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REVIEW ARTICLE

Hospital Preparedness for the Covid-19 Crisis; an Overview

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Abstract: The situation, structure, and facilities of hospitals change in a crisis, which negatively affects the provision of care quality of health services. One of the current world crises is the Covid-19 pandemic. This study aimed to investigate the preparedness of hospitals to deal with the Covid-19 crisis. This narrative review searched the SID, PubMed, Scopus, and Google Scholar databases/search engines in published articles between 2019-2022. A search strategy was defined for PubMed and it was translated into other selected databases. Also, the reference list of the included articles was searched. The databases/search engines were searched by two authors independently, and any disagreement was resolved through discussion. Inclusion criteria included being an original paper, in Persian or English, and compliance with the purpose of the study. The exclusion criteria included not having access to the full text of the article. To find related articles, Iranian and International databases were searched using Persian keywords and their English equivalents (Covid-19, Hospital, Preparedness, epidemic, and Pandemic). A total of 311 articles were found, of which 15 were reviewed. The study showed that hospital preparedness against the Covid-19 pandemic in most countries and different regions in Iran is not optimal. Hospitals should be prepared in terms of personal protective equipment, staffing, and beds. Rapid response management and hospital equipment should be strengthened. Considering the desirability of patient preparation in coping with Covid-19, it is necessary to improve healthcare facilities by increasing the number of workforce and beds.

Keywords: Covid-19; Hospital; Preparedness; Pandemic

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1. Introduction

Many human diseases have been discovered with an unknown etiology. For many of these diseases, a viral origin has been proposed (1). Earlier in December 2019, a strange pneumonia case was identified in Wuhan, China (1-3), similar to SARS-COV in terms of phylogenetics (4). Patients infected with the virus were identified in hospitals and communities (4, 5).

The spread of Covid-19 is a significant public health problem worldwide (5). On March 11, 2020, the World Health Organization declared the disease a pandemic. To date (November 3, 2021), more than 244 million people have been infected worldwide and the death toll exceeds 4,960,000. The most reported cases of the disease are from the United States, with about 46 million affected. India, Brazil, England, Russia, Turkey, and France are among other countries with the most substantial number of victims globally (6).

Since the first definitive case of COVID-19 in early March 2020, more than 585,000 people have been infected with the disease.

However, with advances in the preventative and therapeutic measures, many patients have recovered (7).

Local and international reports indicate a person-to-person way of transmission through respiratory droplets (8). The common symptoms of COVID-19 include fever, cough, dyspnea, or diarrhea. About 20-30% of patients need mechanical ventilation, and the mortality rate is 5%. The most mortality rate is seen in the elderly and those with underlying diseases

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(9).

During this crisis, all international organizations decided to react to the pandemic quickly and reduce the pressure on people and healthcare workers. Many of the surgical procedures were postponed, and hospitalization slowed down (10). Nonetheless, Covid -19has brought a sharp shock upon the health systems in most countries worldwide (11). One of the most important aspects of a healthcare system is proper response management and preparedness (12).

Structure (physical, administrative, equipment, human resources) and hospital facilities change in a crisis , which causes negative effects on the quantity and quality of healthcare (13). Today, in compliance with the preparation of most organizations for crisis management, hospitals should also have the ability to deal with any unprecedented crisis and emergency. On the other hand, previous experiences have shown confronting the crisis and the following consequences a challenge and concern especially in hospital settings in Iran (13-15).

Hospital preparation results in an increase in hospital services, and a reduce in medical constraints during crises (16). The Validation Committee of the American Health Centers defines the hospital's readiness of those activities that the hospital is obliged to do to increase their accountability capacity (12). In the Covid-19 pandemic, following the increase in the number patients, ICU admissions, pressure on the hospital staff, the need for numerous intubations, the need for high flow oxygen, the need to consult with infectious and pulmonologists, hospitals faced numerous challenges (17). Obaseki et al. (2021) pointed out that the lack of hospital beds, facilities, protective equipment, and problems in COVID-19 diagnosis as the challenges of readiness to confront the Covid-19 crisis (18). Kaito et al. (2021) consider the rapid selection of a therapeutic team with different specialties equals to high readiness (19). Iranian and foreign studies have been investigated for the hospital preparation status reports during the COVID-19 pandemic, including the study of Hosseini et al. (20) in Mazandaran province, Abdolrazaghnejad et al. (21) in Sistan and Baluchestan province, and Gupta et al. (22) in the United States. Investigating the hospitals' preparedness level and its different dimensions in varying units is of a great importance. In this study, we reviewed, summarized, and analyzed the existing evidence.

2. Methods

This narrative review searched the SID, PubMed, Scopus, Google Scholar databases/search engines in published articles between 2019-2022. A search strategy was defined for PubMed and was translated into other selected databases (Table 1). Also, the reference lists of the obtained articles were searched.

The databases/search engines were searched by two authors independently, and any disagreement was resolved through discussions. To find related articles, Iranian and International databases were searched using Persian keywords and their English equivalents (Covid-19, Hospital, Preparedness, epidemic, and Pandemic).

2.1. inclusion and exclusion criteria

Inclusion criteria were being original, in Persian or English, and the evaluation of the hospital preparedness in the Covid-19 pandemic. Exclusion criteria were lack of access to the full text, duplicate reports, review articles, retracted papers, and not related ones.

2.2. Data extraction

Two authors extracted the data from the selected studies independently. The name of the first author, the year of publication, geographical location of the study, the type of study, level of hospital preparedness, and the most important findings were extracted.

3. Results

A total of 311 articles were found. In the initial selection process, duplicates and unrelated articles were removed, and 55 articles were reviewed. Regarding inclusion criteria, 40 articles were excluded due to the lack of relevance to hospital preparedness in the Covid-19 pandemic and the lack of access to the full text. Finally, 15 studies were included (Fig.1).

Among the reviewed articles, 9 articles (60%) were published in English, and 6 (40%) were in Persian. In Iranian studies, two studies were done in Sistan and Baluchestan province (12), one study was done in Tehran (23), one study was done in Mazandaran (20), one study in Ardabil, and one study was done in the entire country. Among English articles, one study was done in America, one in India, two in Vietnam, one in Nigeria, one in Indonesia, one in Nepal, one in Britain, and one in Ethiopia. All articles were original and descriptive-analytic research studies. The sample size varied in studies from 8 hospitals (3) to 374 hospitals (24). The checklist or instrument used for the examination of the hospital readiness level in most studies was a checklist of the World Health Organization or the American Centers for Disease Control and Prevention. Five articles were carried out after a year from the Covid-19 pandemic and seven after two years. In terms of methodology, one article collected the data qualitatively, and the rest (14 articles) were done quantitatively as descriptive cross-sectional studies. In two articles, people were used as samples and the rest investigated the hospitals and healthcare centers (Table 2). This study showed that hospital preparedness against the Covid-19 pandemic in most countries and different regions inside Iran is not optimal. The lowest

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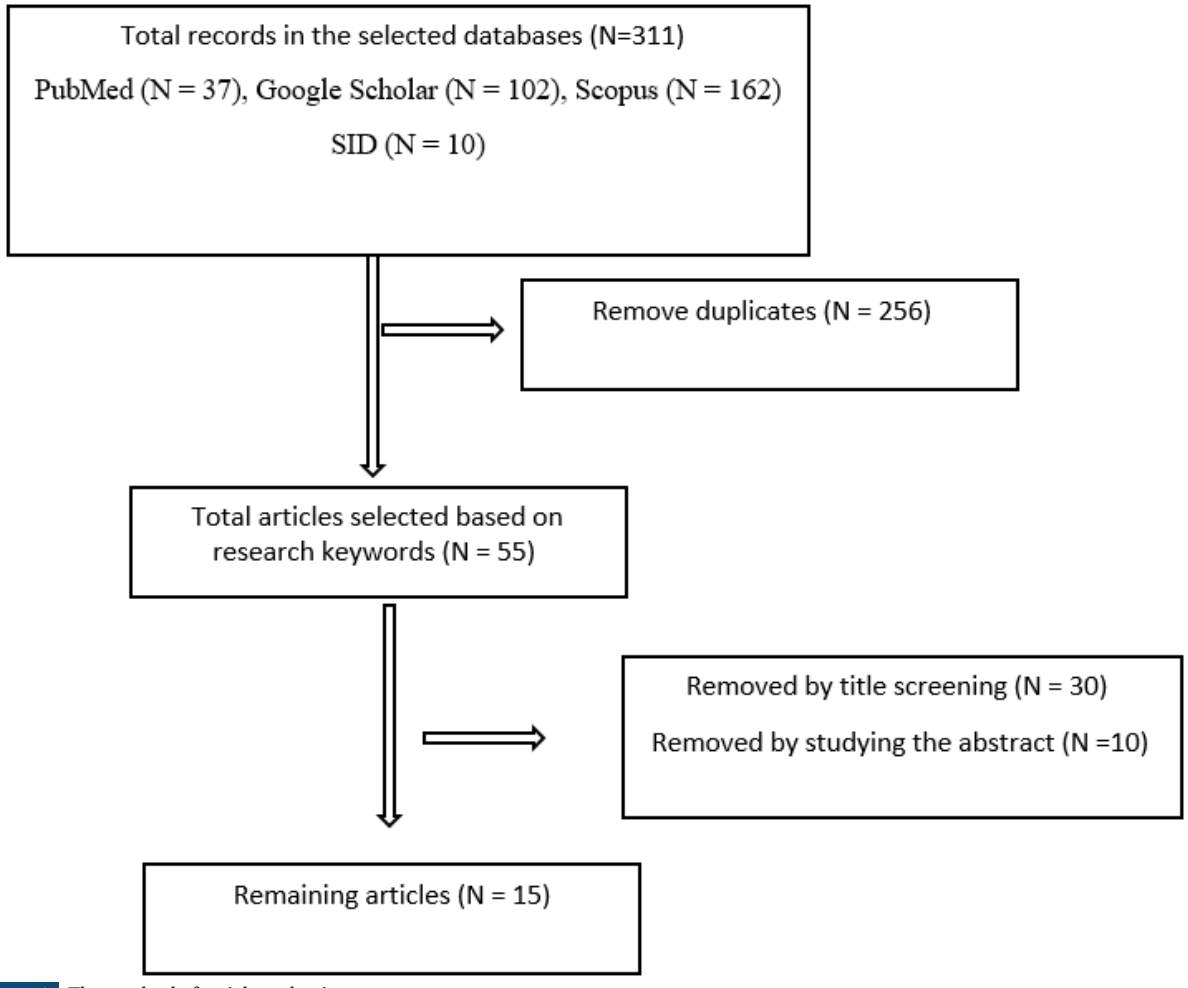

Figure 1: The method of articles selection

Table 1: Search strategy in the selected databases

Database	Search strategy	Date of search
PubMed	("hospital preparedness" [tiab] OR "hospital readiness" [tiab]) AND (Covid-19[mh] OR pandemic[tiab] OR epidemic[tiab])	1 February 2023
Scopus	(TITLE-ABS("hospital preparedness") OR TITLE-ABS("hospital readiness")) AND (TITLE-ABS(Covid-19) OR TITLE-ABS("covid 19") OR TITLE-ABS(SARS-CoV-2) OR TITLE-ABS(pandemic) OR TITLE-ABS(epidemic))	1 February 2023
Google Scholar	Allintitle: hospital preparedness, hospital readiness, Covid-19, covid 19, SARS-CoV-2, pandemic, epidemic	1 February 2023

percentage of compliance was related to lack of staff, space, and equipment, discontinuation of essential health services and diminished patient care. Hospitals should be prepared in terms of personal protective equipment, staffing, and hospital beds. Rapid response management and hospital equipment should be strengthened.

4. Discussion

This study aimed to determine the readiness of hospitals in confronting the crisis of Covid19. The review showed that in most studies, the level of preparedness was not desirable. Hospitals should have a pre-formal operational program to counteract critical conditions. The lack of such a program will increase discoordination in the affairs. The crises occur when services are insufficient, and the only way to accom-

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Table 2: Characteristics of the included studies and their important findings

Record	Title	Author, place, and year	Type of study and procedure	Subjects	Results
1	COVID-19 pandemic: Hospital preparedness in a tertiary care hospital in North East India	Topno et al., India (2022)	The descriptive-cross-sectional study, Various guidelines given by Ministry of Health and Family Welfare, Centre for Disease Control, Indian Council of Medical Research	The hospital under study was a 590 bedded multidisci-plinary hospital	The investigators concluded that the new hospitals should be planned and constructed in such a way so that a major part of the hospital building can be converted to an isolation area with little modifications in the physical structure of the hospital at the time of pandemics (37).
2	Hospital safety preparedness during the COVID-19 pandemic: Lessons learned from Vietnam	Bui et al., Vietnam (2022)	The cross-sectional study, using both quantitative and qualitative method, Quantitative research was based on recent national surveys of hospital safety conducted by the MOH (nationwide scale of public and private hospitals that participated in hospital safety assessment in the COVID-19 online reporting system of Quality Management Division, Ministry of Health). Qualitative research employed in-depth interviews of key health managers and staff in four selected hospitals.	four hospitals including one central hospital, one regional hospital, one district hospital, and one private hospital.	Most hospitals in Vietnam successfully met the classification of "safe hospitals" according to Decision 3088/QD-BYT, a key tool for hospitals to self-assess preparedness and responsiveness to the COVID-19 pandemic. The MOH should adapt the criteria in Decision 3088/QD-BYT to be more suitable (38).
3	Assessing the Preparedness of Hospitals in Ardabil Province During COVID-19 Pandemic	Kamran et al., Ardabil, Iran (2022)	The cross-sectional study, using standard checklist of 92 questions for COVID-19 Crisis Preparedness issued by the Iran Ministry of Health and Medical Education.	17 hospitals affiliated with Ardabil University of Medical Sciences.	The level of hospital preparedness in most dimensions (9 out of 10 dimensions) was good, and only in the area of rapid identification was at a moderate level. However, further evaluation is needed at different stages of an epidemic (39).
4	Hospitals Readiness in Response to COVID-19 Pandemic in Mazandaran Province, Iran 2020	Hosseini et al., Mazan-daran, Iran (2021)	The descriptive-cross-sectional study, using standard checklist Pan American World Health Organization (PAHO 2019)	39 Mazandaran province hospitals	The readiness of hospitals in the face of covid-19 Pandemic was at a reasonable level in Mazandaran province. However, due to prolonged epidemics and uncertainty about the end, key monitoring components is essential for maintaining high readiness levels (20).
5	Investigating the Readiness of Emergency Department of Khatam Al-Anbia Hospital in Zahedan, Iran, for Facing COVID-19 in 2020: a Descriptive-Analytical Study	Abdolrazaghnejad et al. Zahedan, Iran (2021)	The descriptive-analytical study, epidemiological and clinical variables questionnaire (Corona counter)	100 emergency personnel of Khatam Anbia Hospital (PBUH) Zahedan	Psychological factors have a significant relationship with Covid-19 coping among hospital emergency personnel and psychological readiness was at an acceptable level (16).
6	Investigating the readiness of hospitals in Sistan and Baluchestan province in crisis of COVID-19	Khorsand Chobdar, Sistan and Baluches-tan, Iran (2020)	A descriptive-cross-sectional study, using a standard checklist of 110 questions about the crisis of the covid -19	24 hospitals in Sistan and Baluchestan province	The hospitals of this province earned the lowest readiness among other areas in terms of facilitating communication (12).

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Record	Title	Author, place, and year	Type of study and procedure	Subjects	Results
7	Assessing Iran's health system according to the COVID-19 strategic preparedness and response plan of the World Health Organization: health policy and historical implications	Ghanbari et al. Iran (2020)	A descriptive cross-sectional study using the World Health Organization Standard Checklist	-	Information analysis and various aspects of hospital preparation in coping with Covid -19 can be helpful in future planning (23).
8	Management of Covid-19 Crisis in Tehran University of Medical Sciences hospitals: Challenges and strategies	Labaf et al., Tehran, Iran, (2020)	This research was qualitative with inductive logic that had an exploratory goal.	22 persons were interviewed among the influential ones in managing the disease at Tehran University of Medical Sciences.	The most critical challenge raised at the macro level, the impossibility of controlling protective consumption and drug and equipment supply. Solutions and effective interventions in this crisis were implemented regarding staffing, clinical, communication, educational, decision, and organization (24).
9	A national survey of hospital readiness during the COVID-19 pandemic in Nigeria	Ogoina et al. Nigeria, (2021)	A descriptive cross-sectional study using the World Health Organization Standard Checklist	20 hospitals of six regions in the country	Only three hospitals had enough readiness to deal with covid-19. The average of each hospital had four ICU and Ventilators (25).
10	Study protocol for a global survey: Awareness and preparedness of hospital staff against Coronavirus disease (COVID-19) outbreak	Qarawi et al. England, (2021)	A descriptive-cross-sectional study, using the center for the control and prevention of American diseases	374 hospitals from 58 countries	Staffing readiness as one of the main dimensions of hospital readiness is essential for self-care and control the entire pandemic (22).
11	Hospital preparedness for COVID-19 pandemic: Experience from department of medicine at Veterans Affairs Connecticut Healthcare System	Gupta et al. United States, (2020)	A descriptive-cross-sectional study, using the America Centers for Disease Control and Prevention checklist	New Haven hospitals	Management with prompt response, individual protection equipment, safety emergency measures, number of hospital beds, and diagnostic tests and screening are from the most crucial readiness of this period (21).
12	Hospital Preparedness for COVID-19 in Indonesia: A case study in three types hospital	Dewi et al. Indonesia, (2021)	A descriptive-cross-sectional study, using the America Centers for Disease Control and Prevention checklist	11 of Banjarmasin Hospitals in Indonesian	The readiness of government, private and military hospitals was low to moderate (26).

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Table 2: Characteristics of the included studies and their important findings

Record	Title	Author, place, and year	Type of study and procedure	Subjects	Results
13	A cross-sectional survey of COVID-19 preparedness in governmental hospitals of North-West Ethiopia	Tiruneh et al. Ethiopia, (2021)	A descriptive cross-sectional study using the World Health Organization Standard Checklist	Total hospitals of Northwest Ethiopia (8 hospitals)	Only one hospital had an acceptable hospital readiness among others (3).
14	Covid-19 Preparedness and Response Capability: A Case Study of the Hanoi Primary Healthcare System	Van Hoang et al., Vietnam, (2021)	A descriptive cross-sectional study using the World Health Organization Standard Checklist	Hanoi Health Centers in four regions of Vietnam capital	Despite the acceptable readiness, incomplete reports, inappropriate financial status, vague health management, and the lack of participation of the private sector were of the readiness problems (27)
15	Preparedness for coronavirus disease in hospitals of Nepal: A nationwide survey	Shrestha et al. Nepal, (2020)	A descriptive-cross-sectional study, using the America Centers for Disease Control and Prevention checklist	131 participants from seven provinces	Most hospitals were not prepared to deal with Covid -19 (28).

plish enough, is making the correct decisions, which requires accurate information. This data is not usually available in the settings of crisis unless implemented in pre-crisis stages, by prediction and planning (25). In a crisis, the role of hospitals and health centers is indispensable. Health centers are the first units that provide optimal and timely health services to reduce mortality, morbidities, and relieve physical and psychological suffering (26).

On the other hand, the facilities of hospitals have changed during the crisis, causing negative effects on providing care, and affecting the quantity and quality of health services. Today, due to the preparation of most organizations to confront crises, hospitals should also be able to deal with unprecedented crises and emergencies, as previous experiences in Iran have shown that these issues are major challenges (14, 15). Readiness to deal with Covid -19 has been investigated in various aspects and dimensions. One of the most critical dimensions is in human resources. A fundamental problem in confronting this disease was the lack of specialists, medical staff, and caregivers. The pandemic lead to long working hours and the abolition of many daily life activities of the healthcare personnel (18). Nurses and doctors are involved in the forefront of the disease, and a heavy exposure to the disease has had an immense mental pressure. Other issues, such as lack of personal protection equipment in many care centers, which were more prominent in the beginning of the pandemic, lack of medications or specific vaccines for controlling and preventing the disease, the pressure of the media, and not receiving support by relevant authorities are all among the things that can override the performance of the health staff and affect their accuracy and skills in providing adequate care services (27-29). The need for improved equipment and hospital beds is also another dimension of preparation for crises, which emerged in the Covid -19 pandemic and became more tangible every day. In the study of Ogina et al. in Nigeria, it was found that each hospital had four ICU beds and ventilators (30). Also, Choobdar and Rahdar (2020) showed that the medical equipment management, and provision were at an undesirable level. This could be due to the sudden spread of the disease, the lack of proper access to certain regions of Sistan and Baluchestan , and insufficient attention to preventive measures in the hospitals (12). The next essential issue is related to the personal protective equipment. Concepts such as personal protection, structural protection, and safety are significant concerns of the healthcare staff, especially nurses, when providing care for Covid-19 patients (11). Moreover, communication and coordination were also discussed, being reported in the study of Choobdar and Rahdar (12). Covid-19 crisis led to the formation of new management systems such as Health System from the Sepas System, Hospital Information System, Sib System, etc., to make the first, second, and third levels

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of communication. Accordingly, if an infected patients need quarantine or referral to a comprehensive health center, the care is provided rapidly. However, until now, it was not possible to follow the status of referred patients from level one to higher levels, and the crisis in the management of Covid-19 caused a complete chain of referrals electronically in the Iranian health system (31).

4.1. Limitations

The study limitation is the lack of similar studies related to Hospital preparedness for the Covid-19 crisis in other countries to compare with the current study findings.

5. Conclusion

Regarding the desirability of hospital preparation in coping with Covid-19, it is necessary to promote this readiness in different dimensions and domains (such as improvement in facilities, and increasing the number of workforce and beds). Since human resources play an important role in hospital management and preventing the wastage of resources, planning to prevent the shortage of human resources in crises is crucial, and the crisis management teams must be fully aware of their responsibilities, instructions, and organizational charts. Moreover, communication plays a conspicuous role in times of disaster, and communication weakness causes a lack of coordination between different organizations. Since the number of Iranian studies is low, further studies and are needed.

6. Declarations

6.1. Acknowledgments

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

6.2. Conflict of interest

The authors declare that they have no conflict of interest.

6.3. Funding and supports

This research received no specific grant from any funding agencies in the public, commercial, or non-profit sectors.

6.4. Authors' contributions

FA and MS: Conception and design of the work
PE: Analysis and interpretation of findings
MS and AH: Data gathering and analysis
PE: Drafting the work and revising it critically for important intellectual content
All authors read and approved the final version and accountable for all aspects of the work.

6.5. Ethical statement

Not applicable.

6.6. Informed consent

Not applicable.

6.7. Availability of supporting data

Data sharing is not applicable to this article. No datasets were generated or analyzed during the current study.

6.8. Using artificial intelligence chatbots statement

This study did not involve the use of any artificial intelligence tools.

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