number of personnel was higher in the emergency medical unit than in the hospital emergency room. In this regard, limited studies have measured stress reduction factors among emergency nurses and EMS staff.

Health workers on the front line of care faced huge and varied demands due to contact with sick patients suffering from COVID-19. Observing the death of patients and colleagues imposed additional stress on them (Franco Coffré & Leví Aguirre, 2020). On the other hand, the participants mentioned observing the recovery of patients and colleagues as the most effective factor in reducing the stress of COVID-19. We believe that this is the first study that has simultaneously measured perceived stress and coping strategies among emergency medical workers and emergency room nurses. Also, the results of Imran Khalid's study showed that a positive attitude in the work environment had the greatest effect on reducing the stress of employees. In addition, recovery of infected colleagues, provision of adequate protective equipment, and reduction of disease transmission after severe infection control measures reduced staff's anxiety (Khalid et al., 2016). Cai et al. showed that family safety had the greatest effect on reducing employee's stress, and factors such as proper guidance and effective protective measures to prevent disease transmission reduced the anxiety of female employees (H. Cai et al., 2020).

The results of the study indicated that the most stressful factors were related to the transmission of the disease to the family and seeing the death of COVID-19 patients in front of their eyes. The results of various studies have shown that the workers on the front line of the fight against COVID-19 are in a stressful situation because they think they can transmit the disease to their family and friends. Uncertainty in knowing when the epidemic will end and seeing patients dying due to COVID-19 also cause significant stress in health groups (Khalid et al., 2016; Rose et al., 2021). In this study, frontline nurses used coping strategies to reduce their stress during the COVID-19 pandemic, which included strict personal protective measures in front of all inpatients and the use of uniforms that the hospital had individually designed to reduce virus transmission. The strategies used were consistent with the results of the study (Al Muharraq, 2021). It can be said that the Iranian Ministry of Health was able to protect its personnel from the physical and mental harm of the disease by providing protective measures such as the use of special clothes and suitable masks and various training programs for COVID-19 for all health care specialties.

The results of multiple linear regression showed that the feelings of hospital emergency nurses and EMS staff towards the care of COVID-19 patients were the most important predictors of perceived stress. The high incidence of COVID-19 and virus mutation may increase the stress on the frontline nursing staff when performing nursing care (Chen & Huang, 2020). Nurses are required to work while wearing uncomfortable personal protective equipment (PPE) to prevent the risk of infection in COVID-19 patients (Q. Liu et al., 2020). Many research findings also show that the causes of stress in nurses caring for COVID-19 patients include clinical workload, social isolation, fear of contracting COVID-19, fear of infecting relatives and friends, discomfort caused by PPE, and frequent washing of the hands (Lee et al., 2022; Wang et al., 2020). According to the studies conducted in Iran, the causes of high stress of caregivers in caring for COVID-19 patients are the fear of infection, the difficulty of controlling the epidemic and the lack of medical equipment, death anxiety, the lesser-known nature of the infection, lack of time, the spread of bad news, people's obsession, and neglect of preventive measures (Galehdar et al., 2020; Hosseini Moghaddam et al., 2022; Mohammadi et al., 2021). Health workers are also faced with heavy workloads, chronic fatigue, the threat of infection, and concerns about the mortality of the patients they care for. They also have to deal with anxiety and even misunderstanding among patients and their families (Chegini et al., 2021).

Gender was another factor that predicted perceived stress. In our study, women were more stressed than men. The results of a study conducted on doctors and nurses at a hospital in Wuhan, China during the epidemic of COVID-19 showed that women in direct contact with patients infected with COVID-19 reported a higher level of stress and anxiety symptoms, which is consistent with the results of the present study (Lai et al., 2020). The findings of our study were similar to other studies (Çınar et al., 2021; Mirzaei et al., 2022). Women often have a double life, that is a combination of work and family life. When professional and family constraints increase, they show less compliance (Couarraze et al., 2021). Women show more adaptability and psychophysiological adjustment than men, so they may have more psychological vulnerability (Parola et al., 2020).

The results of multiple linear regression indicated that concern about COVID-19 was another effective factor in the stress of frontline health workers. Worrying about the family during the epidemic period of COVID-19 was raised as one of the main stressors in a study by H. Cai et al. (2020). Knowing that their family is safe is also the biggest stress, while the fear of infecting the family is another important concern of the health staff (De Kock et al., 2021). In the absence of specific treatment for COVID-19, health care professionals should provide basic care, comfort, and symptoms. This type of care preferably involves paramedical staff in contact with the patient and thus possible contamination (Wang et al., 2020). Nurse-to-patient ratio standards in care services require new resources during the pandemic. This means that some paramedical staff were assigned to understaffed units to provide assistance and increase manpower (Couarraze et al., 2021; Y. Liu et al., 2020). Therefore, it is natural that sources of worry and subsequent stress are more important for frontline health workers.

The results revealed that the workplace is one of the predictors of perceived stress. Stress was higher in emergency medical workers than in emergency nurses. A literature search found one study in which hospital emergency nurses reported more stress than EMS staff, which was contrary to the result of our study. EMS personnel are often the first responders to emergencies ranging from heavy vehicle accidents and natural disasters to minor injuries and illnesses. As a result, these individuals usually experience significant occupational stress (Mirzaei et al., 2022). EMS has a number of characteristics that make it a stressful job, such as insufficient sleep, insufficient recovery time after each shift, heavy shift work, low job satisfaction, and trauma, which leads to stress and subsequent disorders (Taylor et al., 2022). It should be noted that workplace stress can have a negative effect on caregiving (Raeissi et al., 2019). Therefore, there is a need for pre-hospital emergency managers to reduce the perceived stress of their employees with effective measures and strategies.

5. Limitations

As a major strength of this study, we examined stress management strategies and outcomes based on the experiences of emergency department nurses and emergency medical services staff directly caring for patients with COVID-19. Also, this study had limitations. First, the current research design was cross-sectional. It is possible to get more accurate results by increasing the length of the research. Second, our

study was conducted among hospital emergency nurses and EMS staff of medical training centers in Ardabil city, therefore, the findings may not be generalized to nurses in private hospitals and other departments. Finally, in the present study, perceived stress and coping strategies were only measured using self-report questionnaires, which may not reflect the real picture of stress and coping strategies, so there is a need for qualitative and in-depth studies in this field.

6. Conclusion

The results of the present study significantly contribute to the literature on perceived stress and coping strategies of health care workers. It also provides valuable information for the development of appropriate interventions to reduce the stress level of emergency nurses and EMS workers in the context of possible epidemics in the future. The findings of the present study showed that employees' emotions during COVID-19, coping strategies, and stress-reducing factors were among the effective predictors of the perceived stress of frontline health workers. Moreover, hospital emergency nurses and EMS staff used effective stress reduction methods such as following strict personal protective measures, using special clothes, and seeing the recovery status of patients and colleagues to reduce the stress caused by the COVID-19 epidemic. This means that despite the perceived stress of COVID-19, health workers have tried to overcome their stress by using different coping strategies. Despite this, it seems necessary to promote and provide training on coping strategies and psychological support for health workers in the current crisis and possible future epidemics.

7. Authorship contribution statement

Zahra Salami: the concept of study/design, helping to collect data, analysis, interpreting data and preparing a manuscript. Naser Mozaffari: study design, data analysis, monitoring, administrative/technical/material support, final review Mohammad Ali Mohammadi supervisor of thesis project, problem statement, data analysis, writing article.

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.

References

Al Muharraq, E. H. (2021). The psychological impact of coronavirus disease 2019 on nurses in Saudi Arabia and their coping strategies. *SAGE open nursing, 7*.

Alanazi, T. N. M., McKenna, L., Buck, M., & Alharbi, R. J. (2021). Reported effects of the COVID-19 pandemic on the psychological status of emergency healthcare workers: A scoping review. *Australasian emergency care*.

Azizpour, I., Mehri, S., Moghaddam, H. R., Mirzaei, A., & Soola, A. H. (2021). The impact of psychological factors on bereavement among frontline nurses fighting Covid-19. *International Journal of Africa Nursing Sciences, 15*, Article 100341.

Batra, K., Singh, T. P., Sharma, M., Batra, R., & Schvaneveldt, N. (2020). Investigating the psychological impact of COVID-19 among healthcare workers: A meta-analysis. *International Journal of Environmental Research and Public Health, 17*(23), 9096.

Cai, H., Tu, B., Ma, J., Chen, L., Fu, L., Jiang, Y., & Zhuang, Q. (2020). Psychological impact and coping strategies of frontline medical staff in Hunan between January and March 2020 during the outbreak of coronavirus disease 2019 (COVID-19) in Hubei, China. *Medical science monitor: international medical journal of experimental and clinical research, 26*, e924171–e.

Chang, E. M., Daly, J. W., Hancock, K. M., Bidewell, J., Johnson, A., Lambert, V. A., & Lambert, C. E. (2006). The relationships among workplace stressors, coping methods, demographic characteristics, and health in Australian nurses. *Journal of Professional Nursing, 22*(1), 30–38.

Chegini, Z., Arab-Zozani, M., Rajabi, M. R., & Kakemam, E. (2021). *Experiences of critical care nurses fighting against COVID-19: A qualitative phenomenological study*. Nursing Forum.

Chen, W., & Huang, Y. (2020). To protect health care workers better, to save more lives with COVID-19. *Anesthesia and Analgesia*.

Çınar, D., Kılıç Akça, N., Zorba Bahçeli, P., & Bağ, Y. (2021). Perceived stress and affecting factors related to COVID-19 pandemic of emergency nurses in Turkey. *Journal of Nursing Management, 29*(7), 1916–1923.

Couarraze, S., Delamarre, L., Marhar, F., Quach, B., Jiao, J., Avilés Dorlhiac, R., … Antunes, S. (2021). The major worldwide stress of healthcare professionals during the first wave of the COVID-19 pandemic–the international COVISTRESS survey. *PLoS One1, 16*(10), e0257840.

De Kock, J. H., Latham, H. A., Leslie, S. J., Grindle, M., Munoz, S.-A., Ellis, L., … O'Malley, C. M. (2021). A rapid review of the impact of COVID-19 on the mental health of healthcare workers: Implications for supporting psychological well-being. *BMC Public Health, 21*(1), 1–18.

Franco, J. A., Coffré, Leví, P.d. l. Á., & Aguirre. (2020). Feelings, stress, and adaptation strategies of nurses against COVID-19 in Guayaquil. *Investigación y Educación en Enfermería, 38*(3).

Galehdar, N., Kamran, A., Toulabi, T., & Heydari, H. (2020). Exploring nurses' experiences of psychological distress during care of patients with COVID-19: A qualitative study. *BMC Psychiatry, 20*(1), 1–9.

Habibi Soola, A., Mozaffari, N., & Mirzaei, A. (2022). Spiritual Coping of Emergency Department Nurses and Emergency Medical Services Staff During the COVID-19 Pandemic in Iran: An Exploratory Study. *Journal of Religion and Health, 61*(2), 1657–1670.

Hosseini Moghaddam, M., Mohebbi, Z., & Tehranineshat, B. (2022). Stress management in nurses caring for COVID-19 patients: A qualitative content analysis. *BMC psychology, 10*(1), 1–13.

Khalid, I., Khalid, T. J., Qabajah, M. R., Barnard, A. G., & Qushmaq, I. A. (2016). Healthcare workers emotions, perceived stressors and coping strategies during a MERS-CoV outbreak. *Clinical Medicine & Research, 14*(1), 7–14.

Khoshnood, Z., Mehdipour-Rabori, R., Nazari Robati, F., Helal Birjandi, M., & Bagherian, S. (2021). Patients' experiences of living with coronavirus disease 2019: A qualitative study. *Evidence Based Care, 11*(1), 44–50.

Koh, D., Lim, M. K., Chia, S. E., Ko, S. M., Qian, F., Ng, V., … Tang, H. K. (2005). Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare Workers in Singapore What can we Learn? *Medical Care*, 676–682.

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., … Li, R. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Network Open, 3*(3), e203976–e.

Lee, S.-H., Juang, Y.-Y., Su, Y.-J., Lee, H.-L., Lin, Y.-H., & Chao, C.-C. (2005). Facing SARS: Psychological impacts on SARS team nurses and psychiatric services in a Taiwan general hospital. *General Hospital Psychiatry, 27*(5), 352–358.

Lee, S.-Y., Chiang, K.-J., Tsai, Y.-J., Lin, C.-K., Wang, Y.-J., Chiou, C.-P., & Pan, H.-H. (2022). Perceived Stress and Coping Behavior of Nurses Caring for Critical Patients with COVID-19 Outbreak in Taiwan: A Mixed-Methods Study. *International Journal of Environmental Research and Public Health, 19*(7), 4258.

Li, X., Zhou, Y., & Xu, X. (2021). Factors associated with the psychological well-being among front-line nurses exposed to COVID-2019 in China: A predictive study. *Journal of Nursing Management, 29*(2), 240–249.

Liu, C.-Y., Yang, Y.-Z., Zhang, X.-M., Xu, X., Dou, Q.-L., Zhang, W.-W., & Cheng, A. S. (2020). The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: A cross-sectional survey. *Epidemiology and Infection, 148*.

Liu, Q., Luo, D., Haase, J. E., Guo, Q., Wang, X. Q., Liu, S., … Yang, B. X. (2020). The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. *The Lancet Global Health, 8*(6), e790–e798.

Liu, Y., Wang, H., Chen, J., Zhang, X., Yue, X., Ke, J., … Peng, C. (2020). Emergency management of nursing human resources and supplies to respond to coronavirus disease 2019 epidemic. *International Journal of Nursing Sciences, 7*(2), 135–138.

Mirzaei, A., Mozaffari, N., & Soola, A. H. (2022). Occupational stress and its relationship with spiritual coping among emergency department nurses and emergency medical services staff. *International Emergency Nursing, 62*, Article 101170.

Mohammadi, F., Tehranineshat, B., Bijani, M., & Khaleghi, A. A. (2021). Management of COVID-19-related challenges faced by EMS personnel: A qualitative study. *BMC Emergency Medicine, 21*(1), 1–9.

Parola, A., Rossi, A., Tessitore, F., Troisi, G., & Mannarini, S. (2020). Mental health through the COVID-19 quarantine: A growth curve analysis on Italian young adults. *Frontiers in Psychology, 11*, Article 567484.

Raeissi, P., Rajabi, M. R., Ahmadizadeh, E., Rajabkhah, K., & Kakemam, E. (2019). Quality of work life and factors associated with it among nurses in public hospitals. *IranJournal of the Egyptian Public Health Association, 94*(1), 1–8.

Rana, W., Mukhtar, S., & Mukhtar, S. (2020). Mental health of medical workers in Pakistan during the pandemic COVID-19 outbreak. *Asian Journal of Psychiatry, 51*, Article 102080.

Rose, S., Hartnett, J., & Pillai, S. (2021). Healthcare worker's emotions, perceived stressors and coping mechanisms during the COVID-19 pandemic. *PLoS One1, 16*(7), e0254252.

Shanafelt, T., Ripp, J., & Trockel, M. (2020). Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *Journal of the American Medical Association (JAMA), 323*(21), 2133–2134.

Taylor, J. A., Murray, R. M., Davis, A. L., Brandt-Rauf, S., Allen, J. A., Borse, R., … Picone, D. (2022). Model policies to protect US fire-based EMS responders from

workplace stress and violence. *New solutions: a journal of environmental and occupational health policy, 1048291122108572 8*.

Vagni, M., Maiorano, T., Giostra, V., & Pajardi, D. (2020). Hardiness, stress and secondary trauma in Italian healthcare and emergency workers during the COVID-19 pandemic. *Sustainability, 12*(14), 5592.

Wang, H., Liu, Y., Hu, K., Zhang, M., Du, M., Huang, H., & Yue, X. (2020). Healthcare workers' stress when caring for COVID-19 patients: An altruistic perspective. *Nursing Ethics, 27*(7), 1490–1500.

Wheeler, H., & Riding, R. (1994). Occupational stress in general nurses and midwives. *The British Journal of Nursing, 3*(10), 527–534.

Windarwati, H. D., Ati, N. A. L., Paraswati, M. D., Ilmy, S. K., Supianto, A. A., Rizzal, A. F., … Supriati, L. (2021). Stressor, coping mechanism, and motivation among health care workers in dealing with stress due to the COVID-19 pandemic in Indonesia. *Asian Journal of Psychiatry, 56*, Article 102470.

Y. Zhang C. Wang W. Pan J. Zheng J. Gao X. Huang … C. Zhu Stress, burnout, and coping strategies of frontline nurses during the COVID-19 epidemic in Wuhan and Shanghai 2020 China Frontiers in psychiatry, 1154.