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Original Article

Hospital emergency department challenges during COVID-19: a scoping review

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Abstract

***Background & Aims*:** The COVID-19 outbreak poses unique challenges for the emergency department, which is a vital hub for providing quality healthcare during the pandemic. Therefore, this study aims to identify the challenges faced by hospital emergency departments during the COVID-19 pandemic.

***Materials & Methods*:** A systematic review was conducted on studies published between 2019 and 2022. The search strategy employed both electronic and manual methods. The main keywords used in this systematic review included hospital, emergency department, COVID-19, epidemic, and challenge. Electronic databases such as MEDLINE (PubMed), Scopus, Web of Science, ProQuest, Google Scholar, Iran Medex, Magiran, and Scientific Information Database (SID) were searched. Additionally, a three-step screening process was used to select studies using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist. Finally, the data were analyzed thematically.

***Results*:** Out of the 1,357 studies retrieved, 11 were included in this systematic review. After analyzing the findings, four main categories of challenges were identified: leadership-related challenges, patient management, physical and mental fatigue among staff, and resource shortages.

***Conclusion*:** Healthcare systems need to be well prepared to deliver effective health services during epidemics. The quality of medical services is compromised by these emerging challenges, and this study provides evidence to support the development of an efficient framework for enhancing hospital emergency department services and addressing the challenges encountered during the COVID-19 epidemic.

***Keywords*:** Challenges, COVID-19, Emergency department, Epidemic, Systematic review

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Introduction

At the end of 2019, a respiratory disease known as COVID-19 emerged in Wuhan, China (1, 2). The complete genome sequence of the virus was identified through PCR and pharyngeal secretion cultures (3, 4). By mid-January, China had confirmed over 2,800 cases of COVID-19, with the first death reported on January 9 (5, 6). On January 30, 2020, the World Health Organization (WHO) declared the outbreak a global public health emergency (5, 6).

COVID-19 primarily affects the respiratory system and presents symptoms similar to those of the common cold (7, 8). These symptoms include respiratory disorders, a runny nose, dry cough, dizziness, sore throat, body aches, and may be accompanied by a headache and fever that can persist for several days. Psychological problems have also been observed due to the disease's unpredictable nature, control uncertainties, and associated risks (9, 10).

The coronavirus pandemic has posed significant challenges to healthcare systems worldwide, leading to global behavioral changes (11, 12). Concerns arose due to the scarcity of personal protective equipment (PPE), infections among healthcare workers, understaffing, and the rapid spread of the disease. Medical personnel faced immense pressure with limited resources and facilities during the COVID-19 outbreak (13).

Emergency departments (EDs), serving as the initial point of contact for patients, faced various issues and challenges during the pandemic. Limited hospital beds and reduced access to outpatient care contributed to overcrowding, prolonged waiting times, and compromised service quality (14). As the heart of the hospital, the emergency department (ED) holds a pivotal and delicate position within hospitals and the healthcare system. The department is responsible for delivering prompt, high-quality, and effective care, which involves numerous intricate processes (15). Despite their pivotal role, EDs often face budget constraints and inadequate staffing. The COVID-19 pandemic exposed vulnerabilities in emergency department design and functionality, impacting both patient care and staff safety (16).

A study by Ariapooran during the pandemic revealed higher levels of anxiety among ED nurses compared to those in other hospital departments (17). The emergency care system within the ED consists of three main components: input, throughput, and output (18). The input component involves factors influencing service demand. The throughput component focuses on triage, assessment, diagnosis, and treatment processes. The output component relates to patient status, efficient admission or discharge, and bed occupancy within the emergency department. Throughout the COVID-19 pandemic, EDs worldwide encountered challenges across all three components, significantly impacting public health (19).

Given the novel nature of COVID-19, medical centers, particularly hospital EDs, play a crucial role in managing the disease. Immediate, appropriate, and effective treatment within the ED is vital due to its critical function in saving lives during the COVID-19 pandemic. Therefore, the ED stands as an indispensable cornerstone of the healthcare system. Recognizing the significance of this department, it becomes essential to identify and address any weaknesses and challenges it may face during the COVID-19 crisis. Doing so will enable effective planning and improvement of the quality of services provided in response to sudden outbreaks. The purpose of this study is to conduct a systematic review of the challenges encountered by hospital EDs during the COVID-19 pandemic.

Materials & Methods

This systematic review includes studies conducted between 2019 and January 2022, which focus on the ED and the impact of COVID-19 as key variables within the study's objectives. Persian and English articles available in databases such as PubMed, Google Scholar, ScienceDirect, SID, and Magiran were searched from March 2019 to January 2022. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was employed to report the articles. All research steps, including the search strategy, article selection, quality evaluation,

and data extraction, were done by the two researchers independently.

Search Strategy:

The search strategy employed both electronic and manual methods. The main keywords used in this systematic review were hospital, emergency department, COVID-19, epidemic, and challenge. Databases including PubMed, Scopus, Web of Science, and Medline, as well as Iranian databases including the Scientific Information Database of Academic Jihad (SID), the Research Institute of Information and Scientific Documents of Iran, Magiran, and IranMedex, were examined based on the search strategy. Additionally, further checks were conducted to ensure that relevant articles were not missed by searching the Google Scholar database.

Data Sources:

Both library databases and reference databases were considered the main sources of our data. Considering that Persian articles were very limited in the field of data source validation, all English articles published up until the end of June 2022 were selected without any time restrictions. These articles were identified by searching the Web of Science, PubMed, Scopus, Cochrane Library, ScienceDirect, Google Scholar, and Embase. Additionally, books, academic websites, authoritative documents, and reports from international organizations were also studied and reviewed based on the purpose of the study.

Inclusion Criteria:

The inclusion criteria for this review encompassed Persian and English-language studies conducted within the designated timeframe, which discuss the models and approaches of hospital EDs during the COVID-19 pandemic. Studies selected for inclusion met the minimum quality standards based on qualitative evaluation criteria.

Exclusion Criteria:

Studies that did not meet the minimum required quality score following the quality assessment were excluded from the review. Additionally, review studies, narratives, meta-analyses, case reports, and studies that did not focus on COVID-19 in hospital EDs were also excluded.

Article Selection:

Following the database search, articles were initially filtered based on their titles and abstracts. Subsequently, the full texts of relevant articles were reviewed. The extraction of relevant information was conducted according to the guidelines outlined in the PRISMA flowchart, as depicted in Figure 1.

According to the PRISMA table in this study, out of the 1,357 studies initially searched using the terms COVID-19, emergency department, challenges, and hospital across various databases, a total of 87 articles underwent full-text review. Eventually, 11 articles were included in this study and analyzed using a thematic analysis approach.

After removing duplicates, 520 studies were excluded due to not meeting the inclusion criteria. These excluded studies were classified into three levels. The remaining 87 studies underwent a quality assessment stage, during which the full texts were evaluated using the CASP checklist. Among these, 76 studies were further excluded because they did not address the specific challenges of hospital EDs during the COVID-19 pandemic, which was the focus of this systematic review. Among the 87 studies reviewed in full text, only three employed a qualitative methodology but were still excluded during the screening stage due to non-compliance with the inclusion criteria.

Quality Analysis and Evaluation:

Quality analysis was conducted using EndNote software, with duplicates being removed independently by two authors. Primary screening of the original articles was performed by checking the titles and abstracts and categorizing the selected articles as either relevant or irrelevant. Irrelevant articles, identified by both reviewers, were excluded. Each reviewer then reviewed the full texts of the remaining articles and

compiled a list of included articles. The two lists were compared, and any discrepancies were discussed. In cases of disagreement, a third team member made the final decision regarding inclusion. Study information, including author names, publication year, study type, and design, was extracted from each study and recorded in Table 2.

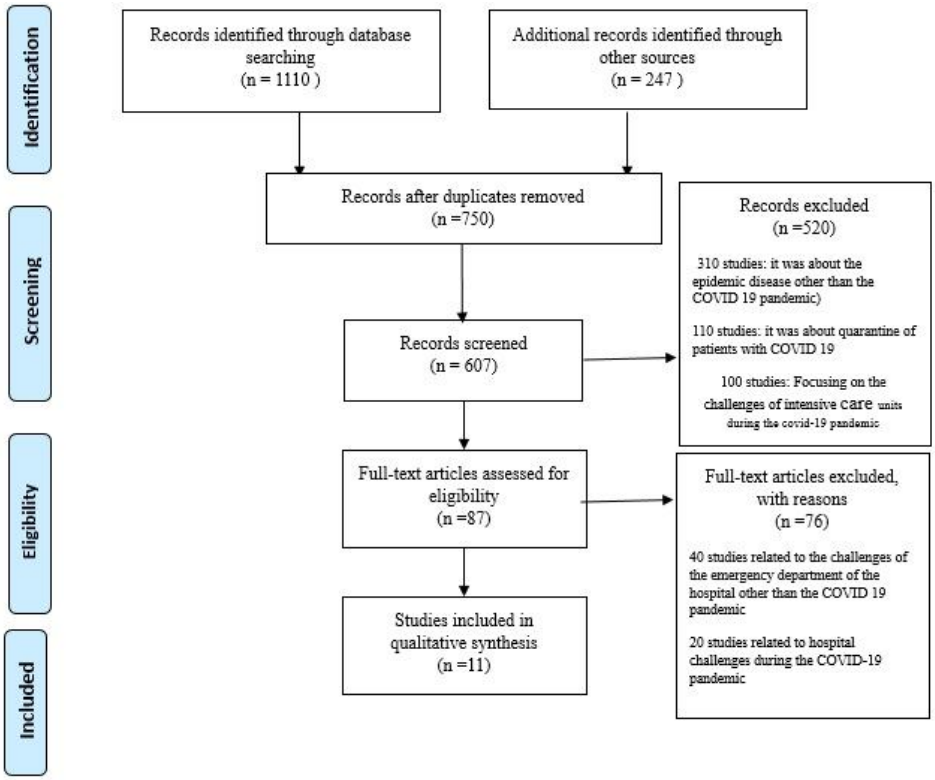

Fig. 1. Flowchart of the process of reviewing and selecting studies based on the systematic review

Table 1. Categorization of challenges faced by hospitals' emergency departments during the COVID-19 period, extracted from research studies

Main classes	Subclasses
Challenges related to leadership	Designing and preparing new instructions
	Weakness in system flexibility
Challenges related to patient triage	Overcrowding in the physical space of the emergency department
	Insufficient data for definitive diagnosis of patients
Challenge of physical and mental exhaustion of individuals	Prolonged and incorrect use of PPE
	Mental exhaustion
Challenges caused by lack of resources	Inadequate medical equipment and PPE
	Insufficient space
	Insufficient personnel and support staff

Table 2. Frequency-based classification of challenges faced by emergency hospitals during the COVID-19 period, as indicated by selected studies

Classification of challenges	Subclasses	Frequency	The relative percentage	The authors
Challenges related to leadership	Weakness in design and new guidelines	7	64%	Björn (24), Markwel(19) , Gemma (23) , Kerrie (13), Jachetti (21), Mujeeb (22),pleg (5)
	Weakness in system flexibility	4	36%	Björn (24). Gayathri (16), Mujeeb (22), Jachetti (21),
Challenges related to patient triage	Overcrowding in the physical space of triage	4	36%	Gayathri (16), Jachetti (21), Kerrie (13),Yang (10)
	Insufficient data for definitive diagnosis of patients	4	36%	pleg (5), Markwell (19), Mulyadi (9),Mujeeb (22)
Challenges related to people's physical and mental exhaustion	Long-term and incorrect use of PPE and high reporting burden	6	55%	Mujeeb (22), Mulyadi (9),Chien (25), Markwell (19), Gayathri (16), Björn (24)
	Mental exhaustion	4	36%	Yang (10), Markwell (19), Gemma (20), Mulyadi (9),
Challenges caused by lack of resources	Lack of medical equipment	6	55%	Gemma (20), Gayathri (16), pleg (5),Yang (10), Markwell (19), Jachetti (21)
	Lack of space	5	45%	Lin (24), Gayathri (16), Jachetti (21), Kerrie (13),Yang (10)
	Lack of specialized and service manpower	5	45%	Markwell (19), Kerrie (13),Yang (10), Gayathri (16), Jachetti (21)

The Critical Appraisal Skills Programme (CASP) checklist was used to assess the quality of the included articles, employing specific checklists based on the article types, a set of eight critical appraisal tools designed to be used when reading research. These eight tools match eight different study or research types. This highlights that the checklist you use should depend on the type of study you are appraising.

Articles that did not meet the minimum quality standards, as determined by two independent authors who reviewed the full texts, were excluded. All studies included in this systematic review were independently reviewed using this checklist. Ultimately, 11 studies were analyzed using thematic analysis, revealing challenges in four main categories: leadership, patient triage, physical and mental exhaustion of employees, and resource limitations, all related to the ED during the COVID-19 pandemic.

Results

The analysis of the articles revealed that the challenges faced by emergency hospitals during the COVID-19 pandemic can be categorized into four main groups:

1. 1. Challenges related to leadership, which include subcategories such as designing and preparing new instructions, as well as weaknesses in system flexibility.

2. Challenges associated with patient triage, overcrowding in the physical space of the emergency department, and insufficient data for definitive patient diagnosis.

3. Challenges of physical and mental exhaustion of individuals, including subcategories such as prolonged and incorrect use of PPE and mental exhaustion.

4. Challenges caused by lack of resources, involving subcategories such as inadequate medical equipment and PPE, insufficient space, insufficient personnel, and support staff (Table 1).

Leadership Challenges:

Hospital and ED operations rely heavily on key factors such as physical space, staff, and equipment. This dependence necessitates effective leadership, supportive policies, and efficient communication (16). The global management of the COVID-19 pandemic has placed significant demands on personnel and medical resources, presenting substantial challenges (20). Furthermore, the lack of prior experience in managing and leading during a pandemic further complicates the situation (20). Among the challenges identified in the reviewed articles, issues related to leadership included deficiencies in designing and implementing new health guidelines, as well as limitations in the adaptability of systems (10).

Designing and Preparing New Instructions:

This disaster has undoubtedly presented major challenges to healthcare and medical services worldwide. The analysis of the articles reveals that a significant portion of these challenges arises from the constant changes in guidelines and protocols associated with COVID-19. At the onset of this crisis, adequate emergency plans to address such a monumental challenge were lacking at the national, regional, and even hospital department levels. Although many emergency plans had been prepared in the past for mass casualty incidents, no one had anticipated something as difficult and prolonged as this. Regrettably, dedicated facilities specifically designed to respond to this type of crisis were not considered (21).

The health authorities continuously revised the protocols for evaluating, diagnosing, and treating individuals suspected of having COVID-19 in the emergency department. Consequently, the staff had to familiarize themselves with these daily changes and updates in order to ensure proper execution of their duties before examining patients. Undoubtedly, this constant update of instructions proved to be somewhat bothersome (9, 20).

Weakness in System Flexibility:

One of the challenges that emerge in management and leadership during a surge in an epidemic is the need for flexibility in response time. This necessitates timely anticipation, planning, and implementation of essential resources, personnel, and facilities. During a pandemic, it is inevitable that the volume of patients seeking care in the ED will increase, consequently leading to a higher demand for hospital beds, personnel, and other resources. A flexible system is required to cater to this surge while managing demand, expanding facilities, increasing bed capacity, and efficiently utilizing resources without compromising regular hospital services (16). To return to a stable state, the ED requires a comprehensive system that includes both infrastructure and dedicated staff. It is crucial for frontline healthcare workers to be able to operate at full capacity during and after the outbreak period. In the recovery phase, the ED may experience a higher influx of patients with complications resulting from the neglect of chronic conditions (16).

Patient Triage Challenges:

Triage is a vital responsibility of the ED, involving the initial assessment required to prioritize patients based on the severity of their conditions, in order to determine their order of treatment. The COVID-19 pandemic significantly impacted the emergency environment, particularly affecting medical staff. Challenges arose in areas such as screening and segregating suspected COVID-19 patients, tasks that were previously unfamiliar to ED personnel. As a result, there were uncertainties regarding the methods employed for triage and patient management in this new environment (9). Therefore, it is essential to comprehend the experiences of triage in the ED during

epidemic situations, as the triage method implemented plays a crucial role in identifying high-risk populations. A review of articles highlighted that a substantial portion of the challenges faced in triage revolves around overcrowding and the insufficient availability of data for definitive patient diagnosis.

Overcrowding in the Physical Space of the Emergency Department:

The outbreak of the COVID-19 pandemic necessitated a restructuring of hospital operations, with a particular focus on the emergency department (ED) (14). Multiple articles highlight the challenges of overcrowding and inadequate physical space within the triage department (21, 20, 16, 9). The effectiveness of a triage system in the ED can be influenced by various factors, including the availability of sufficient physical space (16). Hospital and emergency operations are inherently constrained by resources like space, staff, and equipment. Significant changes were made in the initial weeks, including the establishment of separate areas for COVID-19 and non-COVID-19 cases, and an extensive reorganization of the department's layout (9). However, the rapidly evolving situation posed difficulties, as there were no properly designed isolation rooms to segregate suspected and non-suspected individuals. This necessitated the implementation of screening and isolation methods for patients with suspected COVID-19, with adjustments made based on the prevailing work environment (9).

Insufficient Data for Definitive Diagnosis of Patients:

During the COVID-19 epidemic, a large influx of patients sought medical services at hospitals, leading to the necessity of screening each patient for COVID-19 upon arrival at the emergency department. Unlike patients affected by natural disasters, this screening process required extensive health data that greatly influenced subsequent treatments and the risk of transmission. Therefore, the ability to obtain accurate and timely test results, along with fast and correct patient identification, became crucial in enabling prompt contact tracing and isolation measures. Although seemingly straightforward, this task required a clear and unambiguous technique with standardized variables. Trained staff were also needed to reliably label and handle laboratory samples (22). According to conducted studies, there were numerous challenges in obtaining accurate data within the ED (9). Additionally, ED personnel encountered significant difficulties due to the high risk of disease transmission, as well as their unmet needs for accurate screening, identification, and triage of patients during the triage process. These personnel lacked adequate resources and understanding of symptoms to diagnose their patients, and problems arose due to incomplete reporting of patients' personal information, leading to instances where patients concealed their travel history and contributed to the spread of the disease (9).

To ensure accurate information gathering regarding COVID-19, patients and their families were asked the same questions together, and any discrepancies in their responses prompted further investigation. However, under such circumstances, there was a possibility of hidden information or individuals not being entirely truthful. ED personnel made continuous efforts to access reliable sources of information on COVID-19, frequently consulting protocols and seeking regular updates to stay abreast of the evolving understanding of the disease (9).

Challenge of Physical and Mental Exhaustion of Individuals:

Physical exhaustion caused by long-term use of PPE and mental exhaustion were among the subcategories of this challenge. Based on the studies conducted, the personnel of the treatment department during dedicated sessions revealed interesting information about their stress related to caring for dying patients and concern for their own health care (13).

Prolonged and Incorrect Use of PPE:

The reviewed studies indicated that ED personnel found the prolonged use of PPE to be uncomfortable.

However, due to its critical role in preventing the spread of COVID-19, they were compelled to use it. The use of PPE led to various problems, such as discomfort, feeling hot, sweating, and limited access to restroom facilities. Additionally, personnel mentioned the increase in their working hours compared to pre-pandemic times and the reduced quality time spent with their families as contributing factors to their physical fatigue (9).

Mental Exhaustion:

Studies involved designing questionnaires to identify hospital employees at high risk of mental health problems. Among the validated questionnaires, it was found that 6.46% of employees experienced depression, while 9.87% reported anxiety. Factors contributing to mental fatigue included longer working hours compared to before, concern for personal and family health, limited communication with the community and loved ones, lack of information about the end of the COVID-19 pandemic, and distressing news from the media (9).

Challenges Caused by Lack of Resources:

One of the major challenges encountered, particularly at the onset of the COVID-19 epidemic, was a scarcity of essential resources such as space, medical equipment, and sufficient human resources. Multiple studies have highlighted the importance of these three aspects: physical space, staff, and equipment (16, 23).

Inadequate Medical Equipment and PPE:

According to studies, one of the main deficiencies in the early stages of dealing with the disease was the inadequate supply of PPE, which resulted in a significant number of personnel being affected by the virus. Additionally, the insufficiency of isolation rooms, oxygen delivery systems, and continuous positive airway pressure (CPAP) devices posed further challenges in combating the spread of the coronavirus (21, 22). International experiences indicated that resources in wards, specialized care units, and ventilators could quickly become overwhelmed due to the high volume of patients.

Insufficient Space:

International experiences have shown that departments, intensive care units, and ventilation resources can quickly come under significant pressure due to the high volume of patients. In such situations, difficult decisions must be made due to limited resources (19).

Insufficient Personnel and Support Staff:

The lack of personnel and the subsequent increase in staff shifts have led to staff burnout. As a result, hospitals have had to seek assistance from personnel in other hospital departments to manage this crisis. Training other employees to assess COVID-19 patients using specific and standardized protocols under the supervision of senior doctors from the ED was necessary (21).

In 7 out of the 11 reviewed articles (64%), the subcategory "weakness in design and new guidelines" was identified as a prominent challenge faced by EDs during the COVID-19 pandemic. The subcategories "long-term and incorrect use of PPE devices and high reporting burden" and "lack of medical equipment" were ranked second in terms of frequency, being mentioned in 6 articles (55%). Detailed information can be found in Table 3.

Table 3. Overview of reviewed studies on challenges in the emergency department during the COVID-19 pandemic

Row	The title of the study	Obstacles and challenges obtained from the study	Sample size	Target population	Type of study	Author (year of publication)
1	The challenge of the COVID-19 pandemic with an all-	-Difficulty in diagnosing disease cases based on definitions and uncertainty about the symptoms of	-	-	a review	Peleg et al. (2021) (5)

Row	The title of the study	Obstacles and challenges obtained from the study	Sample size	Target population	Type of study	Author (year of publication)
	hazards approach to disaster planning	COVID-19 - The need for different planning compared to previous disasters Lack of knowledge about the disease among both the staff and the puplic - Logistical obstacles - The strong dependence of disease outbreaks on people's health behaviors and treatment - Lack of resources and increasing demand - The risk of emergency personnel being involved with the disease - The politicization of COVID-19, which leads to dictating the recommendations of politicians to the medical staff, as well as affecting people's health behaviors -From the behavior of public trust in the healthcare system				
2	Emergency department crowding and hospital transformation during COVID-19, a retrospective, descriptive study from a university hospital in Stockholm, Sweden.	- Overcrowding in the emergency department - Forming a queue in the hospital - Increasing the average length of stay of people in the emergency department of the hospital -Lack of beds -Separation of suspected patients from other patients - The negative impact of crowding on the quality of services provided and the fatigue of personnel - Weakness in quick response	9754 people	General hospitals in Stockholm, Sweden	A retrospective description	Björn af Ugglas et al. (2020) (24)
3	A conceptual framework for emergency department design in an epidemic	- Awareness of environmental defense situation and protocols through pre-triage screening - The problem of human resources, communication and job burnout and the impossibility of recovery after waves of illness -Lack of space - Lack of resources (supplies)	-	-	Field review	Nadarajan et al. (2020) (16)
4	Emergency responses to the COVID-19 outbreak: experiences and lessons from a general hospital in Nanjing, China	- Mental and psychological problems of personnel - Lack of personnel -Lack of supplies and equipment -Lack of space - Personnel training -Education of patients	-	A general hospital in Nanjing, Jiangsu Province, China	Research	Yang Shen et al. (2020) (10)

Row	The title of the study	Obstacles and challenges obtained from the study	Sample size	Target population	Type of study	Author (year of publication)
5	Clinical and ethical challenges for emergency departments during infectious disease outbreaks: can lessons from Ebola virus disease be applied to the COVID-19 pandemic?	-Ethical challenges in the triage of COVID-19 patients -Infection of emergency department personnel with COVID-19 - Lack of sufficient and accurate information about the disease -Weaknesses in existing guidelines and protocols - Psychological problems of personnel, patients and their families -Lack of medical equipment and PPE - Lack of strength and physical fatigue of personnel	-	-	Futuristic	MARKWELL et al. (2020) (19)
6	Management and leadership of nursing services in an emergency plan for the COVID-19 pandemic: the experience of the Barcelona Clinic Hospital	-Lack of experienced manager and leader - Absence of specific guidelines for COVID-19 - Personnel infected with COVID - Psychological and emotional problems of personnel -Lack of reliable diagnostic information in the screening and triage stage -Lack of personal protective equipment	16 nurses, doctors and managers and services	Barcelona Teaching Hospital	Qualitative	Estalella et al. (2021) (20)
7	Strategic planning and response to COVID-19 in a London emergency department	- Lack of space - Lack of sufficient manpower - Leadership and instructions - Employee welfare problems	-	A teaching hospital in London	Case report	Kerrie Whitwell et al. (2020) (13)
8	Nurses' experiences of emergency department triage during the COVID-19 pandemic in Indonesia	-Sudden change of work space - Non-disclosure of personal health information by patients - Ambiguity in the implementation of screening and isolation of patients - Concerns of emergency medical staff about their health and their families - Creating stress by media and virtual space - Mental fatigue and incompatibility of personnel with personal protective equipment	10 people	Indonesian hospitals	Qualitative Study	Mulyadi et al. (2022) (9)
9	Resuscitation teamwork during the COVID-19 pandemic in the emergency department: challenges and solutions	- Limiting the work of personnel to isolated rooms - Lack of sound transmission in the workplace due to the use of personal protective equipment	-	-	Letter to the editor	Chien-Hua Huang et al. (2021) (25)

Row	The title of the study	Obstacles and challenges obtained from the study	Sample size	Target population	Type of study	Author (year of publication)
10	Reorganization of the emergency department to deal with the outbreak of COVID-19 in Milan University Hospital. A time sensitive challenge	- Weakness in design and related instructions - Long-term and wrong use of PPE - Lack of strength and fatigue -Lack of physical space and virus spread -Lack of medical equipment - Weakness in providing information to patients and their families	-	Milan University of Medical Sciences Hospital	Descriptive	Jachetti et al. (2021) (21)
11	Epidemic management with health informatics: successes and challenges	- Weakness in developing strategy and harmonizing data Weakness in system flexibility -Insufficient data for definitive diagnosis of patients - High reporting load and weakness in the automation and correspondence system	-	National states, regional/local agencies, hospitals/healthcare companies/individuals	A review	Basit **et al.** (2021) (22)

Discussion

Since the end of 2019, healthcare systems worldwide have been grappling with an unprecedented crisis caused by an infectious epidemic. This crisis has challenged many scientific and operational assumptions of global management systems. The ED of hospitals is considered the frontline in tackling this disease and is an essential element of the healthcare system. This study aimed to systematically review the challenges faced by hospital EDs during COVID-19.

Most of the reviewed studies prioritize challenges related to management and leadership systems, such as weaknesses in guideline design and formulation, as well as coordination within hospital emergency systems. It is important to acknowledge that previous epidemics like SARS and H1N1 were vastly different from managing COVID-19, presenting distinct management challenges (24). There is an increasing demand for specialized personnel, medical equipment, medications, and physical space at all levels of the healthcare and treatment systems. The availability of these resources relies on effective leadership, supportive policies, and efficient communication (15). The emergency department, being in a frontline and defensive position, is directly and doubly impacted by these policies.

Another significant challenge within the ED is the use of PPE, which is often seen as tiresome protective gear. The availability of PPE has saved the lives of numerous healthcare workers (20). Unfortunately, during an epidemic, inadequate or insufficient standardized PPE can prevent emergency specialists from providing services for several weeks, leading to illness or even death. This issue is crucial because experiences from previous outbreaks (e.g., Ebola) have shown that increased patient volume, perceived risks, and lack of adequate PPE can create stress and compromise the performance of healthcare workers. A vital lesson learned from the COVID-19 pandemic is the importance of always being prepared and equipped with necessary PPE, including masks, isolation garments, and oxygen delivery systems (20). Patient triage, as the initial specialized action in the emergency room, is undoubtedly one of the essential and significant challenges during the COVID-19 pandemic. The lack of physical space for isolation, insufficient data for definitive patient diagnosis, and subsequent measures are among the primary challenges faced by this department (25).

One of the most effective clinical solutions proposed is segregating designated areas for coronavirus patients to facilitate isolation and implementing a two-tier triage system to promptly identify and isolate suspicious individuals upon their arrival. Lessons learned from the SARS epidemic have shown that "early and rapid identification and isolation are the first and foremost steps in controlling infectious diseases." Additionally, having a national-level disease monitoring system and establishing regulations and laws to mitigate disease spread are necessary and indispensable in preventing and controlling the transmission of diseases (23). During the COVID-19 era, all three components essential to the functioning of the emergency department, including intake, operational capacity, and output, have encountered significant challenges that ultimately affect public health. This study highlighted that research in this field, policymaking, management systems, and resource allocation to enhance the operational capacity of the ED are among the central and pivotal factors contributing to these challenges.

Mental fatigue is a persistent condition affecting ED workers during COVID-19. This situation arises due to increased workloads, sudden changes in procedures and instructions, and personal and professional concerns (10). To manage the mental fatigue of ED workers during COVID-19, the following measures should be taken: Increasing financial and spiritual support: ED employees should be supported by increasing financial and spiritual support, including bonuses and opportunities for rest. Increased training and counseling: ED staff should be supported with increased training and counseling on managing mental fatigue and anxiety. Increase effective communication: ED staff should be supported by increasing effective communication with colleagues and managers about concerns and challenges. Finally, managing the mental fatigue of ED workers during COVID-19 contributes to the goal of creating a safe and sustainable work environment.

Lack of equipment and personnel during COVID-19 is a significant challenge in global medical and emergency systems. This shortage is due to the increase in the number of patients, the heightened demand for equipment and personnel, and the financial and resource limitations faced by medical and emergency systems (13). Management measures to address the lack of equipment and personnel include: Timely and sufficient allocation of equipment and personnel: Timely and sufficient allocation of equipment and personnel helps emergency workers to be able to help patients. Increased training and counseling: Increased training and counseling will help emergency workers manage fatigue and stress. Increasing financial and moral support: Increasing financial and moral support helps emergency workers to aid patients. Increasing cooperation between organizations: Increasing cooperation between organizations helps manage shortage of equipment and personnel. Finally, managing shortages of equipment and personnel during COVID-19 contributes to creating a safe and sustainable work environment.

As mentioned, establishing an infectious disease control management system at the national level not only enables effective epidemic control from the outset but also reduces the need for constant changes in instructions and protocols. Developing and disseminating effective operational plans to manage infectious diseases and epidemics within the emergency system, whether at the national, regional, or hospital level, following the stages of prevention, preparation, response, and recovery (crisis management cycle), is indispensable and crucial. Additionally, establishing a flexible and dynamic system in the hospital's ED to manage demands effectively and increase facilities and resources, serves as a common point emphasized in the studies. In order to maintain preparedness and manage biological crises such as COVID-19 effectively, ensuring an adequate supply of medical and diagnostic equipment, medications, PPE, oxygen delivery systems, diagnostic tests, etc. It is essential to have standardized processes for their procurement and preparation. Managing the enthusiasm and motivation of specialized staff, who serve as the main assets of the emergency department,

is one of the key solutions for more effective actions in the aftermath of the crisis and in facing future challenges.

One of the limitations of the current research was restricted access to databases and full access to all articles. Future research should explore potential solutions to overcome the aforementioned challenges.

Conclusion

Healthcare systems need to be well-prepared to deliver effective health services during epidemics. The quality of medical services is compromised by emerging challenges, and this study provides evidence supporting the development of an efficient framework to enhance hospital ED services and address the challenges encountered during the COVID-19 epidemic. Further research and collaboration among healthcare providers, policymakers, and stakeholders are necessary to develop strategies and resources that mitigate the challenges faced by EDs during pandemics and other healthcare emergencies.

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Authors' Contributions

Conceptualization and supervision: Fahimeh Barghi Shirazi, Shandiz Moslehi and Ameneh Marzban; Data collection: Mohammad Taghi Bastami and Mostafa Modareszade; Study design and data analysis: Hadis Amiri and Shandiz Moslehi; Drafting the manuscript: All authors; Final approval: Ameneh Marzban.

Data Availability

All data obtained from this study are included in the text of the article.

Conflict of Interest

The authors declare no conflicts of interest in conducting this research.

Ethical Statement

This study is the outcome of a research project approved by Kerman University of Medical Sciences in 1401 with the code IR.KMU.REC.1401.271 from the Research Ethics Committee of Kerman University of Medical Sciences.

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