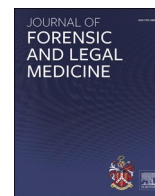




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Research Paper

Factors affecting management of corpses of the confirmed COVID-19 patients during pandemic: A systematic review

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ARTICLE INFO

Keywords:

Management of corpses
COVID 19
Pandemic
Systematic review

ABSTRACT

Introduction: The global spread of the COVID 19 disease and the concerning rise in the number of corpses of the patients dying of the disease has caused challenges in handling the corpses by the health system and relevant organizations in most countries. The aim of the present study was to investigate factors affecting the corpse management process of the patients dying of COVID 19.

Materials and methods: This study was a systematic review of literature using the PRISMA guideline. Without time limit until the end of January 2021, the studies related to corpse management in patients with COVID 19 were extracted from the data resources of Medline (PubMed), Web of Science, Google scholar, Embase, ProQuest, Scopus, Iranmedex, SID, and ISC, and also the reference lists of selected studies, as well as other systematic reviews, key journals, and proceedings of conferences and congresses. Finally, thematic analysis was used to analyze the obtained data.

Results: 190 studies were identified based on the initial search, and finally 21 studies were entered into analysis. Based on the systematic review and thematic content analysis, challenges in the process of managing the corpses of COVID-19 victims were divided into three main themes and eight sub-themes. The themes included psychosocial factors, environmental factors, and resources, and the sub-themes included supporting survivors, customs, values, infection control, corpse identification and burial, corpse transferring, equipment, and governments' capacity.

Conclusion: Implementing psychological, social, and spiritual support programs for grieving families, the observance of customs and values governing the community at the time of funeral and burial, and planning to control infection and safety in the process of maintenance, transfer to the cemetery and safe burial are the most important strategies that can be used in the process of corpse management. Utilizing and aligning religious leaders with the health system in order to inform people about the ways of disease transmission from the bodies and to use alternative solutions for holding religious and cultural ceremonies (e.g., virtual mourning), as well as providing personal protective equipment to those in close contact with corpses, the development and implementation of health protocols for managing possibly a large number of bodies, capacity building, and anticipating necessary resources are highly recommended strategies.

1. Introduction

In December 2019, the novel coronavirus was identified in Wuhan, China, and only within a few weeks, spread to all countries around the world. On February 12, 2020, the World Health Organization (WHO) named the causative agent of the disease Coronavirus 2019 (COVID-2019).¹ As of October 27, 2021, there were 244,385 confirmed Covid-19 cases worldwide, of which 4,961,489 resulted in the death of patients, according to the World Health Organization Corona Virus Dashboard.²

According to the classification performed by the Centre for Research on the Epidemiology of Disasters (CRED), types of epidemics, including Covid 19, are classified into natural disasters and biological subgroups.³

One of the consequences of epidemics is the death of a considerable number of patients, and this issue becomes even more problematic for highly contagious diseases. Based on the available evidence, the COVID-19 virus has a high virulence, pathogenicity, and airborne transmission capability⁴; however, it seems to have other transmission routes as well.⁵ In addition to airborne transmission, the virus has been shown to

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<https://doi.org/10.1016/j.jflm.2021.102273>

Received 25 July 2021; Received in revised form 27 September 2021; Accepted 25 October 2021

Available online 2 November 2021

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survive for hours on surfaces, which can be other sources of infection. Mucous secretions, bodily fluids such as sputum and urine, and skin surface can also be contaminated and transmit the virus to others.⁶ The same is true for the bodies of the patients dying of COVID-19.⁷ The process of corpse management includes locating, collecting, transferring, retaining, documenting, conducting tests, identifying, and delivering corpses to families.⁸ The most common problem following widespread crises, regardless of their causes, is a large number of dead bodies. Respectful handling of the deceased, the rights of their families and responding to Media coverage of such sensitive topics makes proper corpse management an important responsibility of local and national authorities.⁹ According to international law, corpse management during crises, including collection, identification, and disposal of corpses in accordance with the religious and cultural beliefs of victims are among the rights of survivors, which must be fulfilled by crisis management organizations in each country.¹⁰ Also, death data is one of the key elements in planning for the health system.¹¹

During the COVID-19 pandemic, many countries implemented restrictions on the purification of corpses and funeral and mourning ceremonies in order to prevent the spread of the disease.¹² In the management of the corpses of COVID-19 patients, there is a need for taking precautions in transferring corpses from home or hospital to the cemetery, and quick burial of the dead, however, respecting his/her dignity and survivors' wishes on performing traditional and religious ceremonies can complicate the process.¹³ Burrell et al., found that allowing such ceremonies during the coronavirus pandemic can improve mental health outcomes for the family.¹⁴ Due to the problems associated with prolonged corpse management, such as identification challenges and the psychological burden imposed on the survivors, it is necessary to give priority to the corpse management process among other health system programs.¹⁵ In a study by Swain et al. in 2020, it was found that poor countries, such as India, should have emergency response plans to effectively manage the corpses of COVID-19 patients, especially when facing mass fatality, to observe the dignity of deceased people and their families.¹⁶ Using mass graves or burning corpses not in accordance with religious beliefs can have dire social, economic, political, and religious consequences.¹

Although corpse management guidelines have been developed by various organizations, such as the Interpol, the International Civil Aviation Organization (ICAO), and the Pan American Health Organization (PAHO) branch of the WHO, there are currently no technical and specific guidelines available for managing mass corpses in individual disasters from the perspective of the health system.¹⁷ The incidence of pandemics such as the Spanish flu in 1918, Crimean Congo Hemorrhagic Fever (CCHF) in 1956, SARS in 2002, MERS in 2012, and Ebola in 2014, indicates that the Covid-19 is not the first and would not be the last pandemic threatening humans. This also reminds us that the lack of planning and taking into account all aspects, including the corpse management process, will cause us many problems in the future.¹⁸ The present study was conducted to recognize factors affecting the management of the corps of COVID-19 patients to improve of the management the situation.

2. Materials and Methods

The present review was conducted in two steps including systematic review and then thematic content analysis. In the systematic review phase, to gather the studies related to research objectives, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was used.¹⁹ The protocol was registered with the international prospective register of systematic reviews (PROSPERO) under the code of CRD42021260911. Based on this protocol, literature search, screening, study selection, quality assessment, and data extraction were performed in the mentioned order. The later three steps were independently performed by two researchers, and their disagreements were resolved by group discussions to reach a final decision. A six-step

framework of thematic analysis was used, which included familiarity with the data, production of initial code, search for themes, reviewing and defining themes, and writing an initial draft.²⁰

2.1. Databases and search strategy

An electronic search of Medline (PubMed), Web of Science, Embase, ProQuest, Scopus, ISC, SID, Magran, and Google Scholar was conducted. Also, conference proceedings, key journals, and the reference lists of selected studies and systematic reviews were assessed for relevant studies. we used MeSH terms and consulted field experts to finalize our search keywords. Valid English keywords and their Persian equivalents (for Persian databases) were used in this study, including "Dead Body", "Corpse", "Burial", "Cadaver", "Funeral", "COVID-19 virus disease", "SARS-CoV-2 infection", "COVID-19 pandemic", "COVID19", "novel coronavirus disease 2019", "nCoV-2019 infection", "novel coronavirus infection", "Coronavirus disease 2019", "nCoV-2019 disease", and "COVID-19 virus infection". The search syntax for each database was developed using the keywords, operators, and search fields. For this purpose, the search syntax was initially compiled for PubMed, and then the search syntax for other databases was generated according to that of PubMed. No time limit was considered, and studies were gathered until the end of January 2021. The search was conducted in both Persian and English.

2.2. Inclusion and exclusion criteria

All the studies, either in Persian or English, addressing corpse management during the COVID-19 crisis were included. Full text unavailability, being published in languages other than Persian and English, and addressing corpse management during other epidemics were regarded as exclusion criteria.

2.3. Study selection

All retrieved articles were entered into EndNote X7 software. After removing duplicates, the titles and abstracts of the remaining articles were screened according to eligibility criteria. the full text of relevant articles was evaluated by two researchers independently. Final eligible articles were decided by consensus.

2.4. Quality assessment

Two members of the research team independently evaluated the quality of the articles. To evaluate the quality of the articles, a researcher-made tool was used, which had 9 items in 4 areas. For this purpose, a researcher-made tool was used which had 9 items in 4 areas (Appendix 1). Each question can be given a score of 0 or 1. The minimum and maximum scores are 0 and 9, respectively. A score of 0–2 was considered poor, 3–6 had moderate quality and 7–9 had good quality. Articles with a score of 6 or higher were included in the study.

2.5. Data extraction and analysis

Data extraction from the final studies was independently performed using a pre-prepared checklist. Thematic content analysis was used to analyze the data. First, the first author of the study reviewed the results of 21 studies. Based on thematic content analysis, in addition to the headings of the studies, their findings were reviewed in detail and then coded accordingly. For coding, all the codes and basic concepts related to corpse management during the COVID-19 pandemic, which had been extracted as the main data, were accurately studied and reviewed several times to being familiarized with them. Afterward, initial codes were identified. In the next step, two members of the research team reviewed all the identified codes to evaluate their similarities and differences and then classified similar codes under the same category to

form a sub-theme. Then sub-themes with concepts close to each other were merged together to form a theme. Finally, all the authors discussed the initial summarized draft of the designed themes and sub-themes and modified them if necessary. After making amendments, the final draft was approved by all the authors.

3. Results and discussion

3.1. Search results

190 studies were retrieved in the primary search, and after removing duplicates, the titles and abstracts of 151 studies were screened., the full texts of 29 possibly related studies were reviewed, of which 21 studies ultimately entered the analysis (Fig. 1).

3.2. Descriptive information

Among 21 included studies, all were journal articles from following countries: The United States,¹ Italy,² Netherlands,¹ Switzerland,¹ Iran,¹ India,⁶ Spain,¹ Canada,¹ Nigeria,¹ Malaysia,¹ Brazil,¹ Nepal,¹ Australia,¹ Portugal,¹ and Lebanon.¹ In terms of study design, most studies were reviews. Based on the results of quality assessment, 14 studies had moderate quality while seven had good quality. The specifications of the selected studies have been noted in Table 1.

3.3. Thematic content analysis

Based on the systematic review and thematic content analysis, the factors affecting the corpse management of COVID-19 patients were divided into three main themes and eight sub-themes. The themes included psychosocial factors, environmental factors, and resources, and the sub-themes included support for survivors, ceremonies, values, infection control, corpse identification and burial, corpse transferring, equipment, and governments' capacity (Table 2).

According to the results of the present systematic review, various factors such as the observance of the funeral and burial ceremonies,

support programs for the relatives of deceased, burial planning, infection control, and governments' capacity can play important roles in the effective management of the corpses of COVID-19 patients. The present systematic review showed that the observance of funeral and burial rituals according to the cultural and religious beliefs of people is an important component of the management of COVID-19 patients' corpses, and insufficient attention to this issue can have psychosocial consequences on society. Fear of disease transmission has led to special burial conditions for the victims of COVID-19 which resulted in the elimination of some parts of funeral and burial ceremonies. The results of a study by Burrell et al. showed that burying the corpses of COVID-19 patients without observing traditional rituals causes unpleasant psychological and social impacts. They suggested amid the imposed restrictions, religious leaders and the organizations responsible for the burial process use cyberspace for holding memorials and praying ceremonies.⁴¹ Rushing to bury the corpses can undermine values such as the rights and dignity of corpses. As the rights and dignity of living humans are valuable, a human's corpse also deserves dignity after death. At all stages of corpse management, religious and cultural sensitivities should be considered to avoid psychological stress to the community and survivors.⁴² In this regard, the WHO has devised measures for the areas where corpse kissing and contact are parts of funeral rites.⁴³ Therefore, it is necessary to observe funeral and burial rites for the corpses of COVID-19 patients, and considering the growing and unclear path of the COVID-19 pandemic, it is recommended to carefully adhere to the religious and cultural customs of burials and funerals of the victims to avoid psychological, spiritual, and social consequences for the society.

The results of the present study showed that the relatives of COVID-19 victims need support measures such as psychological counseling and social support programs. The fear of spreading the infection, the lack of adequate consolation by relatives due to social distancing requirements, restrictions on gatherings and commemorations, and spiritual struggles⁴⁴ highlight the need for support programs. The results of a study by Sumathipala et al. showed that following each crisis, the psychosocial intervention programs (short-, medium-, and long-term) related to corpse management should be developed and implemented regarding

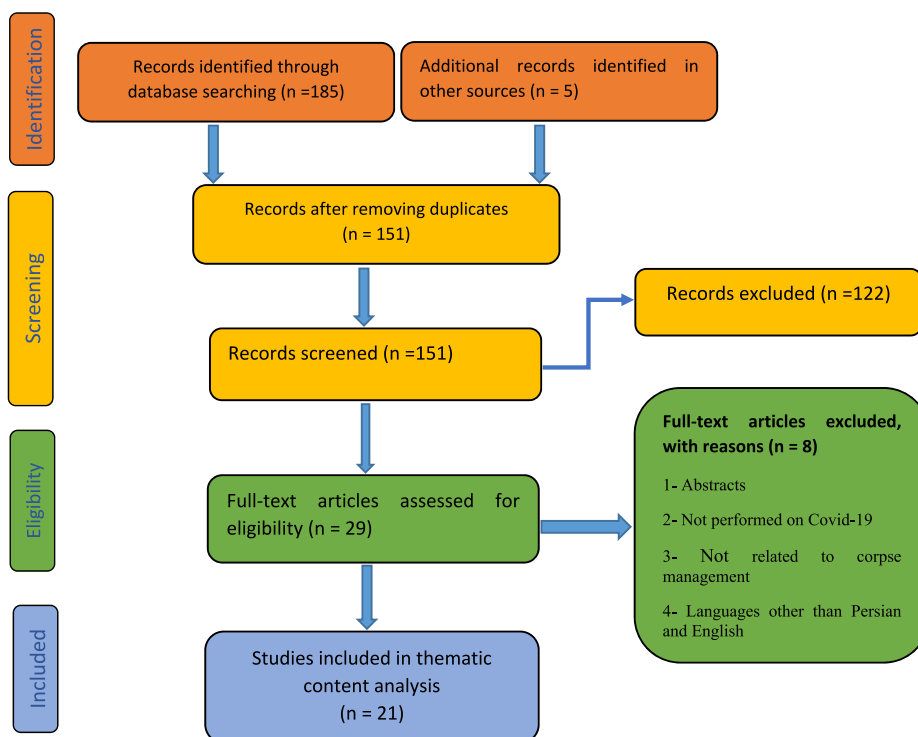


Fig. 1. The PRISMA flowchart of the present systematic review conducted to identify the factors influencing the management of COVID-19 patients' corpses.

Table 1

The Specifications of the Studies Extracted in This Systematic Review to Identify the Factors Affecting the Management of Covid-19 patients' corpses.

First Author	Place	Study type	Study design	Findings
Smitha Rani ²¹	India	Journal article	Review	Public awareness about the methods of transferring the bodies of victims is largely effective in preventing disease transmission and avoiding social stigma.
Anant Kumar ²²	India	Journal article	Review	The insufficient capacity of governments for managing the corps of COVID-19 patients can affect the mental health of survivors and cause distress to families and society.
Behnam Farahmandnia ²³	Iran	Journal article	Review	Social and psychological support through rehabilitation and specialized counseling programs can help people mitigate the pain of losing a loved one and compensate for the inability to hold memorials due to pandemic related limitations.
Raghendra Kumar Vidua ²⁴	India	Journal article	Review	The people who are in close contact with the bodies of COVID-19 victims are at risk and should take precautions during each stage of corpse management.
Kumar Satish Ravi ²⁵	India	Journal article	Review	Adhering to health instruction in corpse management, holding online classes for practical courses (such as anatomy) for medical students, and screening and observing standards in organ donation should be considered.
James, R. I ²⁶	India	Journal article	Review	There should be laws to support health sector providers. Police and local authorities must ensure the safe burial of the deceased to minimize danger to the community, control the quality of PPEs, and ensure that sufficient PPEs are available at all centers. There should be national guidelines for the safe use of autopsy specimens in laboratories. The National Organ and Tissue Transplant Organization should provide clear instructions on how to transfer organs.
Rijen Shrestha ²⁷	Nepal	Journal article	Viewpoint	It is essential to assess community attitudes to minimize the psychological consequences of corpse mismanagement. Governments must be held accountable and use the recommendations of the WHO and the ICRC to protect the rights and dignity of the relatives and survivors of COVID-19 victims.
Ana Aguiar ²⁸	Portugal	Journal article	Perspective	Recommendations have been provided for holding mourning and memorial ceremonies in accordance with preventive health protocols so that families can mourn for their lost loved ones and help themselves cope with the grief.
Silvia Ussai ²⁹	Italy	Journal article	Perspective	Implementing burial restrictions should be done based on risk assessment. Policymakers need to carefully assess risk to gain public trust. The dignity of the deceased and the cultural and religious customs of the families must always be respected.
Abidemi Emmanuel Omonisi ³⁰	Nigeria	Journal article	Supplement article	The various laws enacted in Africa on the burial of Covid-19 victims have prevented the complete performance of the process. There is a need to hold a meeting between policymakers and these families so that they can share their concerns about the importance of holding respectful burial ceremonies in accordance with their cultural and religious customs.
Oran Finegan ³¹	Switzerland	Journal article	Descriptive	Providing guidelines on designated cemeteries and their locations, the size, distance, and depth of graves, and how to track graves when there is a sudden increase in corpses will be beneficial. The procedures of delivering bodies and the measures implemented to ensure the health of families and cemetery staff should also be provided in this guideline.
Jorge González-Fernández ³²	Spain	Journal article	Descriptive	The instructions issued by health authorities on temporary storage of corpses during the Covid-19 pandemic and the classification of corpses based on the risk of infection transmission have been summarized.
Rajanikanta Swain ¹⁶	India	Journal article	Review	Poor countries such as India should develop emergency response programs on how to manage mass corpses while respecting their and their families' dignity.
Vittorio Fineschi ³³	Italy	Journal article	Review	Possible hazards and precautions in dealing with COVID-19 patients' corpses and practical guidelines on biological hazards, personal protection, and autopsy procedures should be provided.
Lay See Khoo ³⁴	Malaysia	Journal article	Review	Necessary guidelines should be provided for all corpse management steps, including the temporary burial of the bodies of unidentified migrants and refugees, especially when dealing with mass corpses.
Jennifer Lowe ³⁵	Australia	Journal article	Review	The COVID-19 pandemic has caused changes in memorial ceremonies, such as in contact with corpses, funerals, and burials. These changes are likely to remain in place even in the post-corona area. So, policymakers should develop new strategies using the experiences of bereaved families.
Dijkhuizen LGM ³⁶	Netherlands	Journal article	Review	There are different guidelines for personal protective equipment, disinfectants and their required concentrations, and other safety measures, especially for performing autopsies, which need to be united. As well, scientific guidelines are needed on how to properly transport COVID-19 patients' corpses.
Sally Yaacoub ³⁷	Lebanon	Journal article	Review	Twenty-three guidelines on transferring Covid-19 patients' corpses at different stages were reviewed and summarized. No studies have addressed the effectiveness of implementing such guidelines.
Oliveira-Cardoso EA ³⁸	Brazil	Journal article	Review	Evaluating the experiences of the bereaved during the COVID-19 pandemic showed that the sudden death of a loved one, along with inability to hold a complete funeral, causes anger and harm to the survivors. So, there is a need for devising new ways of performing such ceremonies to reduce complicated grief.
Rebecca M. Entress ³⁹	USA	Journal article	Viewpoint-Review	The COVID-19 pandemic highlighted the lack of leadership in corpse management due to families' engagement with funerals and mourning and accentuated the need for human-oriented innovations to boost the society's resilience.
Ivy Muturi ⁴⁰	Canada	Journal article	Review	Virtual funerals amid the restrictions of the COVID-19 pandemic can be affordable, comfortable, and easy to attend for all relatives and friends.

the specific social conditions, the psychological state of the community, and religious and cultural sensitivities of the community.⁴⁵ The results of these studies are in line with those of the present review, highlighting the importance of providing psychological support to the survivors of COVID-19 victims. Therefore, it is advised for the organizations in charge of the management of COVID-19 patients' corpses to develop and implement spiritual and psychological support programs for survivors.

Based on the findings of the present study, infection control is one of the most important items in the corpse management process. Infection control measures should be implemented in accordance with the health

requirements of burial, autopsy process, organ donation, collection and transfer of bodies, and environment disinfection. According to WHO guidelines, for effective infection control, COVID-19 patients' corpses should be wrapped with covers, which should not be removed during burial. The people involved in the burial process should wear personal protective equipment such as gloves, impervious clothes or gowns, medical face masks, face shields or goggles, and waterproof boots.⁴³

In the present study, it was found that having plans for the cemetery to perform a safe burial was one of the most important issues that need to be considered in the process of corpse management. The

Table 2

The themes and sub-themes related to the corpse management of Covid-19 patients.

Themes	Sub-themes	Codes
Psychosocial factors	Supporting survivors	Social stigma, psychological consequences, social consequences, survivors' mental health, families' concerns, community concerns, psychological support, social support, rehabilitation plans, counseling programs, and spiritual support from bereaved families
	ceremonies and rituals	Virtual funeral, burial ceremony, religious customs, cultural rites, the presence of relatives and friends, mourning, funeral, embalm
	Values	Respectful burial of the deceased, observing moral principles and corpses' rights and dignity
Environmental factors	Infection control	Collecting and transferring samples, corpse risk stratification, cemetery health requirements, autopsy specimens, waste management, organ donation, autopsy, anatomy training, disinfecting the environment, precautions in contact with corpses
	Corpse identification and burial	Temporary storage and burial of bodies, documentation in cemeteries, physical dimensions of graves, tracking of graves, having plans for cemeteries, safe burial, and unidentified corpses
	Corpse transferring	Returning corpses to their homelands, and packing and transferring corpses
Resources	Equipment	Personal protective equipment, corpse cover
	governments' capacity	Resource management, sudden increase in the number of corpses, managing mass corpses

unpredictable horizon of the COVID-19 pandemic requires allocating cemeteries and preparing graves for future victims, especially in countries with special topographic and geographical conditions. This program can be a part of the emergency response program for the management of mass corpses of COVID-19 patients. According to Kumar et al., it is essential to have plans for the management of mass corpses of COVID-19 patients.⁴⁶ In most cases, the families and survivors of the victims of epidemics resist the instructions implemented for safe burials. It is suggested that by seeking help from religious leaders, health organizations more effectively and easily convey their messages to people regarding the necessity of complying with safety instructions. In this regard, Lyons et al. showed that involving religious leaders to promote safe burial instructions during the Ebola outbreak in Sierra Leone was effective in encouraging people to adapt safe behaviors during the burial of contaminated corpses.⁴⁷

Based on the findings of the present study, increasing the capacity of governments to make appropriate policies and provide human resources, hospital equipment, and personal protective equipment was among the factors affecting corpse management during the COVID 19 pandemic. More than a year after the onset of the COVID 19 pandemic, some countries still suffer from shortages in Intensive Care Unit (ICU) beds and medical staff. According to the study of Christensen et al., among the reasons for the success of Norway in the comprehensive management of COVID-19 were the improvement of the government's coordination capacity, enacting laws for corpse management, and adopting precise strategies based on participatory decision-making, enabling the government to effectively communicate with people and win their trust.⁴⁸ Therefore, it seems that the government's capacity and power for fighting the pandemic can be improved by boosting inter-organizational coordination and collaboration between the organizations responsible for planning, implementing, budgeting, and guiding COVID-19 control measures.

4. Conclusion

The results of this study indicates that adhering to acceptable funeral and burial ceremonies held for COVID-19 victims and respecting social values, as well as the rights and dignity of corpses should be the cornerstone of any chosen strategy in the management of the bodies of these patients. Holding religious ceremonies and memorials in accordance with the culture and traditions of the deceased is one of the important priorities highlighted in most of the enrolled studies. As a result, policy and decision makers, should seek alternative methods of commemoration in accordance with social conditions when implementing COVID-19 related health protocols. Developing psychological, social, and spiritual support programs for the families of victims and providing them with counseling on the processes of delivery, transfer, and burial of the deceased are among other measures that can be performed. Preparing and communicating relevant instructions for each of the above-mentioned steps, providing personal protective equipment for those who are in close contact with the deceased bodies, developing educational programs for the public in order to change their attitudes and practices amid the pandemic, providing and improving capacities and resources required for managing possible mass corpses. Finally, recruiting religious leaders and aligning them with the health care system in their attempt to encourage people to follow public health orders and adapt their behavior accordingly, are also recommended.

Ethical approval

This article is a result of a research project approved by the ethics committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran (code: IR.SBMU.PHNS.REC.1400.023).

Financial support

This study was funded by Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Authors' contributions

KJ: study design, BNZ and AS: Literature search and screening, BNZ, KJ, and AS: Study selection and qualification and data extraction, AS, KJ, and BNZ: Data synthesis, BNZ: Writing the initial draft, KJ and BNZ: Revising the manuscript. The final version of the manuscript was approved by all authors.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jflm.2021.102273>.

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