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REVIEW ARTICLE

Factors affecting the communication of risk during public health emergencies

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ABSTRACT

Background: Risk communication during public health emergencies is a demanding and dynamic public policy process. In this paper, we provide an overview of risk communication during public health emergencies by discussing the theoretical foundations of risk perception. While communication is a complex art and a science that helps to facilitate daily life, it may also be misused, leading to a multitude of problems. Communication is essential in situations that involve threats to public health and safety.

Methodology: An extensive literature review was performed, and various databases, including PubMed, Scopus, and Google Scholar, were consulted to identify relevant peer-reviewed articles. A two-stage analysis of the collected literature was then conducted: In the first stage, a comprehensive examination was carried out to identify and categorize the factors affecting risk communication, such as media effectiveness, public trust, and governmental policies. The second stage focused specifically on Saudi Arabia as a case study to analyze the unique cultural, social, and governmental factors that shape risk communication in public health emergencies within the country.

Conclusion: Effective crisis management relies on open lines of communication; this is why risk communication is so important. Thus, it is essential to utilize the proper channels and sources and to ensure stakeholders' participation in the dissemination of information, since such information may contain sensitive details that might trigger widespread fears. Moreover, implementing a risk communication strategy that connects with and addresses people's concerns is essential for increasing public involvement in disaster planning and response, as well as for providing access to accurate and timely information about an impending crisis.

Keywords: Risk communication, risk perception, COVID-19, public health, public health emergencies, disasters, crisis.

Introduction

Risk communication during public health emergencies is a demanding and dynamic public policy process that requires the integration of numerous disciplines and perspectives, including epidemiology, economics, sociology, psychology, and communication studies, as well as the methodology of communication research itself [1]. In this paper, we provide an overview of risk communication in public health emergencies by discussing the theoretical foundations of risk perception and outlining the psychological processes that influence how people understand and respond to risks related to a specific hazard. Moreover, we outline essential strategies for communicating risks during emergencies and briefly discuss some key concepts, such as trust building, in risk communication. While communication is essential for daily life, it can also be misused, leading to a multitude of problems. Communication is particularly important in situations that involve threats to public health and safety. For example, during a crisis, specialists, decision makers, and the public must share and receive information, views, and recommendations in real time [2]. Public health emergencies, such as the spread of disease via air or water, the release of chemicals or other toxins into the ecosystem, or the release of radioactive materials, can all represent serious risks to human health and the

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environment [3]. Various natural or man-made disasters, including storms, floods, terrorist attacks, and conflicts, can have a negative impact on public health [4]. The well-being of the impacted population and the public health system suffers as a result of these occurrences in various destructive ways. Recent outbreaks of infectious diseases, including the Ebola virus outbreak in West Africa (2014–2015), the outbreak of the Zika virus illness in 2015–2016, multi-country yellow fever outbreaks in Africa in 2016, and the on-going coronavirus pandemic, have revealed critical problems and disparities in risk communication during pandemics and other public health emergencies [5]. The rapid evolution of communication technologies, such as the nearly ubiquitous usage of cellular phones, the prevalent use and progressively important impact of digital content, which has impacted on "conventional" mainstream media (publications, radio, and television), and significant shifts in how humans access and trust health-related information are all factors that contribute to such difficulties [6]. The neglect of these aspects fails to adequately consider the social, economic, geopolitical, and cultural factors that affect people's perceptions of risk and risk-reduction behaviors, which is a crucial oversight [6]. Finally, recommendations for improving emergency risk communication (ERC) and maintaining it in future health crises are required.

Methodology

An extensive literature review was performed to investigate the factors affecting the communication of risk during public health emergencies. Various databases, including PubMed, Scopus, and Google Scholar, were consulted to identify relevant peer-reviewed articles. A two-stage analysis of the collected literature was then conducted: In the first stage, a comprehensive examination was conducted to identify and categorize the factors affecting risk communication, such as media effectiveness, public trust, and governmental policies. The second stage focused specifically on Saudi Arabia as a case study to analyze the unique cultural, social, and governmental factors that shape risk communication during public health emergencies within the country.

The role of integrating risk communication into National health and emergency response systems and strategic communication planning

Health emergencies, such as the Ebola outbreak in West Africa (2014-2016) and the global COVID-19 pandemic, have highlighted the crucial role of risk communication in the management of public perceptions, behaviors, and, ultimately, the course of diseases [7]. Governance is central to the effectiveness of risk communication, as effective governance frameworks enable a coordinated approach to communicating risks, thereby ensuring consistent messages that increase public trust [1]. Moreover, good governance ensures that there is minimal misinformation, which often exacerbates public panic and hinders preventive measures. The World Health Organization's (WHO) guidelines accentuate the importance of governance in risk communication by emphasizing the clarity of roles, fostering inter-sectoral collaboration, and ensuring transparent, timely exchanges [2]**.** Information systems are the backbone of risk communication: a robust and agile information system captures, analyses, and disseminates data pertaining to potential threats, thus ensuring that all stakeholders, ranging from policymakers to the public, are kept informed [8]. Real-time surveillance systems and digital platforms that harness the power of big data and artificial intelligence can detect emerging threats rapidly and can provide actionable insights [9]. However, having state-of-the-art information systems is not sufficient, as capacity building is paramount. Strengthening the skills and knowledge of health workers, community leaders, and communication professionals ensures that risk communication strategies are culturally sensitive, context-specific, and effective [10]. For example, during the Zika virus outbreak in South America in 2015, the successful engagement of communities centered on teaching local health workers about risk communication; these health workers then played a pivotal role in dispelling myths and promoting preventive measures [11]. Nonetheless, the pillars of governance, information systems, and capacity building cannot be constructed without the foundation of finance. Although finance is often sidelined in many discussions regarding risk communication, its importance cannot be overemphasized; embedding risk communication within national health budgets fosters continuity, preparedness, and innovation [12]. Therefore, integrating risk communication into national health budgets ensures sustained investment in developing the necessary infrastructure, training personnel, and conducting research to constantly improve strategies [12]. Similarly, allocating funds for risk communication is not simply an expenditure, but can be seen as an investment. For every dollar spent on risk communication, countries can potentially save thousands more by treating diseases, controlling outbreaks, and mitigating the economic and social impacts of health emergencies [13]. Thus, integrating risk communication into national health and emergency response systems is non-negotiable. Through a combination of robust governance, advanced information systems, on-going capacity building, and dedicated financing, nations can better prepare for, respond to, and recover from health threats, thus ensuring the safety and well-being of their citizens. The importance of strategic communication planning in risk communication during public health emergencies rests on several pillars, each of which is fundamental for public safety, trust, and the efficient management of crisis situations. As Reynolds and Quinn [14] pointed out, effective risk communication can establish trust and credibility and can promote informed decision making. Consequently, the planning phase must account for changing information landscapes and devise methods for timely message updates without eroding public confidence [15]. Another dimension of strategic communication planning is the need for stakeholder engagement. Engaging with community leaders, healthcare providers, and other stakeholders can provide invaluable feedback pertaining to message framing, channel selection, and potential barriers to message acceptance. Fischhoff et al. [16] emphasized that overlooking such engagement could lead to the inadvertent amplification of risks, as well-intentioned

Figure 1. *Key factors for effective risk communication.*

messages may inadvertently increase fears or misinform the public [16]. Moreover, the global nature of many public health threats requires communication plans not just to be strategic, but also collaborative across national borders. In its guidance on risk communication, the WHO emphasizes the importance of international collaboration, data sharing, and resources, as well as crafting messages that resonate across diverse cultural and linguistic landscapes [17]. The focus of this review is to examine the key factors that impact significantly on the process of communicating risks (Figure 1).

Factors affecting the impact of risk communication

Recent studies have mainly focused on event-specific alerts, such as those sent before, during, and after a disease outbreak. It is important to differentiate between these alerts and public health education, which involves disseminating information about potential hazards before or during a crisis [18]. The success of risk communication in encouraging the public to take certain defensive actions is influenced by several factors, such as the nature of the risk, the type of message, the communication method used, and how the recipients process the information. During public health crises, risk communication is mainly aimed at motivating people to act in a specific manner, such as remaining where they are, evacuating, or stocking up on supplies. However, for risk messages to be effective, recipients must not only receive them but must also fully comprehend the information, realize that it applies to them, understand the risks of inaction, decide to act, know which steps to take, and be capable of acting [19]. The proposed measures and the public's capacity to adhere to them are essential components of risk communication during crises. Several elements impact risk communication during public health emergencies, including message clarity, constancy, and accuracy, as well as the trustworthiness and recognition of the source. Furthermore, studies have shown that the recipients' socio-demographic traits strongly influence their ability to comprehend and respond to risk communication messages. Warnings and directions, particularly if they are provided in only one language, can be challenging for minority groups and for those for whom the language that is used is not their primary language of communication.

Community engagement

Community engagement is central to successful risk communication, as engaging with communities ensures that their perspectives, knowledge, and concerns are factored into public health strategies. Communities are more likely to trust and adhere to health recommendations if they feel a sense of ownership and involvement in decision-making processes [20]. Historical precedents have shown that the lack of community engagement can be detrimental; for example, during the early phases of the Ebola outbreak in West Africa, efforts to control the spread of the virus were hampered by community resistance to and mistrust of health workers

and interventions. However, there was a marked improvement in cooperation and compliance once community engagement strategies, such as involving local leaders and addressing community concerns were implemented [7]. Effective community engagement in risk communication necessitates an in-depth understanding of local cultures, beliefs, and norms. Local cultural practices might influence perceptions of risk and receptivity to public health messages; for example, burial practices in some cultures can exacerbate the spread of certain diseases. By engaging with communities, health authorities can devise strategies that respect local customs while mitigating health risks [21]. Furthermore, in today's digital age, the rapid spread of misinformation and fake news on social media can undermine public health efforts. Engaging with communities allows for the identification of prevalent misconceptions, thus enabling health authorities to address them promptly and efficiently [22]. Local influencers, religious leaders, or community groups can disseminate accurate information and play a pivotal role in dispelling myths. However, community engagement is not without challenges, as diverse communities might have varied perspectives and priorities, and balancing these different viewpoints and ensuring inclusivity can be complex. Moreover, in regions with a historical mistrust of authorities, initiating and maintaining community engagement can be particularly daunting [23]. To overcome these challenges, it is imperative to adopt a proactive, transparent, and adaptive approach to community engagement. Continuous feedback loops should be established to ensure that strategies remain relevant and effective. Employing participatory methods, such as focus group discussions and community dialogues, can provide insights into local concerns, knowledge gaps, and potential barriers to intervention adherence [24].

Communicating uncertainty and risk communication messages

Communicating uncertainty during public health emergencies poses significant challenges. The rapidly evolving nature of emergencies, coupled with the need for prompt and actionable public health guidance, requires a delicate balance between providing timely information and ensuring the accuracy thereof. Uncertainty can arise due to various reasons, such as incomplete data, evolving scientific understanding, or the inherent unpredictability of novel health threats [25]. During outbreaks such as the 2014-2016 Ebola epidemic or the 2019-2021 COVID-19 pandemic, scientists and health officials frequently struggled with gaps in their understanding while facing tremendous public and political pressure to provide immediate answers [26]. Transparent communication becomes vital in such contexts; public health officials must convey the known facts, acknowledge what is not known, and outline the steps that are being taken to reduce uncertainty, as this openness fosters trust and prevents the spread of misinformation. During the H1N1 pandemic in 2009, the WHO found that transparent communication, even if it meant admitting uncertainty, was essential for maintaining public trust [27]. Withholding information or providing overly optimistic assessments can erode that trust, as can be seen in past health crises when information was downplayed or delayed. Effective communication strategies also involve selecting the correct medium and messenger. Furthermore, risk communication messages should be easily readable and transparent, thus allowing for conversations in which multiple perspectives are considered. This approach promotes convergence and assists in arriving at an agreement about contentious topics. In addition, during public health emergencies, risk communication should begin as soon as a risk is identified and continue as new information becomes available [28]. For example, during the COVID-19 pandemic, risk communication was essential for informing the public about the spread and transmission of the disease, as well as preventive measures. When communicating about illnesses that do not have a clear cause, it is important to avoid making statements and drawing conclusions until clinical and epidemiological research has been conducted, as this ensures that any new findings are made public without delay and prevents unintended consequences. Effective risk communication programs should also use diverse communication channels, such as social media, text messaging, and mobile applications, to increase their reach [29]. It is essential to ensure that these messages are consistent across all platforms and that the audience can access and digest the information that is provided easily [29]. For example, during the COVID-19 pandemic, social media platforms were widely used to communicate important information, including vaccination updates and prevention measures. Experts and non-experts often have distinct perceptions of hazards and use different language when discussing them [30]. Assessing the range of audience perceptions and using an evidence-based strategy to avoid ambiguity is essential for successful communication. In risk communication, particularly in public health emergencies, the use of ambiguous language should be avoided, and no guarantees should be given. For example, during the pandemic, the use of unambiguous language to convey the uncertainty surrounding the transmission and severity of the disease helped to avoid false expectations and panic among the public [30].

Audience risk perception

Risk communication draws on various fields, including interpersonal, behavioral, and economic psychology, as well as their applications in business and the community. Research has shown that people experience a range of emotions, thoughts, and actions when their physical safety is at risk [31]. Certain factors, such as a man-made risk, a feared illness or condition, a lack of control, a confined location, experts' debates, and difficulty in identifying exposure, can increase the perception of risk. Actions that lack value, a lack of credibility of the source of risk information, and a history of poor risk management can also contribute to an increased sense of danger. Risk perception is a crucial aspect of risk communication because it influences people's concerns and their responses to hazards [32]. While high perceptions of risk can motivate proactive behavior, they can also lead to emotional resistance to risk communication and the advised actions [33]. It is important to acknowledge

that recipients of risk communication may struggle to process the information if they are already experiencing negative emotions such as anger, fear, indignation, stress, conflict, or extreme concern. However, effective risk communication programs need to be based on a strong understanding of the underlying socio-psychological processes and preconditions for successful communication [34].

Creditability and trust

Credibility, trust, reputation, and relationships are crucial for effective risk communication. Building trust through effective communication and maintaining positive relationships with stakeholders can increase compliance with preventive measures, such as vaccinations or quarantine; a good reputation can also increase public confidence in health authorities and their recommendations [35]. However, a lack of trust in the source of information or the method of communication may undermine even the most well-designed and well-implemented risk communication strategies. For example, a study of occupational risks revealed that open communication increased workers' trust, but not to the same extent that a lack of communication decreased trust [36]. Negative risk information reduced trust among workers who already had low levels of trust, while positive risk information only increased trust among workers who already had high levels of trust. The level of trust that developed through communication (or the lack thereof) influenced the way in which subsequent risk information was processed [36]. Therefore, gaining and retaining credibility and trust is essential for successful ERC. Trust can be cultivated through risk communication initiatives that are disseminated via various streams and mediums, and which are transparent, appropriate, and easy to understand. Such initiatives should accept unpredictability, target and engage vulnerable populations, establish a connection between the affected individuals' sense of agency and their ability to cope with risk, and use a combination of these factors [37].

Stakeholders' participation

Stakeholder involvement in public health ERC is vital for its success. Information dissemination across subnational and national administrations and institutions has been improved or facilitated by establishing task groups and committees involving key stakeholders. The function of stakeholders in risk communication is to provide input and to comment on a particular issue or decision, which can ensure that all stakeholders have a voice in the decision-making process and that their concerns are considered when choices are made. In addition, stakeholders may assist in identifying possible risks and hazards, as well as mitigations of or solutions for these risks [6]. The WHO recommends including stakeholders from several sectors in risk communication, such as governments, NGOs, community groups, and the commercial sector. Engaging with stakeholders can help decision makers to understand different groups' needs and concerns, which can develop trust and improve risk communication [38]. Several key elements were identified as being necessary for the efficient functioning of networks, task groups, and committees, among which was the value of pre-existing connections among responders, the superiority of network units over hierarchical ones in the effectiveness of public emergency responses and decision making, and the importance of sharing and disseminating information across different decision-making bodies [6]. Having a public communication commissioner and using communication administrators to coordinate information among agencies may help to decrease requests for information and increase the availability of essential data. The involvement of local stakeholders is also vital for a successful public ERC plan: such involvement can include the use of existing social connections in small towns for preparedness and response efforts, consolidating materials that could be utilized to promote communication with diverse cultural populations, and the designation and identification of an institution with the best regional and social range to spread and exchange public health ERC information [15].

Saudi Arabia's experience of risk communication during the COVID-19 pandemic

Saudi Arabia's experience of risk communication during the COVID-19 pandemic was noteworthy, as the kingdom took several measures to keep its citizens informed about the risks of the pandemic and how to protect themselves from the virus. One of the main ways in which Saudi Arabia communicated about risk during the pandemic was via its Ministry of Health (MoH). The MoH regularly updated the public about the latest developments regarding COVID-19, including the number of cases, deaths, and recoveries, as well as new preventive measures and guidelines [39]. In 2017, Saudi Arabia participated in the WHO's Joint External Evaluation program for international risk assessment, which included risk communication [40]. This evaluation documented the use of the Saudi MoH's web-based social listening tool to control rumors and to deliver accurate information to the public, as well as the government's efforts to manage digital transformation in governmental sectors under the Saudi Vision 2030 [40]. During the COVID-19 pandemic, the Saudi MoH utilized various technical platforms to ensure appropriate risk communication, including the establishment of various informatics tools with the aim of delivering appropriate public health information [40]. The MoH educated the public through various channels, such as the MoH website, social media, and MoH applications [41]. Several risk communication measures were implemented in Saudi Arabia to minimize the risk of COVID-19 transmission, such as daily press conferences held by the MoH, a public health hotline center to provide reliable information, professional media materials, and mobile applications to provide educational information [42]. Countering rumors and misinformation is crucial in risk communication, and the WHO recommends preventing, monitoring, and addressing rumors as they arise [40]. A recent survey study reported that the Saudi population was generally well-informed due to the Saudi MoH's efforts in its risk communication campaign, thus creating the desired knowledge and awareness regarding COVID-19

among the public [41]. Moreover, the majority of the Saudi population relied on and trusted the MoH as the primary source of health information [42]. The numbers reflect the effectiveness of risk communication during the COVID-19 pandemic in Saudi Arabia, as 82% of the participants reported that the MoH had a rapid response to counter rumors during the pandemic, and 85.3% strongly agreed with the need for taking preventive actions to combat the spread of COVID-19 in the community [41].

Study's limitations

This study had several limitations. First, we only searched three academic databases (PubMed, Scopus, and Google Scholar) for this study; this might have led to the exclusion of relevant studies that were published in other databases. Second, we did not distinguish among the different types of public health emergencies, such as natural disasters versus infectious disease outbreaks, which may necessitate different risk communication strategies and pose different challenges.

Conclusion

In conclusion, effective crisis management relies on open lines of communication; this is why risk communication is so important. Thus, it is essential to utilize the proper channels and sources and to ensure stakeholders' participation in the dissemination of information, since such information may contain sensitive details that might trigger widespread fears. Moreover, implementing a risk communication strategy that connects with and addresses people's concerns is essential for increasing public involvement in disaster planning and response, as well as for providing access to accurate and timely information about an impending crisis. The findings presented in this paper can contribute to the field of public health ERC in several ways, the first being by providing an overview of the theoretical foundations of risk perception and the psychological processes that influence how people understand and respond to the risks that are related to a specific hazard. This understanding can inform the development of risk communication strategies that are tailored to the specific needs and characteristics of the target population. Second, the paper provides recommendations for improving ERC and maintaining it for future health situations. These recommendations can inform the development of policies and guidelines that guide ERC practices and enhance their effectiveness. However, future research should aim to explore whether these findings can be generalized to other contexts and populations and should investigate additional factors that may impact on effective risk communication in public health emergencies. Third, the WHO has identified prominent research gaps in risk communication during emergencies [6]. The complex nature of trust remains under-explored, particularly concerning its overlap with concepts such as confidence, and its interaction with mass media. Communicating uncertainty is another area that requires a deeper investigation, particularly with the rise of digital media. Research on governance and leadership information systems and coordination is notably scarce in low- and middle-income contexts. Moreover, the financial aspects of risk communication, including the establishment of sustainable budgets for ERC, have been severely neglected. Addressing these gaps is essential for effective and life-saving risk communication strategies.

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Conflict of interest

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Author Contributions

YA contributed to conception and design of the study. YA and MA wrote the first draft of the manuscript. YA and MA wrote sections of the manuscript. AA, FA, HS, and AK review the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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