



Challenges in Managing Patients During Biological Emergencies in the Iranian Health System: A Qualitative Study

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ABSTRACT

Objectives: This qualitative study aimed to identify the key challenges associated with managing patients affected by biological emergencies in Iran.

Methods: This study was part of grounded theory research using the constant comparative analysis method proposed by Corbin (2014). Data were gathered through semi-structured interviews with 25 individuals with expertise or experience in managing biological emergencies. Purposive sampling, followed by theoretical sampling, was employed until theoretical saturation was reached. Data collection was conducted between April and November 2023, and MAXQDA software (2020) was used for data analysis.

Results: After several rounds of data analysis and summarization, considering similarities and differences, four main categories and 14 subcategories were identified. The main categories included: 1) lack of a comprehensive risk communication strategy, 2) inefficiencies in patient flow mismanagement, 3) systemic political and governance challenges, and 4) deficiencies in resource allocation and utilization.

Conclusion: This study highlighted the challenges faced by Iran's Healthcare system in managing affected individuals in biological emergencies. Key issues included mismanagement of patient flow and systemic inefficiencies. Addressing these challenges is essential for enhancing the effectiveness and sustainability of Iran's Healthcare system. Further research is recommended to provide practical strategies for managing biological emergencies in the future.

Keywords: Iran, Delivery of Health care, Emergencies, Content analysis.

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Introduction

Biological hazards and Emergencies pose significant threats to global public health, potentially leading to substantial loss of life and economic consequences [1]. Managing the risks associated with biological emergencies is therefore a national priority, as reflected in international health regulations and the Sendai Framework [1].

Biological hazards, which originate from biological sources, may result from natural events or intentional or accidental releases [2, 3]. Throughout history, biological emergencies have caused pandemics, epidemics, and significant morbidity and mortality. examples of global threats from emerging pathogens include the Black Death, the Spanish flu, bioterrorism with anthrax, and coronaviruses. Influenza pandemics occur approximately every 1 to 3 years, with the 1918 pandemic being the deadliest in recorded history [4, 5]. Deadly epidemics and life-threatening infections such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), which emerged in 2003 and 2012, respectively, continue to pose challenges to public health systems [6]. The most recent example, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was first identified in Wuhan, China, in late December 2019 [7, 8]. According to the World Health Organization (WHO), as of January 21, 2024, COVID-19 has caused approximately 774,395,593 infections and over 7 million deaths worldwide [9].

The 21st century will be remembered in medical history for the profound and devastating impact of the COVID-19 pandemic. A major challenge for countries during biological emergencies is managing affected populations, which can overwhelm or even collapse a country's healthcare system, depending on the governmental capacity [10]. At the peak of the COVID-19 pandemic, healthcare infrastructures were strained or collapsed both in developed and developing countries [11-13]. The crisis further exposed systemic weaknesses and the fragility of healthcare systems globally [14, 15]. Effectively balancing limited hospital resources with the surge in demand for care during unpredictable patient influxes remains a critical priority in healthcare policymaking [16].

The challenges of managing affected populations in biological emergencies vary across countries due to cultural, social, and economic factors [17, 18]. In Iran, during the COVID-19 pandemic, widespread sanctions and inadequate resources hindered universal access to vaccines, medical supplies, and healthcare services, particularly for vulnerable groups. Therefore, this study aimed to explore the experiences of expert managers and policymakers in addressing the challenges of managing individuals affected by biological emergencies in Iran.

Materials and Methods

This study was a part of a grounded theory study that employed qualitative content analysis, using Corbin's proposed constant comparative method for conceptual ordering. This approach is particularly suitable for investigating new phenomena or examining known phenomena from novel perspectives [19]. Qualitative content analysis provides a systematic method for obtaining a comprehensive and detailed description of a phenomenon, resulting in categories or concepts that characterize the subject of study [19]. Based on the principles of this approach, data were collected directly from participants with no predefined assumptions and analyzed simultaneously [20].

Participants were selected using purposive sampling based on their expertise in managing biological emergencies and willingness to participate. Inclusion criteria required participants to have experience in managing disasters and emergencies, including outbreaks of infectious diseases and biological emergencies such as influenza, Ebola, and COVID-19. The study involved senior and middle-level managers from various parts of Iran's Healthcare system, including Ministry of Health's COVID-19 management headquarters, National Organization for Passive Defense, Reference laboratories (e.g., Pasteur Institute), Center for Management of Infectious Diseases, Designated COVID-19 referral hospitals, 16-hour comprehensive health centers for COVID-19 patients, Pre-hospital emergency centers, United Nations High Commissioner for Refugees (UNHCR), Executive management of the Pasteur Covac vaccine project, and Virology departments. The interviews were conducted at the participants' workplaces, as mutually agreed upon. To ensure maximum diversity, participants were selected from various specialties and professional backgrounds, with sampling continued until data saturation was achieved. Any participant who expressed unwillingness to continue the study was excluded [21].

The final sample comprised 25 participants (18 men, 7 women) with a mean age of 51.8±8.4 years. Purposive sampling with maximum diversity was employed, and data saturation was reached after 27 interviews, including two repeat interviews with participants. The participants' specialties and positions are detailed in Table 1.

In-depth, semi-structured interviews were conducted to collect data [20, 22]. This method was selected for its flexibility and ability to yield rich qualitative insights, which are essential for exploring complex phenomena. Data collection took place between April and November 2023, with interviews lasting 32 to 89 minutes each.

Following institutional approvals, the researcher contacted potential participants, introduced herself, and clearly explained the study objectives. Written informed consent was obtained to audio-record the interviews. Interviews were conducted at locations

Table 1. Demographics of study participants on patient management challenges during biological emergencies in the Iranian health system.

Row No.	Specialized Degree	Management Level	Management Experience (Years)	Work Experience (Years)
1	Infectious Disease Specialist	Executive Manager of Vaccine Trial	7	27
2	PhD in Health Services Management	Deputy of Treatment	22	34
3	PhD in Disaster and Emergency Health	University Lecturer	13	29
4	Infectious Disease Specialist	Dean of Medical School	12	24
5	General Practitioner	Deputy of Health	11	21
6	General Practitioner	Health Center Director	8	18
7	PhD in Disaster and Emergency Health	Deputy of the Pre-Hospital Emergency Center	6	22
8	General Practitioner	Manager of Network Infectious Disease Control	13	28
9	PhD in Health Services Management	Treatment Manager	16	33
10	PhD in Medical Virology	Virologist	12	32
11	Emergency Medicine Specialist	Deputy of Treatment and Manager of 16-hour COVID Centers	4	18
12	General Practitioner, MPH in Infectious Diseases	Director of the Infectious Disease Center, Ministry	5	16
13	Infectious Disease Specialist	Director of Health Education and Promotion, Ministry	4	14
14	Subspecialist in Disaster and Emergency Health	University President	20	30
15	General Practitioner	Representative of the United Nations High Commissioner for Refugees in the Ministry	24	38
16	Specialist in Disaster and Emergency Health	Member of the National Coronavirus Committee	2	8
17	Anesthesiology Specialist	Deputy of Education	23	35
18	Emergency Medicine Specialist	University Lecturer	8	18
19	General Practitioner, MPH in Disaster and Emergency Health	Emergency Operations Center Head, University	19	29
20	General Practitioner	Head of the Pre-Hospital Emergency Communications Center, University	11	17
21	PhD in Nursing	Head of Pre-Hospital Emergency Center, County	5	16
22	Master's degree in Nursing	Director of Nursing Services, Hospital	8	18
23	Master's degree in Nursing	Director of Nursing Services, Hospital	11	21
24	PhD in Health Services Management	Director of Nursing Services Office, University	19	35
25	Master's in Health Services Management	Director of Nursing Services, Hospital	14	23

mutually agreed upon to ensure participant comfort and convenience, typically their workplaces. Each interview began with a broad, open-ended question addressing the main research question: "What are the challenges associated with managing patients in biological emergencies in Iran?" Subsequent questions followed the semi-structured interview guide (Table 2), beginning with general questions and progressively focusing on specific themes as they emerged. This process is both exploratory and iterative. Example questions included: "What has been your experience in managing patients during biological emergencies?" "What challenges and difficulties have you encountered in patient management during these crises?" Subsequent questions were more specific, based on emerging themes, and were guided by the research objectives. Probing questions were used

to delve deeper into participants' responses when necessary. All interviews were audio-recorded and transcribed verbatim for analysis. A sample of semi-structured interview questions is included in Table 2.

To facilitate a comprehensive understanding of the data, the first author conducted multiple thorough readings of each interview transcript to achieve deep immersion in the data. Following repeated listening sessions to ensure accuracy, all interviews were transcribed verbatim. The data were analyzed using the constant comparative method [19] through the following stages: Identification of meaning units, open coding of significant statements, grouping of codes based on similarities and differences, and development of main categories and subcategories. MAXQDA software (2020) was used to facilitate the organization and management of the analytical process.

Table 2. Guide to semi-structured interview questions

Participants	Questions
Expert managers/ Policymakers	Open-ended Questions
Age	What has been your experience in managing patients during biological emergencies?
Sex	What challenges and difficulties have you encountered in managing patients during biological emergencies?"
Specialized Degree	In your experience, what was the role of volunteers, benefactors, and non-governmental organizations in facing biological emergencies?
Position: Work Experience:	Considering the challenges you mentioned, what is your solution and suggestion for managing these challenges in the face of biological emergencies in the future?
Management Experience	Exploratory questions Why? How?
Management Level:	Please explain more Please give an example.

Table 3. Categories, subcategories, and conceptual codes extracted from the study of challenges in managing patients during biological emergencies in Iran's healthcare system.

Categories	Subcategories	Codes
1. Lack of a Comprehensive Risk Communication Strategy	Shift in trust towards unofficial sources	<ul style="list-style-type: none"> • Lack of a unified spokesperson • Absence of clearly categorized information • Numerous unreliable news channels • Non-specialized media production and communication strategies
	Mass media's loss of news credibility and authority	<ul style="list-style-type: none"> • Failure to provide timely responses to public concerns • Denial and news desperation • Insufficient understanding of the audience by the National media • Dissemination of incorrect information by news networks • Intervention of non-experts and disputes among experts
	Failure to control the infodemic	<ul style="list-style-type: none"> • The overwhelming presence of both accurate and inaccurate information from various sources • Contradictory opinions • Confusion regarding the choice of reliable information sources • Delayed establishment of a national coronavirus information system
2. Inefficiencies in patient flow management	Failure to proceed based on response standards	<ul style="list-style-type: none"> • Lack of a graded care system • Absence of a separate section for managing biological patients in healthcare centers • Fear of healthcare staff in performing therapeutic procedures on infected patients • Delay in establishing temporary inpatient clinics • Neglect of treatment for a large volume of moderate patients • Lack of planning for discharge and monitoring of patients after returning to the community • Sense of distrust in convalescent homes and intermediate centers
	Ambiguity in managing specific groups with special needs	<ul style="list-style-type: none"> • Abandonment of vulnerable groups • Mimicking disease symptoms with underlying conditions in the elderly • Loss of specific groups in large-scale counting and analysis • Lack of an <i>ad-hoc</i> plan for managing illegal immigrants and foreign nationals • Neglect of physically and socially vulnerable groups
	Lack of a capable system for drug production, distribution, and security	<ul style="list-style-type: none"> • Weak pharmaceutical system literacy • Leakage of drugs from medical centers and a lack of drug management • Unequal distribution and lack of a unified drug price • Ambiguity in drug quality and safety • Lack of alignment between the pharmaceutical system and the healthcare system
	Sinusoidal vaccination	<ul style="list-style-type: none"> • Political disputes and the impact of sanctions on vaccine imports • Delayed production and distribution of domestic vaccines • Limited role of knowledge-based institutions in vaccine production • Delay in determining and locating vaccination sites • Delay in the digital vaccine registration system and tools • Lack of readiness for high-speed and high-volume vaccination • Sinusoidal distribution of vaccines • Delay in selecting the type of vaccine and vaccination guidelines for pregnant women and children

3. Systemic political and governance challenges	Conflict of interest in the healthcare system	<ul style="list-style-type: none"> • Lack of prioritization of health • Conflict of interest among managers and specialists • Rapid and unplanned management changes • Emotional senior management • Multiple factors influence the healthcare system • Lack of supportive and aligned government policies with the Ministry of Health
	Non-implementation of upper-level documents	<ul style="list-style-type: none"> • Breakdown of the biological defense structure • Neglect of the capacity of the national crisis management organization • Inability to utilize the potential of the National Civil Defense organization • Multiple stakeholders in crisis management • Inability of the crisis management organization to address the issue • Overlapping work of executive and managerial organizations
	The scientific committee's susceptibility to governing considerations	<ul style="list-style-type: none"> • Delayed formation of specialized committees during the pandemic • Neglect of the audience of guidelines in the scientific committee • Development of non-native and consensual protocols • Lack of scientific analysis of the color-coding score • Influence of famous figures and imposition of reasoned opinions • Constant change in membership and management of the scientific committee • Autonomy and authority of specialists in therapeutic and pharmaceutical interventions • Insufficient legal support for decisions • Lack of attention to the scientific principles of risk management in accidents and disasters
4. Deficiencies in resource allocation	Shortage of standard medical equipment and supplies	<ul style="list-style-type: none"> • Shortage of diagnostic and therapeutic devices and supplies • Delay in supplying medical equipment and standard personal protective equipment • Shortage of disinfectants • Lack of infection control facilities in healthcare settings and urban communities
	Inefficient development of human resources	<ul style="list-style-type: none"> • Weak knowledge and skills of various levels of specialized forces • Lack of multi-disciplinary rapid response teams • Shortage of skilled and pandemic-responsive human resources • Lack of timely performance evaluation and appropriate feedback • Neglect of mental health and occupational burnout of healthcare staff • Wasted capacity of volunteers and charities • Lack of effective training, the Achilles' heel of the healthcare system • Decay of training of specialized forces
	Inefficient process facilitation	<ul style="list-style-type: none"> • Lack of reorganization of operational and clinical processes • Lack of an integrated approach from identification to discharge of patients • Unstable interdisciplinary and interdepartmental therapeutic cooperation • Lack of continuous support from the private sector • Inability to convert hospitals into multi-specialty centers
	Weak and aging healthcare infrastructure	<ul style="list-style-type: none"> • Weakness in the physical infrastructure of centers/facilities • Insufficient Intensive Care units and hospital beds • Worn-out ambulance fleets • Lack of review of the logistics structure • Non-standard spaces • Non-compliance with modern hospital engineering principles

To ensure data credibility and trustworthiness, Lincoln and Guba's criteria were employed [23]. Participants with diverse experiences were selected to enhance the validity and reliability of the findings.

Results

This study explored the experiences and perspectives of healthcare experts and stakeholders regarding the challenges in managing victims of biological emergencies within Iran's healthcare system. Through qualitative analysis of participants' experiences, four thematic categories emerged: lack of a comprehensive risk communication strategy, inefficiencies in patient flow management, systemic political and governance challenges, and deficiencies in resource allocation and utilization. These key

findings are presented in detail in Table 3, which outlines the categorical structure derived from the data analysis.

The first category, Lack of a Comprehensive Risk Communication Strategy, included three subcategories: a shift in trust towards unofficial sources, the mass media's loss of news credibility and authority, and failure to control the infodemic.

Shift in Trust towards Unofficial Sources

Participants in this study highlighted a critical lack of timely and transparent risk communication with the general public as a major challenge during biological emergencies.

One participant noted: *"We lacked a communication strategy, and our strategic communication was also problematic. We didn't know whether we were at the*

peak or the beginning of the outbreak. People trusted cemetery officials more than high-ranking officials” (Participant 13).

Another interviewee stated: “The lack of transparency and inadequate communication with patients and their families caused fear and anxiety, creating a swamp of uncertainty- uncertainty in all aspects. This swamp engulfed people, making them prefer obtaining information from other sources rather than from us. We still need a proper risk communication system” (Participant 7).

Loss of News Credibility and Authority of National Media

The second subcategory of challenges in risk communication management was the loss of news credibility and authority of national media. According to one of the participants, “The national media had become a platform for settling scores, damaging its key position. We had non-experts appearing on national media and engaging in debates with experts, which led to the erosion of media credibility “ (Participant 19).

Failure to Control the Infodemic

Another communication challenge mentioned by the participants was the inability to control the infodemic during biological emergencies. One participant stated: “We experienced a severe infodemic in Iran. Both correct and incorrect information circulated widely. For instance, there was significant public confusion about vaccination in the initial months. People waited for vaccines while insisting on specific types, and the media coverage politicized the choice between foreign and domestically produced vaccines. This blurred the line between scientific evidence and news reporting, creating considerable public distress. “ (Participant 3).

Mismanagement of Patient Flow

The second and most significant challenge identified was inefficiencies in patient flow management. This category included four subcategories: failure to proceed based on response standards, ambiguity in managing specific groups with special needs, lack of an effective system for drug production, distribution, and security, and Sinusoidal vaccination.

Failure to Proceed Based on Response Standards

Based on the views and experiences of the interviewees, the surveillance system should initially proceed based on established response standards. A syndromic surveillance system alongside a routine surveillance system should promptly and sensitively detect and confirm sudden emergencies and epidemics.

As one participant stated: “Given that the disease reporting system for managing infectious diseases in the country is based on a syndromic system, we unfortunately missed identifying the index case.

Furthermore, when an individual arrived at the hospital, there was still no standard treatment protocol for patients. Treatments were administered arbitrarily with no clear thresholds. Guidelines only existed on paper, they were not implemented in practice. Physicians and treatment teams lacked uniform, coordinated, and standardized practices” (Participant 1).

Ambiguity in Managing Specific Groups with Special Needs

Participants highlighted challenges faced in clinically managing vulnerable groups such as children, the disabled, the elderly, pregnant women, individuals with psychological, social, or physical disabilities, and migrants during biological emergencies. These groups require specialized care and must be explicitly included in contingency plans and training programs to ensure their needs are adequately addressed. One participant remarked: “Our healthcare system is not robust enough to cover specific groups with special needs because these individuals are often small in number, overlooked in large cities, and get lost. In Iran, we have groups of illegal migrants who are unregistered and invisible in the system “ (Participant 15).

Lack of a Capable System for Drug Production, Distribution, and Security

Participants emphasized that effective management of biological emergencies requires a robust drug system for production, distribution, and security. They identified drug mafias and inequitable drug distribution as key obstacles in clinical patient management. One participant stated:

“There were drug shortages, and in some cases, medications were smuggled and sold at inflated prices. In some medical centers, drugs were even diverted outside hospitals. Additionally, low pharmaceutical system literacy further complicated clinical management” (Participant 4).

Sinusoidal Vaccination

Participants highlighted that weaknesses in domestic vaccine production, along with delayed vaccine imports due to political struggles and sanctions, exacerbated case numbers and mortality rates early in the COVID-19 pandemic. Regarding the vaccination program, one participant explained: “People viewed vaccination as their only salvation, and our experience confirmed this; however, significant challenges emerged. Initially, we had no vaccines, and imports were blocked. After a long delay, when vaccines finally arrived, their distribution followed a sinusoidal pattern due to staggered, phased deliveries. Moreover, the system’s lack of preparedness for mass vaccine registration and administration caused further problems in selecting and operationalizing vaccination sites “ (Participant 6).

Political and Governance Challenges

This category consisted of three subcategories: conflict of interest in the health system, non-implementation of upper-level documents, and the scientific committee's susceptibility to governing considerations.

Conflict of Interest in the Health System

One participant stated: *"Despite all its problems, the scientific community reached consensus, the prevailing conditions imposed conflicting demands. There were contradictions and conflicting opinions with different levels of resources, and issues other than health and science were prioritized by managers and decision-makers"* (Participant 14).

Non-implementation of Upper-level Documents

Based on the experiences of the participants, using upper-level documents and implementing them in decision-making could be effective in managing affected individuals while preventing redundant efforts across supervisory and executive bodies. A key challenge in COVID-19 management was the failure to leverage both the crisis management organization's capacity and the passive defense organization's potential. One participant emphasized: *"Our crisis management system already included the biological defense headquarters called 'Shafa'. Rather than establishing redundant committees, we should have maximized Shafa's existing framework to coordinate the pandemic response"* (Participant 2).

Scientific Committee's Susceptibility to Governing Considerations

Participants reported that the scientific committee's objectivity was undermined by political, logistical, and governance considerations. One participant stated: *"The scientific committee's decision-making was compromised when personal opinions and unreviewed studies were given equal validity as peer-reviewed evidence. The scientific committee was formed with the presence of famous people, and the reputation of the individual influenced the opinions and decisions of this committee"* (Participant 16).

Inadequate Resource Management

Challenges in resource management included four subcategories: shortage of standard medical equipment and supplies, inefficient human resources development, inefficient process facilitation, and weak and aging healthcare infrastructure.

Shortage of Standard Medical Equipment and Supplies

According to participants, proper management of medical equipment and supplies is essential in managing biological emergencies. The shortage of up-to-date diagnostic and therapeutic devices and delays in supplying standard personal protective equipment significantly compromised frontline

healthcare delivery. One participant explained: *"Hospital challenges stemmed from equipment infrastructure limitations. For surge capacity, we need three fundamental pillars: staff, supplies, and structure. In terms of structure, our hospitals had critical deficiencies, from oxygen delivery systems to inadequate supplies of standard medical equipment and personal protective equipment (PPE) in healthcare facilities"* (Participant 22).

Inefficient Human Resource Development

Participants emphasized that an effective pandemic response requires a specialized, multi-skilled workforce. One participant stated: *"We lacked prepared personnel when the pandemic hit. Our specialized teams and rapid response units were depleted. Although we redeployed staff from other departments, such as psychology and nutrition, they lacked proper training and simply served as stopgap measures. This workforce development should have occurred preemptively. Some hospitals canceled surgeries and converted operating rooms with oxygen supply into ICUs and COVID-19 wards; they increased the space but failed to account for staffing needs. We simply did not have enough qualified personnel to operate these converted facilities"* (Participant 9).

Inefficient Process Facilitation

Participants highlighted the lack of sustained interdepartmental or interdisciplinary collaboration required to create new clinical approaches and reorganize clinical and operational processes for biological emergencies in Iran. For example, one participant added: *"In the process of improving the management of patients with biological emergencies, certain processes could be adapted. For example, implementing specialized team visits, such as internal medicine, anesthesia, and infectious disease specialists, would have been crucial, as these three groups play major roles in patient management. Another potential improvement was establishing a two-level triage system outside the hospitals, differing from standard hospital triage protocols. However, treatment centers strongly resisted modifying these established processes"* (Participant 24).

Weak and Aging Healthcare Infrastructure

Participants identified deteriorating healthcare infrastructure as the most critical resource management challenge during biological emergencies. In this respect, one specialist elaborated: *"Our primary constraint is outdated medical facilities. Most hospitals operate in antiquated structures with limited renovation potential due to financial and logistical barriers. The substantial resource investment required for infrastructure modernization currently exceeds our capacity, making this our most pressing limitation during crisis response."* (Participant 11).

Discussion

This qualitative study investigated patient management challenges during biological emergencies in Iran's healthcare system. The analysis revealed four main categories and 14 subcategories, which are discussed below:

Lack of a Comprehensive Risk Communication Plan: The study found that the lack of clear, organized information, coupled with the widespread dissemination of both accurate and inaccurate details from various sources, created a highly confusing information landscape. This uncoordinated flow of information significantly exacerbated public confusion. During disasters and emergencies, when conditions are constantly changing and information is rapidly evolving and being revised, the focus should be on the role of appropriate and effective risk communication [24]. In these situations, emergency organizations must provide sufficient, accessible, and credible information. Failure to do so leads to public uncertainty and anxiety in the community and drives people to rely on rumors [25, 26]. Previous studies highlighted that effective disaster risk communication management and improving its processes are vital for Iran and should be treated as the first step in reducing disaster risk within the disaster management cycle [27]. By developing strategies to enhance risk communication, planners and managers in Iran can better design and implement effective risk management programs.

Mismanagement of Patient Flow: This was identified as the main category of challenges in this study. Findings indicated that patient flow was inadequately managed during biological emergencies. Inefficient internal processes, such as poor patient flow management, might have led to treatment delays, healthcare facility overcrowding, and subsequent impacts on patient safety, satisfaction among patients and staff, and overall care quality. Public health-threatening biological emergencies, which often involve a high number of patients, highlighted the critical need for a coordinated patient flow approach throughout the entire health system. Such coordination is essential for effective health resource management and reduces the risk of overcrowding in healthcare facilities. Previous studies highlighted the mismanagement of resources and equipment, inadequate contact tracing guidelines, and poor patient flow management as significant challenges during the COVID-19 pandemic in Iran. Further systemic challenges in managing COVID-19 patients included weak leadership, ineffective problem prioritization, insufficient intersectoral collaboration, and poor coordination between health sectors, all of which hindered the implementation of an integrated response.

Political and governance challenges: According to participants' experiences, delays in coordination between managerial and executive organizations

resulted in duplicated efforts and failure to implement decisions issued by the Iranian Ministry of Health's National Corona Committee, which was responsible for health during COVID-19. During biological emergencies, close collaboration between political and scientific structures is necessary. Since health system units operate within complex political, economic, social, and environmental contexts, effective coordination is crucial for maintaining health service delivery in such crises [28]. The dominance of a government-centric paradigm in the health system's policy-making processes became more prominent during the COVID-19 pandemic [29]. Furthermore, the populist approach of managers posed significant challenges to Iran's health system, especially during the pandemic's initial phase.

Inadequate Resource Management: The study revealed that despite the need for adequate resources and equipment, the management of requests, strategic supply chain, and distribution during biological emergencies was highly inefficient. Some hospitals and even frontline healthcare workers lacked adequate resources. These challenges were exacerbated by shortages of skilled, pandemic-responsive personnel, temporary and short-term specialized training, and the departure of trained professionals from service. In short, the deteriorating healthcare infrastructure, combined with the imposition of sanctions, severely hindered Iran's ability to procure essential medical equipment and supplies, further exacerbating the challenges faced by the healthcare system. Studies showed that the lack of adequate resources, including human resources, equipment, and medical supplies, caught Iranian managers unprepared [17, 18]. Effective epidemic management requires financial incentives, continuous monitoring, sufficient protective equipment, and skilled personnel [30].

Some key individuals were unavailable for interviews due to managerial responsibilities or position changes, which posed a limitation for this study.

The findings of the present study provided valuable insights for policymakers to improve patient management during future biological emergencies. One notable strength of this research was the inclusion of participants from various managerial positions.

The findings of this study showed that patient management during biological emergencies in Iran is a multi-dimensional challenge, requiring urgent interventions by policymakers and health system managers. Strengthening health system governance, eliminating multiple competitors within the healthcare system, enforcing upper-level documents, and addressing the effective political, social, and economic factors for integrated management during such crises.

Declaration

Ethics approval and consent to participate: The license for this study was issued by the Ethics

Committee of the University of Social Welfare and Rehabilitation Sciences (code: IR.USWR.REC.1400.326). The researcher contacted the participants by phone, e-mail, or in person to get their written consent to participate in the interview.

Consent for publication: All authors expressed their consent to the publication of this study.

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Coordinated and transcribed interviews, assisting with participant feedback and edited the final draft; SA: Analyzed the data, secured ethical approval and drafted the manuscript; MS: Contributed to the study design, data collection, and analysis. All authors approved the final manuscript; HKH: Supported the study design, conducted the research, and data analysis, and edited the final draft.

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