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REVIEW ARTICLE

Identifying the Key Factors Influencing Risk Perception Among Healthcare Workers in the Context of Disasters; A Systematic Review

Raziyeh Bakhshi Giv[1], Mohammadreza Amiresmaili[1]*, Hojjat Farahmandnia[1], Ali Sadatmoosavi[2], Seyed Mobin Moradi[1]†, Seyyed Mohammad Reza Hosseini[3], Samaneh Alinejad[4]

1. Health in Disasters and Emergencies Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran.

2. Department of Medical Library & Information Sciences, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences.

3. Disasters and Emergencies Department of Health in Disasters and Emergencies, School of Nursing and Midwifery, Birjand University of Medical Sciences, Birjand, Iran

4. School of Nursing, Faculty of Science, Medicine and Health, University of Wollongong, South Western Sydney Campus, Australia.

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Abstract: **Introduction:** Risk perception is a cognitive, multidimensional process through which individuals identify and assess potential threats. This study aimed to systematically review the recent research to identify the key factors influencing the risk perception within healthcare workers operating in critical and disaster scenarios. **Methods:** This study was conducted as a systematic review in accordance with PRISMA guidelines. A search was performed for articles published between January 2014 and July 2025 in the PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar databases. Of the 2,154 initial articles, 10 eligible studies were included in the analysis following screening and quality assessment. Quantitative, qualitative, and mixed-methods studies addressing factors influencing healthcare workers' risk perception during disasters were selected, and the data were coded and categorized using thematic analysis. **Results:** The analysis of the 10 selected studies identified a central theme titled "Factors Influencing Risk Perception," which was further divided into five key domains: 1) Demographic and individual factors, 2) Experience and exposure to risk, 3) Knowledge resources and information capital, 4) Cognitive–emotional attitudes and beliefs, and 5) Protective behaviors and measures. **Conclusion:** This review demonstrates that healthcare workers' risk perception during disasters is a multifaceted phenomenon shaped by the interaction of individual, experiential, knowledge-based, emotional, and behavioral factors. Understanding these dimensions is crucial for explaining responses and designing interventions to enhance resilience and preparedness among healthcare workers. Based on the conceptual framework, it is recommended that educational programs and organizational policies consider demographic differences, experiences, and the psychosocial needs of staff.

Keywords: Risk perception; healthcare workers; disasters; systematic review

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1. Introduction

Disasters, whether natural or man-made, are large-scale events that can profoundly disrupt social structures, the economy, and healthcare systems. The increasing frequency and intensity of such disasters, driven by factors such as climate change, population growth, and technological advancements, have severe implications for healthcare infrastructure and present significant challenges to the response capacities of societies (1). These events cause direct damage, population displacement, disruption of preventive and therapeutic services, and depletion of vital resources (2). The experience of the COVID-19 pandemic clearly demonstrated that even advanced healthcare systems are vulnerable to widespread crises, with their resilience heavily dependent on the capacity and health of the frontline workforce (3–6). Healthcare workers in such situations face multiple risks, ranging from the direct threat of infectious diseases to psychological pressures, including anxiety, burnout, and feelings of insecurity (7, 8). Nurses and emergency personnel, in particular, are more affected by the consequences of disas-

***Corresponding Author:** Mohammadreza amiresmaili;Health in disasters and emergencies, research Center, Institute for Futures Studies in Health, Kerman University of medical Sciences, Kerman, Iran, Email: mohammadreza.amiresmaili@gmail.com TEL: 00989129636504. ORCID: https://orcid.org/0000-0002-9137-5873.

†**Corresponding Author:** Seyed Mobin Moradi; Health in Disasters and Emergencies Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran. Email: mobin_moradi@yahoo.com, Tel: 00989163992853. ORCID: https://orcid.org/0000-0002-8416-842X.

ters than other groups due to the nature of their work, which involves urgency, uncertainty, and continuous exposure to risk (9). Moreover, the reactions and performance of these individuals during crises largely depend on their "risk perception," a concept that reflects healthcare workers' subjective assessment of the likelihood and severity of threats and can directly influence protective behaviors, work-related decisions, and even job retention (10). In fact, risk perception is not merely a reflection of fear or concern; it is a multidimensional process encompassing cognitive, emotional, and social factors. This concept includes an individual's judgment regarding the nature of the threat, its likelihood, potential consequences, and the degree of control or preventability of the risk (11). In other words, what drives an individual to take preventive actions or engage in safe behaviors is not merely awareness of a threat's existence but how they interpret and subjectively evaluate its severity and consequences. This is particularly critical for healthcare workers due to the sensitive and high-pressure nature of their work environment.

Studies conducted across various fields demonstrate that numerous factors influence the formation of risk perception, particularly among healthcare workers (3, 5). The findings of Zhao et al. (2023) revealed that individual characteristics such as gender, education level, and experience with patient contact significantly affected the level of risk perception among nurses during the COVID-19 pandemic (12). Similarly, a study by Liu et al. (2024) among emergency nurses indicated that age, marital status, education, and safety behaviors were important predictors of risk perception (7). A review of other studies across different communities further underscores the role of cultural and social differences. For instance, research in East Asia and the Middle East has demonstrated that gender differences, disaster experience, and access to information all play crucial roles in shaping the level of risk perception (13-15).

Despite the growth of research in this field, the evidence remains fragmented and inconsistent. Many studies have focused exclusively on specific situations or limited populations, and no comprehensive framework has been proposed to explain the factors influencing healthcare workers' risk perception. This gap impedes policymakers and health administrators from fully utilizing existing findings to design evidence-based educational programs and management interventions. Therefore, conducting a systematic review that identifies, categorizes, and analyzes all factors reported in previous studies is an essential step. The objective of the present study is to identify the factors affecting healthcare workers' risk perception through a systematic review, thereby addressing the existing gap and laying the groundwork for enhancing the resilience of the healthcare system and providing more effective support to workers during disasters.

2. Methods

2.1. Study design and setting

This study was conducted as a systematic review following the PRISMA 2020 guidelines. A search was performed for articles published between January 2014 and July 2025 in the PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar databases. The objective was to identify and comprehensively synthesize the available evidence on the components and factors influencing risk perception among healthcare workers during disasters and health crises, with the aim of establishing a foundation for developing a conceptual framework. The study protocol was developed prior to the commencement of the review, and the methodology strictly adhered to the principles of systematic review. This research work has been approved with the ethical code IR.KMU.REC.1403.530 by Kerman University of Medical Sciences.

2.2. Eligibility Criteria

The inclusion and exclusion criteria for the studies were defined according to the PCC framework (Population, Concept, Context). Eligible studies focused on healthcare workers (physicians, nurses, paramedics, emergency responders, health managers, and other frontline staff) and directly examined risk perception, its dimensions (such as perceived likelihood, perceived severity, and perceived vulnerability), or factors influencing risk perception. These studies were required to be conducted in the context of disasters (natural or man-made) or public health crises (such as pandemics and epidemics). Original empirical studies employing quantitative designs (cross-sectional, longitudinal, cohort), qualitative designs (phenomenology, grounded theory, ethnography), or mixed-methods approaches published between January 2014 and July 2025 were eligible for inclusion.

Non-systematic review articles, meta-analyses, editorials, letters to the editor, case reports, proposals, and conference abstracts were excluded from this study. Additionally, studies that examined risk perception solely as a secondary or mediating variable, without providing independent findings on its dimensions or influencing factors were excluded. Studies conducted on the general population, patients, or non-clinical students, as well as those outside the context of disasters or health crises (such as everyday occupational hazards or non-pandemic diseases), were also excluded.

2.3. Information Sources and Search Strategy

A comprehensive search was conducted across three electronic databases: PubMed/MEDLINE, Scopus, Web of Science, and google scholars with the final search completed on July 31, 2025. The search strategy was developed in collaboration with a medical librarian and encompassed three main concepts, using a combination of free-text keywords and controlled vocabulary terms (MeSH terms). The first concept pertained to risk perception and included terms

such as risk perception, perceived risk, risk awareness, perceived vulnerability, perceived susceptibility, and perceived severity. The second concept focused on healthcare workers and included terms such as health worker, healthcare worker, health personnel, medical staff, health professional, frontline worker, nurse, physician, and paramedic. The third concept addressed disasters and health crises, incorporating terms such as disaster, emergency, crisis, epidemic, pandemic, outbreak, natural disaster, earthquake, flood, and infectious disease emergency. Keywords within each concept were combined using the OR operator, and the three main concepts were then connected using the AND operator. The complete and detailed search strategy for each database is provided in Appendix 1. In addition to the database searches, the Google Scholar search engine was manually reviewed to identify additional studies that may have been missed in the initial search.

2.4. Selection Process

The search results from all databases were imported into EndNote Reference Management Software, version 20, and duplicates were first removed automatically, followed by manual removal. The screening process was conducted in two stages. In the first stage, two researchers independently assessed the titles and abstracts of all remaining articles based on the eligibility criteria. In the second stage, the full texts of articles deemed eligible or uncertain in the first stage were independently reviewed by the same two researchers. In both stages, any disagreements were initially resolved through discussion between the two researchers; if consensus was not reached, a third researcher was consulted.

2.5. Quality appraisal

The quality of the selected studies was independently evaluated by two researchers using the Critical Appraisal Skills Programme (CASP) tool. CASP checklist evaluates multiple methodological dimensions including clarity of research focus, appropriateness of research methodology, subject recruitment and selection bias, measurement validity and bias reduction, data collection methodology, sample size adequacy, result presentation, analytical rigor, clear statement of findings, and local population applicability.

Studies were classified into three categories based on their overall scores: high quality (≥80% positive responses), moderate quality (60–79%), and low quality (<60%). Discrepancies in the quality appraisal were resolved through discussion, and, if necessary, the opinion of a third researcher was sought.

Data were extracted using a pre-designed, standardized data extraction form in Microsoft Excel by one researcher and subsequently reviewed by a second researcher. The extracted information included study details (first author's name, year of publication, country of study), methodology, study population (type of healthcare workers, work environment), crisis context (type of disaster or health crisis), and key findings related to factors influencing risk perception.

2.6. Data Synthesis and Analysis

A narrative synthesis approach and thematic analysis were employed to integrate the findings. Thematic analysis followed the six-step framework outlined by Braun and Clarke (2006), which involved: familiarizing with the data through repeated and active reading of the extracted findings; generating initial codes inductively by two independent researchers; searching for themes and categorizing similar codes into potential themes; reviewing the themes at two levels codes and the entire dataset; defining and naming the themes; and ultimately producing the report in a scientific narrative form. Disagreements between coders were resolved through group discussion. The final findings were presented as a comprehensive conceptual framework illustrating the main and subcomponents of risk perception and the factors influencing it.

3. Results

3.1. Characteristics of included studies

The complete search and selection process is illustrated in the PRISMA 2020 flowchart (Figure 1). Of the 2,154 initial articles, 10 eligible studies were included in the analysis following screening and quality assessment. Table 1 summarizes the characteristics of included studies.

The identification phase began with a comprehensive database search across three major databases: PubMed (1550 records), Scopus (82 records), and ISI/Web of Science (731 records), yielding a total of 2363 records. After removing 209 duplicate records, 2154 unique records remained for screening. The screening phase involved multiple stages of elimination: title screening excluded 691 papers, reducing the pool to 1463 studies; abstract screening further excluded 838 papers, leaving 625 studies for full-text review. During the full-text screening stage, 559 papers were excluded based on eligibility criteria, resulting in 66 papers proceeding to quality appraisal. In the final inclusion phase, an additional 56 papers were excluded during the quality assessment process, ultimately yielding 10 studies that met all inclusion criteria and quality standards for this systematic review. This rigorous multi-stage screening process demonstrates a systematic reduction from 2363 initial records to 10 final included studies, representing approximately 0.42% of the original search results, which reflects the stringent selection criteria applied throughout the review process.

3.2. Quality analysis

The quality analysis of included studies is presented in table 2. The overall CASP scores ranged from 7/10 to 9/10, indicating generally high methodological quality across the included studies. Three studies achieved the highest score of 9/10: Bahramzadeh et al. (2025) from Iran, Dryhurst et al. (2020) from a multi-country setting, and Portell et al. (2014)

from Spain. Five studies received scores of 8/10 or 8.5/10, including Griesi et al. (2024) from Brazil, Liu et al. (2024) from China, Chang et al. (2023) from China, Nishikawa et al. (2023) from Japan, Zhao et al. (2023) from China, and Kuhlmann et al. (2022) from Germany. The lowest score of 7/10 was assigned to Sultan et al. (2020) from Saudi Arabia, which showed partial adequacy in measurement validity, sample size, and analytical rigor. Notably, all studies demonstrated clear research focus and appropriate research methodology, while the most common limitations were observed in subject recruitment and selection bias (all studies scored "Partly"), and local population applicability, where only three studies (Nishikawa et al., Dryhurst et al., and Portell et al.) achieved full applicability. These findings suggest that while the included studies maintain robust methodological foundations, considerations regarding sampling strategies and generalizability warrant attention in future research.

3.3. Thematic analysis

The thematic analysis of the selected studies indicated that healthcare workers' risk perception during disasters and pandemics is influenced by a combination of individual, social, and organizational factors. These factors were categorized into five main themes: personal characteristics shaping risk perception; lived experience and direct exposure to disasters; knowledge capital and informational resources for risk perception; cognitive-emotional structures in risk perception; and behavioral responses to risk (Table 2). Each of these themes contains several subthemes, which are described below:

Theme 1: Personal characteristics shaping risk perception

The personal characteristics of healthcare workers are among the most fundamental factors influencing their risk perception when confronted with disasters and pandemics. These characteristics include demographic factors (age, gender, marital status, education level), professional and occupational status (rank or job position, years of service), and personal traits (chronic illnesses, perceived health, and sense of coherence). A total of 5 studies addressed the role of age. The results were varied: some studies found that younger workers exhibited greater concern and sensitivity toward risk, while others associated older age with a higher and more realistic perception of threats. Additionally, four studies indicated that women had a higher perception of risk than men and expressed greater concern about potential consequences.

Three studies indicated that married workers, due to family responsibilities and concerns about transmitting the disease to family members. Four studies examined education level, yielding inconsistent findings. Some studies suggested that higher education is associated with greater awareness and risk perception, while one study found that workers with lower education levels reported higher levels of concern. Four studies identified job rank or position as a determining factor; nurses and workers with more direct patient contact reported higher levels of risk perception compared to other occupational groups. One study examined years of work experience and found that less experienced workers had a higher perception of risk, likely due to their limited experience and heightened concern. Another study addressed personal characteristics such as chronic illnesses, perceived health, and sense of coherence and found that workers with underlying health conditions or those who perceived their health as poorer reported higher levels of concern and risk perception. Additionally, sense of coherence, as a psychological resource, played a mitigating role in the intensity of risk perception.

Theme 2: Lived experience and direct exposure to risk

Healthcare workers' risk perception is shaped not only by their personal characteristics but also significantly influenced by their past experiences and the extent of their direct exposure to crises and disasters. Lived experiences, whether through direct contact with patients during pandemics or participation in disaster response operations, provide the mental and emotional framework that enables workers to assess threats. Experience can contribute to a more realistic understanding of risk and, in some cases, may also intensify concern and anxiety. For example, workers who have been directly involved with patients on the frontlines typically report higher levels of awareness and understanding of risk. In contrast, ambiguous and uncertain experiences such as potential or uncertain contact with infected patients are often associated with anxiety and an overestimation of risk. Thus, exposure to risk plays a dual role: on one hand, it enhances preparedness and leads to more accurate assessments; on the other hand, it can fuel excessive worry. Five studies have shown that workers with experience in dealing with patients infected with infectious diseases (such as COVID-19) or those involved in critical situations reported a deeper and more realistic understanding of risk. Specifically, one study highlighted that participation in previous disasters or crises gave workers a more accurate perspective and greater preparedness, while another found that direct contact with infected patients led to higher levels of anxiety and risk perception. Together, these findings suggest that ambiguity in exposure increases concern.

Theme 3: Knowledge capital and informational resources for risk perception

The knowledge and level of awareness of healthcare workers are among the most decisive factors in shaping their risk perception during disasters and pandemics. Risk perception is accurate and realistic when individuals possess sufficient knowledge about the nature of the risk, its potential consequences, and effective coping strategies. Limited awareness or incomplete knowledge can lead to underestimating or overestimating the actual risk, which may result in disproportionate behaviors such as negligence or excessive anxiety. Furthermore, information sources and channels play a critical role in shaping this perception. Reliable information from scientific and official sources can enhance the accurate per-

ception of risk, while reliance on informal or social sources may fuel rumors, concern, and even distrust. Additionally, active information-seeking behavior by workers reflects their agency in dealing with a crisis and can contribute to better mental preparedness. Accordingly, two studies highlighted the importance of familiarity with risk/personal knowledge. The level of knowledge and familiarity with risk is a key determinant of risk perception. Moreover, personal knowledge about the virus (during the COVID-19 pandemic) increases risk perception. One study examined information-seeking behavior and found that workers who spent more time seeking information about COVID-19 reported higher levels of concern and risk perception. One study examined social reinforcement (receiving warnings and information from others) and found that warnings and information received from others, as a form of social reinforcement, played a crucial role in increasing awareness and sensitivity to risk, thereby intensifying risk perception. Another study examined trust in science, doctors, and the government, and the results showed that workers with greater trust in scientific institutions, doctors, and the government had a different level of risk perception. Higher trust could reduce irrational worry and enhance adherence to the realistic perception of risk.

Theme 4: Cognitive-emotional structures in risk perception

Healthcare workers' risk perception is not solely shaped by their personal characteristics or past experiences; it is also profoundly influenced by cognitive and emotional mechanisms that individuals activate when facing threats. Emotions such as fear, worry, and anxiety are among the most common reactions in critical situations and can amplify risk perception. Additionally, how individuals assess the severity and potential of the threat, the degree of vulnerability, and their perception of the controllability of the situation determines the quality of this perception. Workers who view the threat as uncontrollable or inevitable typically report higher levels of anxiety and risk perception. In contrast, those who experience a sense of individual and collective efficacy are more capable of assessing risk more realistically. Moreover, cognitive-evaluative structures, such as prosociality or individualism, also contribute to shaping risk perception. Workers with prosocial tendencies are generally more willing to accept risk and participate in supportive actions, while those with an individualistic worldview tend to prioritize personal benefits and security. Thus, emotion and cognition together form a complex network that influences both the extent and quality of risk perception. One study found that fear and anxiety about the occurrence of a crisis (such as the COVID-19 pandemic) were among the most significant triggers for heightened risk perception in healthcare workers. One study reported that the perception of the disaster's severity and scope, coupled with anxiety about its potential consequences, was directly related to an increase in risk perception. One study showed that workers who perceived themselves as more vulnerable or regarded the crisis as uncontrollable had higher levels of risk perception. One study indicated that viewing the disaster as inevitable heightened worry and increased threat perception. One study found that a tendency to help and support others during a crisis was associated with greater preparedness and a higher acceptance of risk. One study reported that workers with a more individualistic perspective viewed risk primarily as a threat to their personal well-being, paying less attention to collective consequences. One study stated that a sense of individual efficacy and confidence in the effectiveness of collective actions helped reduce worry and led to a more balanced perception of risk.

Theme 5: Behavioral responses to risk

Healthcare workers' risk perception does not remain confined to the cognitive or emotional level; it translates into the development of practical behaviors in response to threats. Behavioral responses are a direct reflection of an individual's assessment of the severity, controllability, and consequences of risk, and they play a critical role in reducing both individual and organizational vulnerability. These behaviors include adherence to preventive measures and compliance with workplace safety regulations, which protect workers' health and prevent the escalation of crises in healthcare settings. Workers who report higher levels of risk perception typically demonstrate greater commitment to following safety protocols; in contrast, those who perceive risk as less severe tend to be more negligent in implementing these measures. Therefore, a bidirectional relationship exists between risk perception and protective behaviors: higher risk perception leads to greater adherence to safety measures, while the execution of safe behaviors also reduces anxiety and fosters a greater sense of control. One study reported that workers with higher levels of risk perception showed significantly greater adherence to preventive measures such as wearing masks, maintaining physical distancing, and frequent handwashing. Another study found that workers who followed occupational safety guidelines (such as using protective equipment or adhering to infection control protocols) not only felt safer but also experienced lower levels of anxiety and concern.

4. Discussion

This review demonstrates that healthcare workers' risk perception during disasters is a multifaceted phenomenon shaped by the interaction of individual, experiential, knowledge-based, emotional, and behavioral factors. Understanding these dimensions is crucial for explaining responses and designing interventions to enhance resilience and preparedness among healthcare workers.

The findings of the present review indicate that demographic and individual variables significantly affect healthcare workers' risk perception; however, the direction of these effects varies across studies. Regarding age, some studies have reported that younger age groups tend to report higher levels of risk perception, possibly due to less clinical experience

and higher emotional sensitivity (24). In contrast, several other studies have associated older age with higher risk perception, which can be illustrated by the accumulation of professional experience and more accurate clinical judgment among older individuals (25). Furthermore, a study conducted in a region with frequent exposure to disasters showed that familiarity with and previous exposure to such events can alter the framework for interpreting risk (26). These discrepancies are likely due to differences in: 1) the target population (frontline nurses versus administrative staff), 2) the timing of the study in relation to the epidemic period, and 3) the presence or absence of direct exposure to the risk factor. Therefore, the relationship between age and risk perception should be interpreted as context-dependent.
Regarding gender, the majority of studies in our review showed that women report higher levels of risk perception compared to men. This pattern has also been observed in previous research and is generally explained by women's social caregiving roles, family responsibilities, and higher emotional sensitivity (27-29). Field evidence among nurses also indicates that women report higher risk perception scores (30). However, there are exceptions; for instance, in a study on flood risks, the opposite results were found, with the authors attributing this to differences in expectations of harm and awareness of flood-related factors (31). Furthermore, the role of biological factors and physiological stress responses may help explain part of this gender difference (32). Marital status has been consistently reported in the reviewed studies as an influential factor in risk perception; however, the direction of the effect is inconsistent across studies. Some reports suggest that married workers report higher levels of risk perception, a phenomenon typically explained by family responsibilities and concerns about transmitting risk to family members (29). In contrast, at least one study found the opposite, with individuals having a higher risk perception when they are single (24). Such discrepancies are likely a result of differences in the sample (type of workers), cultural and social context, and the timing of the study (during the COVID-19 pandemic wave).
Regarding education level, the findings are heterogeneous. Some studies have shown that higher education is associated with higher risk perception (33), which may be due to better access to scientific resources and greater capacity for analyzing potential consequences. However, another study (Discussion 2) reported that individuals with lower educational backgrounds had a higher risk perception (34). This pattern may reflect two distinct mechanisms: on one hand, higher education leads to a deeper understanding of risks; on the other hand, individuals with lower levels of education may perceive threats more strongly due to greater feelings of vulnerability or reduced access to supportive resources. Therefore, the relationship between education and risk perception is contingent upon other variables (such as job role, access to education, and family support).
Job rank/title and years of service also demonstrate discernible effects: studies have reported that employees with higher ranks or titles, as well as managers, tend to have higher levels of risk perception (35, 36), likely due to their involvement in decision-making processes and access to managerial information about risk. In contrast, the results of other studies have shown that employees with less experience or lower professional titles report higher levels of risk perception (24, 37), which may be due to their lower practical experience and reduced self-confidence when facing critical situations.
Additionally, one review (Discussion 4) reported a lack of a consistent pattern between work experience and risk perception, indicating that "work experience" alone is not a reliable indicator and should be integrated with variables such as actual exposure to disasters and training in models (31). Finally, personal characteristics (including perceived health, prior experience in responding to pandemics, or direct exposure to infected cases) also play a significant role in shaping risk perception. For instance, workers who have previously worked in COVID-19 units or been in direct contact with infected cases exhibit different risk perceptions (38-40). Similarly, individuals with poor perceived health or physical and psychological vulnerabilities tend to report higher levels of risk perception (29).
Direct or indirect experience and exposure to disasters are among the most significant determinants of risk perception among healthcare workers. Studies have shown that exposure to crises, whether through contact with patients infected with emerging viruses or participation in disaster response efforts, directly influences individuals' perception of the threat (41, 42). Workers who have been on the frontlines of the COVID-19 pandemic have gained a deeper understanding of the complex nature of crises and their multidimensional consequences. This exposure not only heightened their awareness of the severity of risk but also led to the development of more practical coping strategies (43). From a psychological standpoint, the experience of exposure can have dual effects on risk perception. Some workers, after experiencing critical situations, become more alert and sensitive to future threats. In contrast, repeated exposure to such situations may lead to the "normalization of deviance," a phenomenon in which individuals gradually become desensitized to threats and reduce their adherence to safety protocols (44). Furthermore, the level of uncertainty regarding the extent of risk exposure, especially in situations like emerging pandemics, directly influences workers' risk perception and anxiety. Workers who are uncertain about their exposure to pathogens experience higher levels of stress and anxiety (45), which can negatively affect their decision-making and clinical performance.
Another important dimension of experience and exposure is participation in non-medical disasters, such as earthquakes or tsunamis. The findings indicate that workers who have experienced such events tend to show greater psychological and operational preparedness for facing subsequent crises

(26). This suggests that practical exposure can facilitate experiential learning and enhance individuals' cognitive framework for understanding risk. Conversely, differences in the intensity and nature of exposure can also influence the level of risk perception; short-term and superficial exposure may cause temporary anxiety, while deep and prolonged exposure can lead to a more enduring and accurate understanding of risk.

The level of knowledge, awareness, and access to reliable information are key components in shaping risk perception among healthcare workers. Research has shown that prior familiarity with the nature of risk and personal knowledge of diseases and disasters is directly linked to workers' ability to accurately assess threats and respond appropriately (46-48). Workers who have received comprehensive, evidence-based crisis management training typically have a more accurate understanding of the severity and potential consequences of risks and exhibit more adaptive responses in emergencies. . In contrast, a lack of knowledge or inadequate information can lead to inaccurate risk assessments, excessive anxiety, or apathy (49). Information-seeking behavior has also been identified as a crucial factor in shaping risk perception. Workers who actively dedicate significant time to gathering news and data related to the pandemic report higher levels of risk perception (19). However, frequent exposure to large volumes of information, particularly when the data are contradictory or erroneous, can result in the "infodemic" phenomenon, characterized by increased confusion, anxiety, and a decline in trust in official sources (50). Thus, the quality of the information received is just as important as its quantity, as it can determine whether awareness is enhanced or concerns are amplified.

Social reinforcement also plays a significant role in this context. The exchange of information and warnings among colleagues, family members, or social networks can shape collective risk perceptions and establish shared safety norms (19). Workers who have received informational and experiential support from their colleagues demonstrate higher levels of mental preparedness and a more accurate perception of risk.

Furthermore, the role of trust in informational sources is critical. Trust in health authorities, scientists, and government institutions encourages workers to follow safety recommendations more rigorously and to base their risk perceptions on scientific data. In contrast, a decline in trust in official institutions, as observed in some countries during the COVID-19 pandemic, has been linked to lower adherence to health protocols and, consequently, a diminished perception of actual risk.

Emotions, attitudes, and both individual and social beliefs are integral components of the mechanisms that shape risk perception among healthcare workers. Studies have shown that fear and worry, as natural emotional responses, can have both protective and detrimental effects on risk perception (51, 52). A moderate level of fear can lead to increased alertness, accuracy, and adherence to safety protocols, while excessive fear can result in severe anxiety, reduced concentration, and even burnout. The severity and potential of the threat, along with workers' perceptions of vulnerability and control over the situation, are critical dimensions influencing the emotional assessment of the threat. Workers who feel they have limited control over the situation typically report higher levels of anxiety and risk perception.

Social and cultural beliefs also play a significant role in this area. Prosocial tendencies among healthcare workers lead them to prioritize the needs of patients and the community over personal safety (53, 54). While this attitude contributes to strengthening social responsibility, it can also expose workers to additional risks. In contrast, an individualistic worldview, which prioritizes personal interests, leads to a stronger focus on personal protection but may decrease attention to collective responsibilities in crisis management (19). This attitudinal conflict suggests that risk perception is shaped not only by cognitive and individual variables but also by values and cultural systems that are reproduced in both the workplace and social environments.

Furthermore, a sense of individual and collective efficacy has been identified as a key psychological factor in shaping risk perception. Workers who believe they can control situations and influence the course of a crisis report higher levels of risk perception and experience less anxiety. On the other hand, the absence of this sense can lead to feelings of hopelessness, reduced motivation to follow safety protocols, and a decreased capacity to cope with threats. These findings are consistent with health psychology models, which highlight the role of perceived control and self-efficacy in predicting safety behaviors.

Protective behaviors and actions are both a reflection of healthcare workers' risk perception during critical situations and influential factors in shaping this perception. Research has shown that adherence to preventive measures, such as consistently using personal protective equipment (PPE) and strictly following health protocols, is directly linked to the level of risk perception. Specifically, workers who perceive higher levels of risk are more likely to follow protective behaviors (55). This bidirectional relationship is also evident, as organizations with strong safety cultures and institutionalized protective behaviors effectively enhance risk perception among their employees. In addition to PPE use, protective behaviors can take many forms, including avoiding unnecessary contact, maintaining social distancing, and following organizational safety regulations. Studies conducted during the COVID-19 pandemic have shown that healthcare workers with higher risk perception not only used masks more consistently but also exhibited better adherence to other safety protocols (56). However, organizational pressures, resource shortages, and conflicts between efficiency and safety can hinder the implementation of protective behaviors. In these situations, even workers with high risk perception may be forced to compromise and abandon protective measures,

suggesting that structural and systemic factors also play a role in this dynamic. These findings suggest that protective behaviors are not solely a reflection of a cognitive variable, but rather the result of a complex interplay between risk perception, social norms, organizational resources, and individual beliefs. In summary, protective behaviors can be viewed as the final link in the risk perception chain, through which employees' mental assessments of threats are translated into observable and concrete actions.

As a result, the study highlights the importance of comprehending these dimensions to enhance staff preparedness in disaster situations. It recommends that educational interventions be tailored to accommodate demographic differences and prior experiences of the workers. Additionally, fostering a culture of safety and establishing strong support networks are crucial to enhancing staff's understanding of potential threats. Ultimately, future studies should evaluate the effectiveness of these interventions and develop suitable tools to enhance the resilience and readiness of healthcare personnel.

5. Limitations

This systematic review has several limitations that should be acknowledged. First, the search was limited to three major databases (PubMed, Scopus, and Web of Science) and may have missed relevant studies published in other databases or grey literature sources. Second, the majority of included studies employed cross-sectional designs, which limits the ability to establish causal relationships between identified factors and risk perception. Third, significant heterogeneity was observed across studies in terms of geographical context, disaster types (natural disasters versus pandemics), and measurement tools used to assess risk perception, which restricted the comparability of findings and precluded meta-analytical synthesis. Fourth, all included studies demonstrated partial limitations in subject recruitment and selection bias, as evidenced by the CASP quality assessment, which may affect the generalizability of findings. Fifth, the predominance of studies conducted during the COVID-19 pandemic may limit the applicability of results to other disaster contexts, as pandemic-related risk perception may differ substantially from perceptions during natural disasters or other health emergencies. Finally, the reliance on self-reported measures in most studies may introduce response bias and social desirability effects, potentially affecting the accuracy of risk perception assessments. Future research should address these limitations through longitudinal designs, standardized measurement instruments, and inclusion of diverse disaster contexts to provide more robust evidence for understanding healthcare workers' risk perception.

6. Conclusions

The analysis revealed that risk perception is shaped by five key factors: individual characteristics, past experiences, knowledge and awareness, attitudes, and protective behaviors. These dimensions underscore the complexity of risk perception, which is not solely based on individual traits but is also influenced by the intricate interactions between personal experiences, information sources, social structures, and emotional responses.

7. Declarations

7.1. Acknowledgments

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7.2. Author contributions

R.B.G. and M.A. conceptualized the study and developed the research design. H.F. contributed to data collection and analysis. A.S. performed statistical analysis and assisted with result interpretation. S.M.M. prepared the figures and visual materials. S.A. drafted the manuscript and coordinated revisions. All authors reviewed and approved the final manuscript.

7.3. Ethics approval and consent to participate

This research work has been approved with the ethical code IR.KMU.REC.1403.530 by Kerman University of Medical Sciences.

7.4. Consent for publication

Not applicable

7.5. Availability of data and materials

It is accessible through the corresponding author.

7.6. Competing interests

The authors declare that they have no conflict of interest.

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7.8. Using arrificial intelligence chatbots

No artificial intelligence was used in writing any part of this article.

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Table 1: Characteristics of included studiess

Author/Year	Country	Population	Method	Crisis Context	Key Findings
Bahramzadeh et al., 2025	Iran	2145 hospital staff in Tehran	Cross-sectional	Disasters (earthquake, flood, fire, etc., in a hospital environment)	Higher age, female gender, and higher education level (especially doctoral degrees) were associated with higher risk perception. Factors like familiarity with the risk, knowledge, experience, preventive measures, fear of risk occurrence, and concern about risk also influenced risk perception.
Griesi et al., 2024	Brazil	1872 healthcare workers in Brazil	Cross-sectional	COVID-19 pandemic	Marital status (married), having chronic diseases, lower perceived health, and weak sense of coherence linked to higher risk perception. Spending more time searching for information about COVID-19, uncertainty in contact with suspected cases, and adherence to preventive measures increased risk perception.
Liu et al., 2024	China	189 emergency nurses from 5 hospitals in China	Cross-sectional	Emergency work environment during the COVID-19 crisis	Older age, marital status (married), higher education level, higher job rank, higher income, and safety training were positively associated with higher risk perception. Risk perception was positively correlated with safety behaviors.
Chang et al., 2023	China	35068 nurses in Henan province	Cross-sectional	COVID-19 pandemic	Younger age and female gender were associated with higher risk perception. Direct exposure to COVID-19 and past participation in similar situations increased risk perception.
Nishikawa et al., 2023	Japan	401 disaster relief nurses from 6 Japanese provinces	Cross-sectional	Multiple disasters and crises (earthquake, volcanic eruption, radiation risk, COVID-19 pandemic)	High risk perception in radiation and nuclear contamination. In COVID-19, 'mass infection' was a key perceived risk. Younger nurses perceived higher risks of mass infection and uncertainty about radiation tests compared to older nurses.
Zhao et al., 2023	China	442 nurses in Jiangsu province	Cross-sectional	COVID-19 pandemic	Gender (females more than males), age (younger more than older), education level (lower more than higher), work experience (less more than more), job title (lower more than higher), marital status (single more than married), health status (weaker more than optimal), and experience of contact with COVID-19 influenced risk perception.
Kuhlmann et al., 2022	Germany	1163 healthcare workers at Hannover	Medical School	Mixed-method	COVID-19 pandemic (second wave in Germany) Nurses had higher risk perception and greater fear of infection compared to other healthcare workers. Contact with COVID-19 patients was associated with greater fear.
Sultan et al., 2020	Saudi Arabia	213 healthcare providers in 10 hospitals in Najran	Cross-sectional	Disasters and public health emergencies (including pandemics)	Higher education levels were linked to lower fear and risk perception. Trust in personal and family safety, confidence in PPE availability, and adequate training influenced healthcare workers' willingness to work and risk perception.
Dryhurst et al., 2020	USA, UK, Germany, Spain, Italy, Sweden, Mexico, Australia, Japan, South Korea	6991 individuals (national sample)	Cross-sectional	COVID-19 pandemic	Direct experience with the virus, social reinforcement (information from friends and family), prosocial values, individualistic worldview, perceived efficacy, trust in science, doctors, and government, knowledge about the virus, and gender (females more than males) were significant factors in risk perception.
Portell, Gil, Losilla & Vives, 2014	Spain	313 healthcare workers in primary care centers, acute hospitals, and social-health centers in Catalonia	Cross-sectional	Health sector work environment (biological, ergonomic, and organizational hazards)	Feelings of anxiety, severity of consequences, personal vulnerability, potential for catastrophe, avoidability, controllability, and personal knowledge compared to expert knowledge, along with job category and center type, influenced workers' risk perception.

Table 2: Quality analysis of included studies

Studies	1	2	3	4	5	6	7	8	9	10	11
Bahramzadeh et al., 2025 (Iran)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Yes	Yes	Partly	9/10
Griesi et al., 2024 (Brazil)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Yes	Yes	Partly	8/10
Liu et al., 2024 (China)	Yes	Yes	Partly	Yes	Yes	Borderline	Yes	Yes	Yes	Partly	8.5/10
Chang et al., 2023 (China)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Partly	Yes	Partly	8/10
Nishikawa et al., 2023 (Japan)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Partly	Yes	Yes	8/10
Zhao et al., 2023 (China)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Partly	Yes	Partly	8/10
Kuhlmann et al., 2022 (Germany)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Partly	Yes	Partly	8/10
Dryhurst et al., 2020 (Multi-country)	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9/10
Sultan et al., 2020 (Saudi Arabia)	Yes	Yes	Partly	Partly	Yes	Partly	Yes	Partly	Yes	Partly	7/10
Portell et al., 2014 (Spain)	Yes	Yes	Partly	Yes	Yes	Partly	Yes	Yes	Yes	Yes	9/10

1: Clarity of Research Focus; 2: Appropriateness of Research Methodology; 3: Subject Recruitment and Selection Bias;
4: Measurement Validity and Bias Reduction; 5: Data Collection Methodology; 6: Sample Size Adequacy; 7: Result Presentation;
8: Analytical Rigor; 9: Clear Statement of Findings; 10: Local Population Applicability; 11: CASP Grade

Table 3: Themes and subthemes identified in the thematic analysis of factors influencing healthcare workers' risk perception

Main theme	Subthemes
Personal Characteristics Shaping Risk Perception	Age (7, 12, 16-18)
	Gender (12, 16, 17, 19)
	Marital status (7, 12, 20)
	Education level (7, 12, 17, 21)
	Rank/Job title (7, 12, 17, 22)
	Years of work/Service history (12)
	Personal characteristics (chronic illnesses, perceived health, sense of coherence) (20)
Lived Experience and Direct Exposure to Disasters	Experience of contact or exposure to risk (COVID-19 or disaster) (12, 16, 17, 19, 20)
	Participation/Presence in similar situations or disasters (16)
	Direct disaster experience (pandemic/virus) (19)
Knowledge Capital and Informational Resources for Risk Perception	Familiarity with risk/Personal knowledge (17, 19)
	Information-seeking behavior (20)
	Social reinforcement (receiving warnings and information from others) (19)
	Trust in science, doctors, and the government (19)
Cognitive-Emotional Structures in Risk Perception	Fear and concern about risk occurrence (17)
	Anxiety and severity/potential of disaster (23)
	Vulnerability and controllability (23)
	Avoidability of disaster (23)
	Prosocial tendencies (19)
	Individualism (19)
	Sense of individual and collective efficacy (19)
Behavioral Responses to Risk	Adherence to preventive measures (use of masks, etc.) (20)
	Safe behavior based on workplace safety regulations (7)

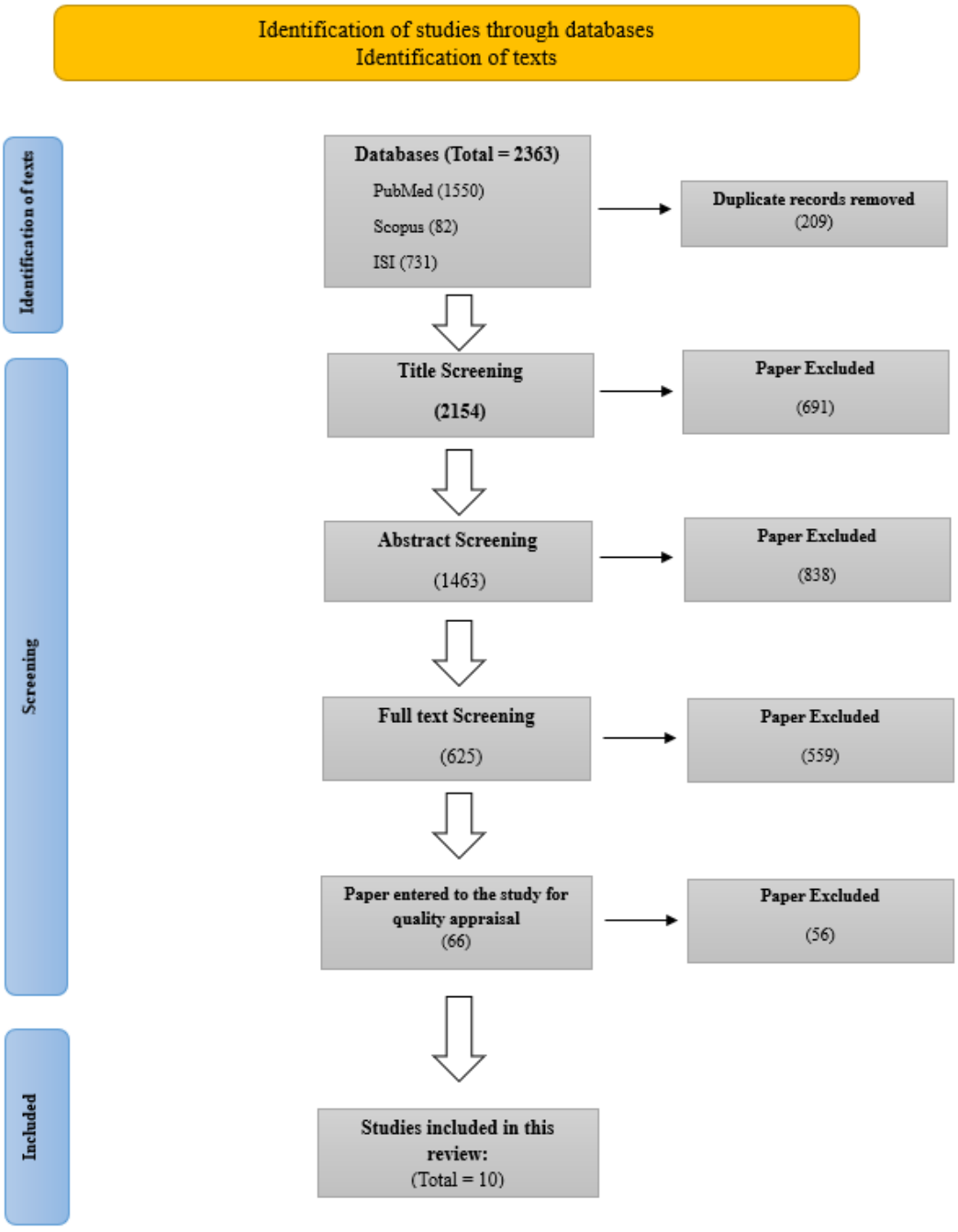

Figure 1: Flow diagram of the systematic review process.

Appendix 1: Search strategy of different databases

Scopus
(TITLE-ABS-KEY((health W/3 worker*) OR (health W/3 staff*) OR (health W/3 employee) OR (health W/3 manpower) OR (medical W/3 worker*) OR (health W/3 professional*) OR (medical W/3 profession*) OR (health W/3 personnel) OR phisition OR nurse* OR (medical W/3 stuff) OR (medical W/3 worker*) OR (health W/3 workforce*)) OR AUTHKEY ((health W/3 worker*) OR (health W/3 staff*) OR (health W/3 employee) OR (health W/3 manpower) OR (medical W/3 worker*) OR (health W/3 professional*) OR (medical W/3 profession*) OR (health W/3 personnel) OR phisition OR nurse* OR (medical W/3 stuff) OR (medical W/3 worker*) OR (health W/3 workforce*))) AND (TITLE-ABS-KEY(Disaster OR (natural PRE/2 disaster) OR earthquake* OR flood* OR storm* OR drought OR (climate W/3 change*) OR landslide OR (land W/3 subsidence) OR wildfire OR tornado OR (man-made PRE/2 disaster*) OR (Human-made PRE/2 disaster*) war OR explosion OR fire OR (chemical PRE/2 disaster*) OR (biological ORE/2 disaster*) OR (radiolog* W/2 disaster*) OR (nuclear PRE/2 disaster*) OR emergency* OR "mass casualty incident*" OR hazard OR incident OR accident OR (Nuclear PRE/3 Accident*) OR (Radiolog* PRE/2 Accident*) OR (Radiolog* PRE/2 Accident*) OR (Nuclear PRE/3 Emergenc*)) OR AUTHKEY(Disaster OR (natural PRE/2 disaster) OR earthquake* OR flood* OR storm* OR drought OR (climate W/3 change*) OR landslide OR (land W/3 subsidence) OR wildfire OR tornado OR (man-made PRE/2 disaster*) OR (Human-made PRE/2 disaster*) war OR explosion OR fire OR (chemical PRE/2 disaster*) OR (biological ORE/2 disaster*) OR (radiolog* W/2 disaster*) OR (nuclear PRE/2 disaster*) OR emergency* OR "mass casualty incident*" OR hazard OR incident OR accident OR (Nuclear PRE/3 Accident*) OR (Radiolog* PRE/2 Accident*) OR (Radiolog* PRE/2 Accident*) OR (Nuclear PRE/3 Emergenc*))) AND (TITLE ((risk PRE/3 perception*) OR (risk PRE/3 awareness) OR (risk W/3 understand*) OR (perceive* W/3 risk*) OR (perceive W/2 susceptibility) OR (perceive* W/2 vulnerabilit*)) OR AUTHKEY ((risk PRE/3 perception*) OR (risk PRE/3 awareness) OR (risk W/3 understand*) OR (perceive* W/3 risk*) OR (perceive W/2 susceptibility) OR (perceive* W/2 vulnerabilit*)))
PubMed
(((disaster*[Other Term] OR "natural disaster"[Other Term] OR earthquake[Other Term] OR flood[Other Term] OR storm*[Other Term] OR drought[Other Term] OR "climate change"[Other Term] OR landslide[Other Term] OR "land subsidence"[Other Term] OR wildfire[Other Term] OR tornado[Other Term] OR "man-made disaster"[Other Term] OR war[Other Term] OR explosion[Other Term] OR fire[Other Term] OR "chemical disaster"[Other Term] OR "biological disaster"[Other Term] OR "radiological disaster"[Other Term] OR "nuclear disaster"[Other Term] OR emergency*[Other Term] OR " mass casualty incident"[Other Term] OR hazard[Other Term] OR incident[Other Term] OR accident[Other Term] OR risk[Other Term] OR danger[Other Term]) AND ("risk perception"[Other Term] OR "risk awareness"[Other Term] OR "risk understanding"[Other Term] OR "perceived risk"[Other Term] OR "perceived susceptibility"[Other Term] OR "perceived vulnerability"[Other Term])) OR (("risk perception"[Title] OR "risk awareness"[Title] OR "risk understanding"[Title] OR "perceived risk"[Title] OR "perceived susceptibility"[Title] OR "perceived vulnerability"[Title]) AND (disaster*[Title] OR "natural disaster"[Title] OR earthquake[Title] OR flood[Title] OR storm*[Title] OR drought[Title] OR "climate change"[Title] OR landslide[Title] OR "land subsidence"[Title] OR wildfire[Title] OR tornado[Title] OR "man-made disaster"[Title] OR war[Title] OR explosion[Title] OR fire[Title] OR "chemical disaster"[Title] OR "biological disaster"[Title] OR "radiological disaster"[Title] OR "nuclear disaster"[Title] OR emergency*[Title] OR " mass casualty incident"[Title] OR hazard[Title] OR incident[Title] OR accident[Title] OR risk[Title] OR danger[Title]))) AND (("health worker"[Title] OR "health workers"[Title] OR "health staff"[Title] OR "health employee"[Title] OR "health manpower"[Title] OR "healthcare worker"[Title] OR "healthcare workers"[Title] OR "medical worker"[Title] OR "medical workers"[Title] OR "health professional"[Title] OR "healthcare professional"[Title] OR "medical professional"[Title] OR "healthcare personnel"[Title] OR "healthcare manpower"[Title] AND "risk perception"[Title] OR "risk awareness"[Title] OR "perceived risk"[Title] OR "risk understanding"[Title] OR "perceived susceptibility"[Title] OR "perceived vulnerability"[Title]) OR ("health worker"[Other Term] OR "health workers"[Other Term] OR "health staff"[Other Term] OR "health employee"[Other Term] OR "health manpower"[Other Term] OR "healthcare worker"[Other Term] OR "healthcare workers"[Other Term] OR "medical worker"[Other Term] OR "medical workers"[Other Term] OR "health professional"[Other Term] OR "healthcare professional"[Other Term] OR "medical professional"[Other Term] OR "healthcare personnel"[Other Term] OR "healthcare manpower"[Other Term] AND "risk perception"[Other Term] OR "risk awareness"[Other Term] OR "perceived risk"[Other Term] OR "risk understanding"[Other Term] OR "perceived susceptibility"[Other Term] OR "perceived vulnerability"[Other Term])) SEARCH STRATEGY(((TS=(Disaster OR (natural NEAR/2 disaster) OR earthquake* OR flood* OR storm* OR drought OR (climate NEAR/3 change*) OR landslide OR (land NEAR/3 subsidence) OR wildfire OR tornado OR (man-made NEAR/2 disaster*) OR (Human-made NEAR/2 disaster*) war OR explosion OR fire OR (chemical NEAR/2 disaster*) OR (biological ORE/2 disaster*) OR (radiolog* NEAR/2 disaster*) OR (nuclear NEAR/2 disaster*) OR emergency* OR "mass casualty incident*" OR hazard OR incident OR accident OR (Nuclear NEAR/3 Accident*) OR (Radiolog* NEAR/2 Accident*) OR (Radiolog* NEAR/2 Accident*) OR (Nuclear NEAR/3 Emergenc*))) AND TS=((Risk NEAR/3 perception*) OR (risk NEAR/3 awareness) OR (risk NEAR/3 understand*) OR (perceive* NEAR/3 risk*) OR (perceive NEAR/2 susceptibility) OR (perceive* NEAR/2 vulnerabilit*))) AND TS=((Health NEAR/3 worker*) OR (health NEAR/3 staff*) OR (health NEAR/3 employee) OR (health NEAR/3 manpower) OR (medical NEAR/3 worker*) OR (health NEAR/3 professional*) OR (medical NEAR/3 profession*) OR (health NEAR/3 personnel) OR poisition OR nurse* OR (Medical NEAR/3 stuff) OR (Medical NEAR/3 worker*) OR (Health NEAR/3 workforce*))
Web of sciences
((TS=(Disaster OR (natural NEAR/2 disaster) OR earthquake* OR flood* OR storm* OR drought OR (climate NEAR/3 change*) OR landslide OR (land NEAR/3 subsidence) OR wildfire OR tornado OR (man-made NEAR/2 disaster*) OR (Human-made NEAR/2 disaster*) war OR explosion OR fire OR (chemical NEAR/2 disaster*) OR (biological ORE/2 disaster*) OR (radiolog* NEAR/2 disaster*) OR (nuclear NEAR/2 disaster*) OR emergency* OR "mass casualty incident*" OR hazard OR incident OR accident OR (Nuclear NEAR/3 Accident*) OR (Radiolog* NEAR/2 Accident*) OR (Radiolog* NEAR/2 Accident*) OR (Nuclear NEAR/3 Emergenc*))) AND TS=((Risk NEAR/3 perception*) OR (risk NEAR/3 awareness) OR (risk NEAR/3 understand*) OR (perceive* NEAR/3 risk*) OR (perceive NEAR/2 susceptibility) OR (perceive* NEAR/2 vulnerabilit*))) AND TS=((Health NEAR/3 worker*) OR (health NEAR/3 staff*) OR (health NEAR/3 employee) OR (health NEAR/3 manpower) OR (medical NEAR/3 worker*) OR (health NEAR/3 professional*) OR (medical NEAR/3 profession*) OR (health NEAR/3 personnel) OR poisition OR nurse* OR (Medical NEAR/3 stuff) OR (Medical NEAR/3 worker*) OR (Health NEAR/3 workforce*))