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Exploring the challenges of emergency medical service providers in the initial phase of the COVID-19 pandemic: a qualitative content analysis

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Abstract

Background As the COVID-19 pandemic continues to unfold, there has been a substantial increase in the demand for prehospital services. Emergency medical service (EMS) providers have encountered a myriad of challenges that have had a discernible impact on their professional performance. This study was designed to explore the challenges faced by EMS providers during the initial phase of the COVID-19 pandemic.

Methods This qualitative research was conducted using a content analysis approach at emergency medical centers affiliated with Hamadan University of Medical Sciences in Iran between April and August 2021. This study included the participation of 21 EMS personnel, which was conducted using purposive sampling and semistructured interviews, and continued until data saturation was reached. The conventional content analysis method, as outlined by Graneheim and Lundman, was applied for data analysis.

Results The analysis of the interview data resulted in the identification of 219 primary codes, which were then organized into ten distinct categories. These categories were further consolidated into three overarching themes: personal safety challenges, professional-organizational challenges, and threatened mental health.

Conclusions EMS personnel play a critical role in healthcare during disasters and pandemics, facing challenges that can have negative effects. Managing these challenges can impact mental health and professional well-being, but awareness, support, resources, and services can help mitigate adverse consequences.

Keywords Qualitative research, Emergency medical services, COVID-19

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Background

On March 11, 2020, the World Health Organization officially declared COVID-19, the disease induced by the SARS-CoV-2 virus, a global pandemic. As the COVID-19 outbreak commenced in 2019, rapidly spreading worldwide, Iran experienced a substantial surge in both cases and fatalities during the initial phase of the pandemic. It is recognized as the third most affected country, with high numbers of cases and fatalities globally, after China and Italy [1].

Individuals afflicted with COVID-19 may necessitate the assistance of an EMS for urgent medical interventions or transportation to a hospital for specialized care [2]. Prehospital medical emergencies assume a pivotal role in delivering healthcare services, particularly during natural disasters and epidemics [3]. Serving as the primary healthcare providers in the initial stages, they play a vital role in the seamless continuum of emergency healthcare [4]. Emergency medical services (EMSs) in Iran can be accessed nationwide by dialing the toll-free number 115. EMS personnel in Iran work in teams of two, with both members holding university degrees (associate's or bachelor's in emergency medical care or bachelor's or master's in nursing), operating in 12-hour or 24-hour shifts [5]. Due to organizational constraints and a shortage of specialized personnel, ambulance dispatch is based solely on the proximity of the incident to the nearest emergency base, and there are no specialized ambulances for specific emergencies. For instance, an ambulance that transports a patient suspected of having COVID-19 may subsequently transport a cardiac patient or a pregnant woman.

Iranian ambulances are equipped with GPS, and their location is monitored by the dispatch center throughout the dispatch process. EMS personnel respond to the incident site upon receiving the dispatch call, consult with the medical director, provide medical care, and transport the patient(s) to the appropriate specialized hospital [6]. Studies in Iran have shown that EMS personnel often face stressful and challenging situations, such as unpredictable events, time pressure, unsafe scenes, and lack of support from authorities in handling patient complaints, leading to moral distress and job dissatisfaction [7–9].

Given that EMS providers engage in direct patient contact, they are identified as one of the most susceptible groups during the COVID-19 pandemic [10]. Nevertheless, delivering medical services to suspected COVID-19 patients by EMS providers can induce psychological stress and present numerous challenges in patient care, potentially leading to adverse consequences [11].

An initial report on EMS activities during the onset of the pandemic in the United States indicated a reduction in EMS calls in contrast to preceding weeks and comparable periods in preceding years [12]. As the COVID-19 pandemic has advanced, there has been a notable escalation in the demand for prehospital services [13], leading to a myriad of challenges for EMS providers that have impacted their professional performance [14].

Consequences stemming from the COVID-19 pandemic among EMS providers include the heightened risk of contracting the disease and subsequently transmitting it to their family members. Additionally, these professionals contend with increased work pressure, compromised sleep quality, and both physical and mental strain [15, 16]. The encounter with such consequences in a stressful environment imposes constraints on the time available for attending to critical patients and making appropriate decisions [8, 17]. Mohammadi et al.'s research elucidated various challenges confronted by EMS providers in delivering care to COVID-19 patients, notably pertaining to the absence of established protocols, inadequate equipment supply and inequitable distribution, limited personnel experience, and insufficient support from higher authorities [14].

The delivery of EMS staff services during a pandemic crisis is subject to the influence of diverse individual and organizational factors [18, 19], along with prevailing attitudes and culture within the community [20]. The discernment of the perceived experiences of EMS providers in confronting challenges, coupled with an understanding of their responses in diverse situations, assumes a pivotal role in workforce preparedness and the formulation of strategies to surmount impediments, thereby enhancing the efficacy of emergency services amid comparable circumstances. In this context, the identification and analysis of EMS providers' experiences contribute to a nuanced comprehension of both strengths and weaknesses, ultimately fostering advancements in the quality of prehospital emergency services [6].

Given the objective of describing a phenomenon, the most fitting methodology is a qualitative descriptive approach, centering on the elements of who, what, where and why the experience transpires [21]. Qualitative research entails an extensive exploration of human experiences and realities achieved through sustained engagement with individuals in their natural settings. This approach yields comprehensive and descriptive data that enhance our understanding of these experiences [22]. Therefore, the identification of challenges encountered by EMS providers in the initial stage of the COVID-19 pandemic is important for addressing deficiencies within the EMS framework and mitigating adverse outcomes during the pandemic crisis. Consequently, this study endeavors to explore and delineate the challenges confronted by EMS providers in the early phase of the COVID-19 pandemic.

Methods

Design and setting

This qualitative study employed a conventional content analysis approach, utilizing a semistructured interview as the data collection tool. The target population in this study consisted of all 158 operational EMS personnel working in urban and road emergency medical centers in Hamadan city.

Participants

The participants in this study were EMS personnel working in urban (12 bases) and road (4 bases) EMS stations in Hamadan city, located in northwest Iran. EMS operational personnel across Iran are male and work in two-person shifts of 12–24 h. Dispatch assignments are sent to EMS personnel via the Asayar software installed on their mobile phones, based on the predefined geographical area of each station, and they are dispatched in less than one minute after receiving the assignment. EMS personnel record additional mission information (time of arrival at the incident, departure time, and hospital arrival time) as well as patient/victim information (number of victims, vital signs, location and severity of injury) through the same software and submit it to the dispatch center before completing the mission. EMS personnel are required to consult with the on-duty physician at the command center and obtain orders before providing any medical interventions to patients.

In the present study, participants were selected using purposive sampling, considering the maximum diversity in terms of age, work experience, and educational level, between April and August 2021 (Table 1). The primary selection criterion for the interview was having the most relevant work experience related to the research questions, and subsequent participants were introduced through snowball sampling by these experienced individuals. Sampling continued until data saturation was reached, and a total of 21 participants were included in the study. The inclusion criteria were a minimum of one year of EMS experience during the COVID-19 pandemic, direct contact with COVID-19 patients, at least a bachelor's degree in emergency medicine or nursing, and willingness to participate in the study. None of the participants withdrew after providing consent and coordinating the interviews, and no repeat interviews were conducted.

Table 1 Demographic characteristics of participants

Participants	Age (years)	Work experience (years)	Field of study	Educational level	Marital status
P1	25	2	EM	Bachelor	Single
P2	36	14	Nurse	Bachelor	Married
P3	47	23	Nurse	Master	Married
P4	29	6	EM	Bachelor	Married
P5	38	16	Nurse	Bachelor	Married
P6	32	8	EM	Bachelor	Single
P7	48	22	Nurse	Bachelor	Married
P8	34	9	EM	Bachelor	Married
P9	40	16	Nurse	Bachelor	Married
P10	27	5	EM	Bachelor	Married
P11	30	7	EM	Bachelor	Married
P12	46	21	Nurse	Bachelor	Married
P13	44	17	Nurse	Master	Married
P14	40	16	EM	Bachelor	Single
P15	43	18	Nurse	Bachelor	Married
P16	26	4	EM	Bachelor	Single
P17	50	26	Nurse	Bachelor	Married
P18	28	6	EM	Bachelor	Single
P19	39	14	EM	Bachelor	Married
P20	20	18	Nurse	Bachelor	Married
P21	51	27	Nurse	Bachelor	Married

EM: Emergency Medicine

Interviews and research team

The core members of the research team consist of four academic individuals, all of whom have completed specialized training in conducting qualitative research. The team includes MT and AKH, both of whom hold PhD degrees in nursing and are faculty members at the university. MT was involved in conducting the in-depth and semistructured interviews, as well as the data analysis, while AKH played a role in coding, interpreting, and analyzing the data and determining the main themes.

ARB, who had a key role in the analysis and interpretation of the findings, holds a master's degree in epidemiology and a doctoral degree in healthcare management. ARB is also proficient in using MAXQDA software for qualitative research.

The MSH, who coordinated the face-to-face interviews, including invitations and consent from participants, is a surgical technologist and an active researcher in the field of healthcare services.

The research team members possess the necessary expertise and experience in qualitative research methods to ensure the rigor and validity of the study findings.

Data collection

The data were collected through in depth, semistructured interviews. The interview guide was developed based on the research objectives under the supervision of the research team. The list of interview questions was then provided to two experienced emergency medicine specialists for review, and some questions were revised and refined with the consensus of the research team (Table 2). MSH, a researcher, initiated contact with participants via phone calls to schedule interviews. Participants were

Table 2 Semistructured interview guide

Stage 1 Introduction:
- Contact with the participant by the coordinating researcher, obtaining oral consent for participation in the research using an interview, and scheduling an interview appointment
- Introduction of the researcher to the participant and description of the research purpose
- Obtaining informed consent from the participant and assurance of confidentiality of information
Stage 2 Conducting the Interview:
Background Information:
- Ask the participant to describe their role and responsibilities as a prehospital emergency medical provider.
- Request they share their overall experiences working in the EMS system, particularly during the early COVID-19 period.
Challenges During COVID-19:
- Inquire about the most significant challenges they faced as an EMS provider in the initial stages of the pandemic.
- Ask them to discuss how COVID-19 impacted their work, personal life, and overall well-being compared to before the pandemic.
Preparedness and Protocols:
- Explore their views on the preparedness of their organization and the EMS system as a whole in responding to the pandemic.
- Question them about the effectiveness of COVID-19 protocols and guidelines implemented by their agency and any challenges faced in following them.
Emotional and Psychological Impact:
- Ask the participant to describe their emotional state and any psychological challenges they experienced during the early pandemic period.
- Inquire about the coping strategies they utilized to manage stress, anxiety, and other emotional difficulties.
Support Systems:
- Discuss the support systems available within their organization or externally to help EMS personnel cope with the challenges of working during COVID-19.
- Request their feedback on the adequacy and effectiveness of these support systems.
Personal Experiences:
- Ask the participant to share a specific incident or situation that was particularly challenging or impactful for them during the early pandemic.
- Inquire how they managed that situation and what coping strategies they utilized.
Stage 3 Closing:
- Express gratitude to the participant for their time and valuable insights provided during the interview.
- Provide the participant with the researcher's contact information in case they have any follow-up questions or concerns.

requested to attend either the prehospital emergency center conference room or a classroom, preferably at the conclusion of their shift or when off-duty, to ensure a quiet and distraction-free environment. All interviews were conducted by a single researcher (MT), and the purpose of the interview was explicitly stated at the outset. The initial questions were open-ended and descriptive, such as "Please describe the process of providing services to patients with COVID-19 symptoms," "Describe your experiences in providing services to patients in the early days of the COVID-19 epidemic," and "Describe the challenges you faced in the early days of the COVID-19 epidemic." Subsequent exploratory questions such as "Can you explain more?" and "Can you provide more examples in this area that have happened to you or your colleagues?" were posed. The average interview duration was approximately 45 to 60 min. With participants' consent, the interviews were digitally recorded. The researcher also made notes on observations and perceptions during the interviews to enhance comprehension of participants' feelings and experiences. Following each interview, the recorded voices were transcribed verbatim onto paper, and the researcher utilized the field notes for data analysis purposes.

Data analysis

In the current study, data analysis occurred concurrently with data collection, employing a content analysis approach based on Graneheim and Lundman's proposed method. Qualitative content analysis is a research methodology that systematically classifies, codes, and develops themes or recognized models to derive comprehensive insights into the conceptual content of textual data, providing in-depth information about the studied phenomenon [23]. The approach proposed by Granheim and Lundman consists of 5 steps: transcribing the whole interview immediately after completion, reading the whole text to arrive at a general understanding/gist of the content, determining the meaning units and primary codes, categorizing similar primary codes into more comprehensive categories, and determining the main theme of the categories [24].

Following each interview, the content was transcribed line by line, and the researchers read through each text multiple times to gain a comprehensive understanding. Meaningful units, comprising important words, sentences, or paragraphs, were selected, coded to represent a concise summary of the unit's meaning, and then applied to the texts (Table 3). Codes were subsequently compared for similarities and differences by merging similar codes, followed by a review of both codes and texts. Ensuring

Table 3 Formation of codes from meaningful units

Meaningful unit	Compressed meaningful unit	Codes
"I've been through one of the toughest years of my life during this period. I was really at my limit and felt helpless, isolated, and ineffective. I didn't have the motivation to do anything, and sometimes I thought about how I could leave this organization and work somewhere else." (P. 16).	I felt helpless, isolated, and ineffective, and lacked the motivation to continue working	Felt helpless Isolated Ineffective Lack of motivation

code reliability involved an examination and comparison of codes with the data. Themes were identified through profound reflection and code comparisons, incorporating both manifest and latent analyses. Data collection continued until saturation, which was achieved after the 18th interviews. Given the lack of ambiguity in the initial codes, no repetitive interviews were conducted, and 4 additional interviews were performed to ensure data saturation. In total, 21 interviews were conducted, and the data were collected. In the final stage, after merging categories with similar meanings, the main themes were extracted based on their meanings and the relationships between the categories. MAXQDA v.2020 software facilitated the data analysis.

Rigor

To establish the trustworthiness of the qualitative content analysis, the researchers employed Guba and Lincoln's criteria. For research credibility, the first author (MT) had prolonged engagement with the data and participants, attended participants' workplaces, and enhanced their qualitative research expertise by studying textbooks, seeking advice from experienced researchers, and closely following the steps of qualitative research. Member checking was conducted, where generated codes were provided to participants to ensure accuracy. Excerpts from the data, along with their corresponding codes and categories, were reviewed by experts in EMS and qualitative research to confirm the accuracy of the data analysis. For dependability, member checking was used to revise any codes that were not congruent with participants' experiences. Excerpts from the data and their corresponding codes and categories were provided to several experts for confirmation of the data analysis. Confirmability was obtained through detailed information about participants' demographics, and the study setting was provided to help readers understand the context. Transferability, also achieved through sampling with maximum variation in terms of participants' age, work experience, educational level, and workplace, was employed to ensure a wide range of experiences. The time and place of interviews were arranged according to participants' preferences. Additionally, the data analysis was carried out by two researchers (MT and AKH) simultaneously to ensure the reliability of the research results. Peer checking and maximum variation of the sampling further attested to the confirmability and credibility of the findings, allowing a comprehensive understanding of the phenomenon.

Ethical Considerations: Before commencing the study, the research team secured ethical approval from the Ethics Committee of Hamadan University of Medical Sciences (ethics code: IR.UMSHA.REC.1401.515). Prior to conducting the research, the investigator obtained verbal consent from the participants, referencing the study's

objectives. During the interviews, the researcher reiterated the aims and benefits of the study and obtained written informed consent. Participation in the study was voluntary, and participants were free to withdraw at any time. The confidentiality and anonymity of the participants' information were ensured throughout the research process. This included maintaining the confidentiality of the interview transcripts, recorded files, and any disseminated data. To protect the participants' identities, each individual was assigned a unique code during the data collection and analysis.

Table 4 The theme, categories, and sub-categories

Themes	Categories	Sub-categories
Personal Safety Challenges	PPE shortage	Lack of standard protective equipment
		Inadequate supply of masks, gowns, and gloves
	Improper isolation	Insufficient isolation protocols
		Lack of clear guidelines for isolation
	Disruption in scrubbing	Disruptions in decontamination and cleaning procedures
		Challenges in maintaining proper hygiene and sanitation
Professional-Organizational Challenges	Burnout	Excessive workload and long work hours
		Emotional exhaustion and physical fatigue
		Decreased job satisfaction
	Unfavorable organization	Inadequate support
		Poor communication interaction
		Discrimination in service provision
	Unreasonable expectations	Unfair allocation of sick leave
		Pressure to respond to non-urgent cases
		Unreasonable demands of patients
	Lack of definitive protocol	Absence of clear treatment protocols
		Uncertainty about proper procedures and guidelines
Threatened Mental Health	Concerns and fears	Fear of contracting the virus and infecting family members
		Concerns related to lack of disease awareness
		Uncertainty about disease transmission
	Compassion fatigue	Feeling helpless
		Impaired concentration
		Difficulty maintaining empathy and emotional connection
	Mental conflicts	Uncertainty and unpredictability of the future
		Limitations of relationships

Results

The participants in this study had an average age of 38 years and an average of 15 years of work experience. Most participants held a bachelor's degree in nursing (9 participants), a bachelor's degree in emergency medicine (10 participants), or a master's degree in nursing (2 participants). A detailed presentation of the demographic characteristics of the participants is available in Table 1. The analysis of the interview data yielded 219 primary codes, culminating in the identification of ten categories and three overarching themes: personal safety challenges, professional-organizational challenges, and threatened mental health (Table 4).

Personal safety challenges

In the early days of COVID-19, EMS providers faced challenges in preventing disease transmission and ensuring personal safety. Procuring and deploying personal hygiene equipment for employees became difficult due to uncertainties and a lack of knowledge.

Personal protective equipment (PPE) shortage

During the early stages of the epidemic, a major problem was the lack of sufficient personal protective equipment (PPE) in prehospital emergencies. Ambulance personnel and patients were unable to access necessary masks and other protective gear, which caused dissatisfaction.

> *"Each ambulance was allocated only two N-95 masks, which became contaminated due to repeated use. The number of EMS employees in a base did not permit access to standard masks, compelling us to resort to double-layer surgical masks. Even in situations requiring special clothing for COVID-19 encounters, we lacked new uniforms, and colleagues had to attend to patients with the same regular emergency attire." (Participant 4).*

> *"In the early days of the pandemic, we did not even have the most basic personal protective equipment. They had given one standard mask to each person and told us to go on all the missions with just that. There was even a time when surgical masks and gloves were scarce, let alone gowns and protective goggles. " (Participant 1).*

Improper isolation

EMS employees faced challenges in the initial COVID-19 phase, including maintaining social distancing at emergency bases and rest areas. In situations where a colleague displayed coronavirus symptoms, there was no designated rest space. This heightened transmission

risk generated discontent among EMS employees and patients during ambulance transfers.

"During the early days at the central base, six people used to share one room during rest time. Those who could not sleep due to worry had to either sleep outside the room or in the ambulance." (Participant 7).

"At times, patients or their companions inquired if we had transported a suspected COVID patient with the ambulance. Upon learning the details, they either refused transportation or reluctantly agreed with a profound sense of dissatisfaction." (Participant 2).

Disruption in scrubbing

Inadequate scrubbing practices with diverse detergents and time constraints due to an elevated workload emerged during the initial days of the epidemic. This led to insufficient cleaning and disinfection of ambulances, potentially contributing to the transmission of COVID-19 and other diseases.

"The volume of missions was so substantial that there was no window of opportunity to scrub the equipment and ambulance… Initially, they cleaned the equipment with any disinfectant, which even led to their deterioration." (Participant 11).

"In the early days of the pandemic, nothing was in its place. From scrubs to disinfectants, they had not provided us with any standard supplies or proper instructions or training on how to use them correctly. No matter how much we tried to comply, it was not according to the standards." (Participant 19).

Professional-organizational challenges

In the initial COVID-19 phase, EMS employees faced challenges, including organizational deficiencies, unclear protocols, and elevated call volumes. This led to heightened work pressure, fatigue among providers, and increased expectations from officials and patients.

Burnout

The COVID-19 pandemic placed immense strain on EMS workers, leading to increased burnout and emotional exhaustion. Excessive workload, lack of rest, canceled leaves, fear of infection, and consecutive shifts left EMS workers to completely drain their energy.

"At times, we were unable to allocate time for meals, swiftly transitioning to the next mission immediately upon delivering the patient to the hospital. The cancellation of leaves and consecutive shifts left us devoid of energy." (Participant 3).

"I wish our predicament was solely the increased number of missions. I felt drained, and even during breaks, the constant worry about potential infection from patients or colleagues added to our exhaustion. All of these factors depleted our energy." (Participant 9).

"During the early days of the epidemic, the number of emergency calls was much greater, and our daily mission average increased from 6–8 missions to more than 15, many of which were not urgent or emergency cases." (Participant. 15).

Unfavorable organization

Inadequate support, weaknesses in the communication system, and discrimination among employees were among the key organizational factors that challenged EMS personnel in delivering services during the COVID-19 pandemic.

"Rather than offering encouragement, officials, at times, reproached us without thoroughly investigating the circumstances." (Participant 8).

"Discrimination was palpable from the outset, not only among administrative and operational colleagues but also extending to prehospital staff and those within the hospital. Disparities ranged from minimal wages to unfulfilled promises under the guise of hazard pay during the pandemic. The distribution of equipment and vaccine injections favored certain officials and those not directly involved in patient care." (Participant 18).

"In the early stages of the pandemic, we experienced a sudden surge in the number of contacts as well as challenges in patient admission. At times, the hospital capacity for admitting COVID-19 patients was fully saturated, but we were unaware of this and were forced to transfer patients back to other healthcare facilities. Unfortunately, the coordination between centers in managing patient admissions and coordination with the emergency medical center was weak." (Participant 15).

Unreasonable expectations

EMS personnel faced several challenges during the pandemic, including the unfair allocation of sick leave, which

placed an undue burden on staff. Pressure to respond to nonurgent cases, diverting resources from critical emergencies. Unreasonable demands from patients can lead to increased stress and burnout among EMS workers.

> *"Officials aimed to address staffing shortages by implementing measures such as canceling leaves and reducing the treatment duration for employees. Despite a physician prescribing a seven-day treatment, the authorities restricted our treatment period to no more than three days." (Participant 12).*

> *"Some patients explicitly requested that we refrain from being in close proximity and instead urged us to sit in front of the ambulance cabin, fearing the potential transmission of diseases, even though it contradicted our professional responsibilities." (Participant 14).*

> *"Despite informing the patient's companions that their patient was suspected of having COVID-19 and did not currently have an emergency condition requiring ambulance transport and that they should go to the hospital themselves for testing, they still insisted on being transported by ambulance." (Participant 5).*

Lack of a definitive treatment protocol

The absence of a defined treatment protocol, including procedures for identifying suspected cases, utilizing specific medical equipment and interventions, and determining patient transfer, presented numerous challenges for EMS staff.

> *"We were genuinely uncertain about the appropriate course of action for the patient during that period. There was a lack of scientific protocols guiding us in terms of diagnosis and treatment." (Participant 13).*

> *"We were just transporting patients to the hospital without any specific diagnostic protocols or triage for COVID-19 patients. We did not have a treatment protocol for suspected COVID-19 patients or a definitive protocol for how to maintain hygiene and prevent COVID-19." (Participant 17).*

Threatened mental health

In the initial COVID-19 phase, EMS staff faced apprehensions about contracting and transmitting the disease to their colleagues and family. This stems from an incomplete understanding of the disease and exposure to rumors and news, highlighting transmission and mortality risks.

Concerns and fears

EMS personnel faced significant concerns and fears during the COVID-19 pandemic. Ambulance workers expressed the psychological burden related to possible infection during work and concerns about transmission to family members. The combination of fear of infection, lack of PPE, and worries about transmitting the virus to loved people took a major psychological toll on EMS personnel, increasing their levels of distress, posttraumatic stress disorder (PTSD), anxiety, depression, and insomnia compared to pre-pandemic levels.

> *"The first missions suspected of having COVID-19 were stressful, and we would go to the scene wearing masks, clothes, and glasses, and both ourselves and the patient and their families were scared." (Participant 6).*

> *"We lacked familiarity with the disease, and our primary source of information was the media and news networks. Daily exposure to evolving news reports added to the pressure, heightened further by the concerns expressed by families." (Participant 11).*

Compassion fatigue

In the initial COVID-19 phase, EMS providers faced psychological stressors that affected performance and care quality. Factors included lack of public recognition, dissatisfaction with interventions, exposure to colleagues or family members, and heightened death anxiety in patients and their relatives. One participant expressed this sentiment, stating, *"We had put our whole lives into it, and despite our own concerns, we were thinking about saving people and reducing their pain, but they did not understand us and looked at us as if it were just our duty"* (Participant 10).

> *"I have been through one of the toughest years of my life during this period. I was truly at my limit and felt helpless, isolated, and ineffective. I did not have the motivation to do anything, and sometimes I thought about how I could leave this organization and work somewhere else." (Participant 16).*

The challenging circumstances extended to the hospital setting, where overcrowding of COVID-19 patients led to issues. Critically ill patients were left unattended, causing distress among EMS personnel, who were unable to provide necessary care. Participant 9 articulated this concern, stating, *"Due to the overcrowding of COVID patients*

in the hospital, sometimes a critically ill patient who we brought to the emergency room was left unattended and did not receive the necessary care, which was upsetting for us, and we could not do anything about it."

Moreover, the constraints imposed by the pandemic, such as insufficient standard equipment and heightened psychological pressures during cardiopulmonary resuscitation (CPR) scenarios, were cited as impeding the quality of CPR. Participant 18 expressed this challenge, stating, *"In some cases, when we faced CPR, due to the lack of standard equipment and psychological pressures, the quality of cardiopulmonary resuscitation was not sufficient, and this was also painful for us."*

Mental conflicts

The onset of the COVID-19 pandemic was characterized by uncertainty and unpredictability, which brought about both physical and psychological threats. On the one hand, the high volume of emergency prehospital contacts resulted in significant workload pressure for EMS personnel. On the other hand, the confrontation with various rumors and reports of high mortality rates among the public, as well as the infection of colleagues, impose substantial psychological strain on the EMS workforce. Furthermore, the restricted social interactions of healthcare workers with their social circles further exacerbated this psychological burden.

> *"At first, no one knew exactly what to do, and every day, we heard something new. People were very confused and had a lot of stress, and they repeatedly called the emergency services and requested an ambulance." (Participant 6).*

> *"The officials did not know what to do either. On the one hand, there was a shortage of staff, and on the other hand, the request for medical leave had created problems for the staff, and every day, the absence of colleagues increased." (Participant 11).*

> *"The psychological pressure related to news of death and the spread of the disease, news about the transmission and persistence of the virus on equipment and devices, and exposure to colleagues who had suspicious symptoms made the situation more difficult for us every day, and we did not know what would happen." (Participant 13).*

> *"Early on, our communication with family and relatives was stopped, and my child was not in contact with any of his friends. The communication of friends and people around us was more limited, and they were afraid that we would be infected." (Participant 7).*

Discussion

The findings of this study revealed that EMS personnel encountered various challenges in the initial phase of the COVID-19 pandemic. These challenges had repercussions on their individual performance, professional responsibilities, and the quality of prehospital care provided.

Personal safety challenges

During the initial COVID-19 pandemic phases, EMS centers faced challenges, including the absence of PPE, insufficient isolation measures, and inadequate decontamination practices. The shortage of essential PPE items generated concerns and discontent among employees involved in service provision. Parvaresh-Masoud et al. emphasized the adverse effects of disorganization and PPE inadequacy on the challenges confronted by emergency medical technicians during the COVID-19 crisis [18]. Mohammadi et al. (2022) highlighted the shortage of PPE, high workload, and extended shifts as contributing factors to the heightened vulnerability of prehospital workers during the pandemic [10]. Similarly, Baru et al. (2022) observed challenges faced by prehospital emergency personnel, including difficulties in transferring COVID-19 patients due to ambulance shortages, oxygen deficits, and interruptions in care provision owing to insufficient PPE [25]. A survey across 50 U.S. states during the early pandemic stages revealed that 48% of EMS personnel had access to N-95 masks when needed, and 94% had access to gloves when required [26].

In this study, participants reported using alcohol and bleach solutions for disinfecting ambulance equipment and their hands. Gibson et al. noted that a majority of employees disinfected their equipment and facilities after each contact. The disinfection materials employed included commercial industrial disinfectants in 45% of the cases and bleach solutions in 47% of the cases [26].

Professional-organizational challenges

Healthcare professionals, including EMS personnel, faced challenges during the COVID-19 pandemic, including a scarcity of skilled resources and heightened work pressure. An increased workload and inadequate management contribute to burnout and moral distress among EMS providers [7]. The surge in global EMS calls during the pandemic exerted immense pressure on dispatch centers, resulting in delayed ambulance responses and an overall escalation in ambulance call duration [4].

Various studies have consistently reported a significant surge in medical emergency calls at the onset of the pandemic. Parvaresh-Masoud et al. identified a shortage of human resources and high work pressure as prominent challenges confronting EMS personnel during the pandemic's early phases [18]. A study by Hadian et al.

revealed that a lack of general knowledge and concerns related to the disease's unknown nature were among the challenges encountered by prehospital staff amid the COVID-19 pandemic [19].

The COVID-19 pandemic has had a profound impact on the occupational health of healthcare workers, including EMS personnel, creating a spectrum of challenges. These challenges include inadequate preparedness, structural conditions, and strains on physical and mental health [27]. Frontline workers have experienced emotional distress, insufficient equipment and information, and work-related burnout [28]. The pandemic has exacerbated burnout symptoms, with healthcare providers facing heightened workloads and psychosocial stressors [29].

In the present study, one of the challenges encountered by EMS personnel pertained to the absence of well-defined protocols for managing COVID-19 patients. This lack of clarity resulted in heightened stress, fatigue, and compromised decision-making at the scene, leading to patient transfers or referrals to hospitals based on the limited knowledge of COVID-19 symptoms among EMS personnel. A study conducted by Parvaresh-Masoud and colleagues revealed that neither EMS personnel nor nurses possessed a specific plan or protocol for therapeutic interventions for COVID-19 patients [18]. Challenges also included inadequate management in the improper deployment of EMS employees in rural areas and the registration of information pertaining to COVID-19 patients during the early stages of the pandemic [19]. Javanmardi et al. (2023) further demonstrated a significantly elevated level of burnout among emergency medical technicians (EMTs) who had encountered the COVID-19 epidemic, citing the lack of clear protocols as one of the contributing factors [30].

The study identified sources of dissatisfaction among EMS personnel during the initial COVID-19 pandemic phases, including inadequate support, discrimination, and unreasonable demands. Technicians faced issues such as a lack of dedicated resting places, denial of medical leave, and excessive missions without backup ambulances. In line with these findings, Leszczyński et al. emphasized the adverse effects of disorganization and PPE inadequacy on the challenges confronted by emergency medical technicians during the COVID-19 crisis [31].

The experiences shared by participants during the COVID-19 pandemic reveal the significant challenges faced by EMS personnel due to the imposition of unreasonable expectations and constraints. One key issue that emerged was the implementation of measures aimed at addressing staffing shortages, such as the cancellation of leaves and the reduction of prescribed treatment durations. Despite medical recommendations for longer treatment periods, the authorities arbitrarily restricted the duration of care to just a few days. This decision, made without consideration of the needs of patients or the well-being of the EMS workforce, placed additional strain on the already overburdened frontline staff. Furthermore, the participants recounted instances where patients requested that EMS workers refrain from close proximity, even though it contradicted their professional responsibilities. Driven by the fear of disease transmission, some patients demanded that EMS personnel remain isolated in the ambulance cabin rather than providing the necessary hands-on care. This not only undermined the ability of the EMS personnel to fulfill their duties but also added to the emotional and psychological burdens they were already experiencing. These unreasonable expectations and constraints imposed on EMS workers during the pandemic highlight the disconnect between the demands placed on them and the realities they faced in the field. The lack of flexibility, understanding, and support from authorities and the public further exacerbated the challenges encountered by this critical component of the emergency response system. Addressing these issues requires a comprehensive approach that prioritizes the well-being and professional autonomy of EMS personnel. Policymakers and healthcare administrators must work closely with frontline workers to develop realistic and evidence-based protocols while also fostering a culture of empathy and support to ensure that EMS personnel can effectively carry out their duties during public health emergencies.

Research indicates that EMS personnel faced various challenges during the COVID-19 epidemic, including a shortage of adequately trained human resources, insufficient ambulance availability [10], insufficient training regarding personal protective equipment [32], a high and high volume of calls [4], and a substantial increase in call volume [4]. Notably, the number of contacts with the EMS center increased by approximately 20 times in Israel in the early months of 2020 [33] and by 24% in Copenhagen, Denmark [34]. Similarly, New York witnessed a daily increase of more than 50% in EMS calls compared to pre-COVID-19 levels [35]. Steflovich's findings demonstrated a significant increase in both overall traffic volume and diverted traffic during the COVID-19 pandemic [36]. A shortage of high-quality PPE contributes to a heightened workload and psychological distress [37]. Addressing this issue requires thorough PPE training for EMS personnel and adequate support from health systems [38].

Threatened mental health

Encountering elevated stress levels and witnessing distressing events affects the mental well-being of EMS personnel. Factors such as inadequate understanding of the disease, fatigue, compassion, fear, and anxiety also impact

mental health. Research findings show that the COVID-19 pandemic has significantly affected the mental health of EMS personnel.

The findings indicate that the psychological pressures experienced by EMS personnel at the onset of the COVID-19 pandemic were influenced by multiple factors, which made the endurance of this threat extremely challenging for these workers. These factors included the uncertainty and unpredictability surrounding the future of the pandemic virus, the high workload pressure stemming from the increased demand for patient transportation and emergency assistance, the confrontation of various rumors and reports of high mortality rates among the general public, the infection of colleagues and loved ones with the virus, and the limitations on social interactions with friends and family, which played a significant role in exacerbating the psychological strain on prehospital care workers. The combination of these factors created a highly stressful and overwhelming environment for EMS personnel, who were tasked with providing critical emergency services during the initial stages of the COVID-19 outbreak. The uncertainty, workload demands, exposure to trauma, and disruption of social support networks all contributed to the substantial psychological burden experienced by this frontline workforce.

This multifaceted challenge underscores the unique and demanding nature of the EMS profession, particularly during a public health crisis of this magnitude. Addressing the well-being of EMS personnel requires a comprehensive approach that addresses the various psychological, organizational, and social factors that have impacted their mental health and resilience during the COVID-19 pandemic.

Reports have indicated that during infectious disease outbreaks such as those caused by Ebola, MERS-CoV, and COVID-19, individuals experience fear arising from the unknown nature and unpredictability of these events [39–41]. In the early stages of the COVID-19 pandemic, qualitative research revealed concerns among healthcare professionals regarding the limited availability of PPE, continually evolving and conflicting protocols, insufficient knowledge and training, excessive workload, and communication constraints [42–44]. A qualitative study conducted in Iran identified various psychological issues, including fear, posttraumatic stress disorder (PTSD), emotional instability, and lack of resilience, among EMS personnel during the COVID-19 pandemic [18]. Borek et al.'s study highlighted that the perceived risk of COVID-19 has impacted the personal (relationships with others) and professional (roles and care) lives of health workers, with factors such as a lack of PPE, observing colleagues contracting the disease, and the high speed of mortality altering their motivation and affecting their roles and care [45]. Ness et al. reported anxiety among nurses and other healthcare personnel concerning contact and disease transmission to family and friends, leading some to voluntarily self-isolate from their family members [46]. Sun and colleagues noted that caregivers of vulnerable dependents, such as children and elderly people, experienced significant psychological pressure [47]. Xiang et al.'s research revealed that caregivers of COVID-19 patients are more susceptible to psychological disorders [48]. Pasam et al. (2021) conducted a survey-based study and reported that health workers experienced increased rates of depression, anxiety, and sleep disorders after the onset of the COVID-19 pandemic [49].

The findings from these studies, aligning with the present investigation, demonstrate that EMS employees' mental health during the initial phase of the COVID-19 pandemic is influenced by various psychosocial pressures.

The findings indicate that EMS personnel experience compassion fatigue due to continuous exposure to stressors and consequences related to the COVID-19 pandemic. This fatigue poses a threat to their mental health and professional life. Giusti et al. demonstrated that healthcare providers experienced elevated levels of burnout and emotional exhaustion during the initial year of the COVID-19 epidemic [50]. Heydari et al. reported that EMS personnel experienced emotional suffering due to factors such as despair in controlling the disease, fatigue, and emotional pressure from the prolonged pandemic, as well as forced separation from family members [51].

The study revealed that EMS personnel reported that the fear of contracting the disease had a detrimental impact on their work quality, leading to reduced CPR duration in some cases due to decreased contact with victims. Studies conducted during the pandemic revealed that out-of-hospital cardiac arrest (OHCA) patients experienced lower survival rates and favorable neurological outcomes [52, 53]. Similarly, research shows that the concern of contracting and transmitting the disease to loved ones or others is a significant obstacle for EMS personnel during the COVID-19 pandemic, affecting their performance quality [54, 55].

In the current investigation, EMS personnel encountered substantial psychological pressure stemming from compulsory self-isolation and the avoidance of contact with their family members. Brown et al. reported that a majority of EMS personnel altered their interactions during the COVID-19 epidemic due to concerns about the safety of their families, with many expressing reluctance to continue working [56]. Similarly, Alqahtani et al. demonstrated that prehospital personnel faced significant psychosocial pressure, resulting in a marked decrease in their interactions with friends and family [57]. Chag and Hu highlighted that prehospital personnel experienced

heightened mental pressure, burnout, and health burdens related to responding to highly contagious patients in society during the COVID-19 pandemic. This was attributed to high work pressure and a deficient support system from superiors [58].

Limitations

One of the limitations of this study was the challenge in planning and coordinating interviews with EMS personnel participants. This was due to the need to accommodate the busy and unpredictable nature of EMS work, which presented difficulties in scheduling and ensuring that all interested personnel could participate without significant time commitments or coordination issues. The approach of conducting interviews outside of working hours through phone calls aimed to minimize disruptions to the participants' work schedules. However, this may have introduced some selection bias, as EMS workers with more rigid schedules or higher workloads may have been less able to participate in the interviews. Another limitation of the study was the risk of COVID-19 transmission during face-to-face interviews, despite the researchers' efforts to maintain standard distancing and health protocols. Additionally, the fatigue of some participants at the end of their shifts may have led to a loss of interviews or the need to reschedule them, as some experts were unwilling to conduct the interviews at that time. A further limitation of this study pertains to the constrained nature of the data, which relied on information furnished by participants selected through targeted sampling, emphasizing individuals with the most extensive experience. Consequently, the perspectives of less experienced employees, who potentially harbor distinct challenges, were not thoroughly investigated. Furthermore, the data exclusively reflect the experiences of participants engaged in a specific geographic and cultural context, and conditions may diverge across other emergency medical centers.

Conclusions

The COVID-19 pandemic has presented significant challenges for EMS personnel, who play a critical role in providing essential healthcare services during crises. This study revealed that EMS workers faced issues such as inadequate personal protective equipment, limited rest areas, unclear protocols, heightened work pressure, separation from family, and restricted social interactions. These challenges have taken a psychological toll, increasing the risk of burnout and compassion fatigue. To mitigate the negative impact on EMS personnel, it is imperative to prioritize their health and well-being through the provision of supportive services, strategic allocation of resources, and addressing human resource needs. By acknowledging and addressing these challenges, the adverse consequences for EMS professionals during a pandemic can be minimized.

Abbreviations

EMS	Emergency Medical Service
PPE	Personal Protective Equipment
OHCA	Out-of-Hospital Cardiac Arrest
CPR	Cardiopulmonary Resuscitation

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Author contributions

MT conducted the research, performed all interviews, analyzed and interpreted the data, obtained ethical approval, and prepared the draft manuscript. MSH coordinated the interview sessions, recorded and transcribed the interviews, and accompanied the lead researcher in documenting participant feedback. ARB participated in the study design, collected the data, and analyzed and interpreted the results. AKH contributed to the study design and analyzed and interpreted the data. and edited the final draft of the manuscript. All authors approved the final version of this manuscript.

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Data availability

Since the data for this study consists of audio files of the interviews, which have been transcribed, and due to the confidential nature of this information, it is not possible to present the details. However, if requested by an authorized organization with a valid rationale, the extracted codes can be provided.

Declarations

Ethics approval and consent to participate

The present study received approval from the Ethical Committee at Hamadan University of Medical Sciences (Ethics code: IR.UMSHA.REC.1401.515). All participants provided informed written consent and were assured of the confidentiality of the data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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