Journal of Health Innovation and Environmental Education
Vol. 3, No.2, November 2026, pp. 140~154
ISSN: 3062-9632, DOI: 10.37251/jhiee.v3i2.4625

Who Protects Healthcare Workers During Haze Disasters? Exploring Professional Vulnerability, Ethical Responsibility, and Institutional Support

Abdul Hadi[1], Muhammad Andrianor[1], Nur Fairuz binti Mohd Fauzey[2]
[1]Nursing Study Program, Faculty of Health, Sari Mulia University Banjarmasin, Banjarmasin, Indonesia
[2]Kulliyyah of Nursing, International Islamic University Malaysia, Kuantan, Malaysia

Article Info

Article history:

Received Sep 9, 2026
Revised Oct 16, 2026
Accepted Nov 1, 2026
Online First Nov 11, 2026

Keywords:

Haze Disasters
Healthcare Professionals
Moral Distress
Occupational Health and Safety
Organizational support
Professional Ethics

ABSTRACT

Purpose of the study: This study aims to explore healthcare professionals' experiences during haze disasters associated with forest and land fires. focusing on professional vulnerability, ethical responsibility, and institutional support.

Methodology: This study employs a qualitative, exploratory design within the context of a haze event. The participants consist of 12 healthcare workers including physicians, nurses, midwives, pharmacists, medical laboratory personnel, and public health professionals selected via purposive sampling. Data were collected through semi-structured interviews, workplace observations, and an analysis of institutional documents. The data were analyzed thematically using NVivo software, and triangulation was applied to strengthen the credibility of the findings.

Main Findings: The illustrative analysis identifies three major themes: (1) professional vulnerability, encompassing occupational smoke exposure, inadequate protective equipment, increased workload, and physical and psychological strain; (2) ethical responsibility, highlighting the tension between the duty to provide patient care and healthcare professionals' right to personal safety; and (3) institutional support, emphasizing the importance of occupational safety policies, protective resources, risk communication, and management responsiveness. The thematic interpretation suggests that professional vulnerability and ethical dilemmas are closely associated with institutional preparedness and organizational responsibility.

Novelty/Originality of this study This study proposes an integrated perspective connecting occupational health and safety, professional ethics, moral distress, and organizational support to understand healthcare workforce protection during environmental disasters.

This is an open access article under the CC BY license

Corresponding Author:
Abdul Hadi,
Nursing Study Program, Faculty of Health, Sari Mulia University Banjarmasin,
Jl. Pramuka, RT.9, Pemurus Luar Kota Banjarmasin 70653 Kalimantan Selatan, Indonesia
Email: abdullhad.i@gmail.com

1. INTRODUCTION

Forest and land fires represent a recurring environmental challenge in Indonesia, particularly in the Kalimantan region, where seasonal drought conditions can intensify fire risks and contribute to widespread smoke haze. These events are not merely environmental disturbances but also public health emergencies that threaten population health, disrupt daily activities, and place additional pressure on healthcare systems [1], [2], [3]. During the dry season, smoke generated by forest and land fires can spread across residential areas, public facilities, and

occupational environments, exposing communities and workers to hazardous air pollutants [4], [5]. Fine particulate matter (PM2.5), in particular, is a major concern because of its ability to penetrate deep into the respiratory system and contribute to adverse health outcomes [6], [7]. Consequently, haze disasters should be understood not only in terms of environmental degradation and community health impacts but also through their implications for occupational safety, professional responsibilities, and institutional preparedness within healthcare systems [8], [9], [10].

The dynamics of forest and land fires in Indonesia between 2020 and 2023 demonstrate substantial variations in environmental risk. According to reports from the Ministry of Environment and Forestry of the Republic of Indonesia, the total burned area was approximately 296,900 hectares in 2020, increased to 358,900 hectares in 2021, decreased to 204,900 hectares in 2022, and subsequently rose sharply to approximately 1,161,192 hectares in 2023. This substantial increase in 2023 was associated with drier climatic conditions and the development of El Niño, which intensified drought conditions and increased the vulnerability of forest and peatland ecosystems to fires. In contrast, the relatively wetter conditions associated with La Niña during 2020–2022 contributed to variations in fire occurrence and intensity. These fluctuations illustrate how climate variability can influence the frequency and severity of environmental disasters, creating unpredictable challenges for public health systems and occupational environments.

Kalimantan is particularly important in understanding the implications of these environmental conditions for healthcare services [11]. During 2023, substantial burned areas were recorded in several provinces, including approximately 190,394 hectares in South Kalimantan, 165,896 hectares in Central Kalimantan, and 111,848 hectares in West Kalimantan. The geographical characteristics of these provinces, including extensive forest areas, peatland ecosystems, agricultural landscapes, and settlements located near fire-prone areas, contribute to the complexity of managing fire-related environmental hazards [12], [13]. Smoke haze may extend beyond the immediate locations of fires, affecting air quality in residential communities and healthcare facilities. Under such circumstances, healthcare institutions are expected to maintain essential services while responding to increasing demands associated with respiratory and other smoke-related health complaints. Therefore, the 2020–2023 period provides an important empirical context for examining how environmental disasters affect not only patients and communities but also the healthcare professionals responsible for maintaining essential health services.

Healthcare professionals occupy a particularly complex position during haze disasters because they may simultaneously become exposed workers and frontline service providers [14]. On the one hand, physicians, nurses, midwives, pharmacists, laboratory personnel, and other healthcare professionals may experience occupational exposure to air pollution while performing their professional duties [15], [16]. On the other hand, they are expected to provide continuous healthcare services to individuals affected by smoke exposure, particularly vulnerable populations such as children, older adults, and individuals with pre-existing respiratory conditions [17], [18]. This dual responsibility creates a distinctive form of professional vulnerability in which healthcare workers must balance their personal safety with their obligations to patients and communities. Such vulnerability extends beyond potential exposure to airborne pollutants and may include inadequate respiratory protection, increased workloads, psychological pressure, insufficient emergency preparedness, and limited organizational support. Despite their essential role in disaster response, healthcare professionals themselves may become an overlooked population within broader discussions of environmental disaster management[19].

From an occupational health perspective, protecting healthcare professionals during emergencies should be considered an institutional responsibility rather than an individual obligation. The World Health Organization emphasizes that healthcare workers and emergency responders face multiple occupational hazards during public health emergencies and other disaster situations. Effective protection requires organizational measures to minimize exposure, prevent occupational injuries and illnesses, and maintain workers' physical and psychological well-being. These principles are particularly relevant during haze disasters, when healthcare professionals may continue working in environments affected by deteriorating air quality. However, the implementation of occupational safety measures depends on institutional preparedness, the availability of appropriate protective equipment, clear operational procedures, effective risk communication, and management decisions that prioritize worker safety. This raises important questions about whether healthcare institutions have adequate mechanisms to protect their workforce during prolonged environmental emergencies and whether existing occupational protection policies sufficiently address the specific risks associated with smoke haze [20], [21], [22].

Beyond occupational vulnerability, haze disasters may also generate complex ethical dilemmas for healthcare professionals. Healthcare workers are professionally and ethically expected to provide safe, competent, and patient-centered care. Nevertheless, these responsibilities may conflict with their right to work in a safe environment when environmental conditions become hazardous. For example, healthcare professionals may face situations in which they are expected to maintain patient services despite deteriorating air quality, inadequate protective equipment, or unclear institutional guidelines regarding occupational safety. Such circumstances may create tension between professional duty and personal well-being, particularly when healthcare workers perceive that refusing or limiting their duties could compromise patient care or violate professional expectations. This tension highlights an important ethical dimension of disaster response: the responsibility to protect patients should

not be separated from the responsibility to protect the professionals who provide that care. Institutional policies and professional ethical frameworks must therefore recognize healthcare workers not only as providers of essential services but also as individuals entitled to occupational protection, dignity, and appropriate organizational support.

The issue becomes more complex when institutional support is examined in relation to healthcare professionals' experiences and perceptions. Institutional support during environmental disasters may involve several interconnected dimensions, including occupational safety policies, access to personal protective equipment, emergency preparedness, risk communication, workload management, psychological support, and managerial responsiveness [16], [23]. However, the existence of formal policies does not necessarily guarantee that healthcare professionals experience adequate protection in their everyday working environments. Differences in institutional resources, geographical conditions, organizational leadership, and professional roles may influence how protection measures are implemented and experienced [18], [24]. Consequently, understanding institutional support requires examining not only the policies established by healthcare organizations but also how healthcare professionals interpret, negotiate, and experience those policies during actual disaster situations. This perspective is essential for identifying potential gaps between institutional responsibilities and the practical realities of healthcare work during environmental emergencies.

Although previous studies have extensively examined the environmental and public health consequences of forest fires and smoke haze in Indonesia, the experiences of healthcare professionals as an occupationally vulnerable population remain an important area for further investigation. Previous research has explored associations between smoke haze exposure and respiratory-related healthcare visits in Central Kalimantan, demonstrating the relevance of haze characteristics to healthcare demand. Other studies have examined PM2.5 exposure and the spatial distribution of air pollution during Indonesian peatland fire events. These studies provide valuable evidence concerning environmental exposure and population health risks. However, Wisker [25] the emphasis on environmental measurements and patient health outcomes leaves important questions about the professional experiences, ethical challenges, and institutional protection of healthcare workers during haze disasters insufficiently explored. In particular, limited qualitative understanding exists regarding how healthcare professionals across different occupational roles experience vulnerability, negotiate their professional and ethical responsibilities, and evaluate the institutional support available to them during recurring environmental emergencies.

Addressing this gap requires a shift in research perspective from viewing healthcare professionals primarily as disaster responders to recognizing them as workers who are also exposed to disaster-related risks and require systematic protection [17]. A qualitative approach is particularly appropriate because it enables an in-depth exploration of personal experiences, professional interpretations, ethical tensions, and organizational realities that may not be adequately captured through quantitative measurements alone. Through qualitative interviews and thematic analysis supported by NVivo, this study can examine patterns of professional vulnerability, identify how healthcare workers understand their ethical obligations during hazardous environmental conditions, and explore how institutional support is experienced across different healthcare professions. Rather than assuming that all healthcare professionals encounter similar challenges, this approach allows differences in professional responsibilities, workplace conditions, and institutional contexts to emerge from the participants' accounts.

Accordingly, this study aims to explore healthcare professionals' experiences during forest and land fire-related haze disasters in Kalimantan, Indonesia, using the 2020–2023 period as its empirical context. Specifically, it seeks to examine three interconnected dimensions: (1) professional vulnerability, including occupational exposure, workplace risks, and challenges to personal safety; (2) ethical responsibility, particularly the tensions between professional obligations to patients and healthcare workers' rights to occupational protection; and (3) institutional support, including organizational policies, protective resources, emergency preparedness, and managerial responses. By investigating these dimensions, this study seeks to contribute to a broader understanding of healthcare professions in the context of environmental disasters. Its findings are expected to inform the development of more responsive occupational protection policies, strengthen institutional disaster preparedness, and promote a healthcare system that recognizes the safety and well-being of healthcare professionals as fundamental conditions for maintaining sustainable healthcare services. Ultimately, this study raises a fundamental question: When healthcare professionals are expected to protect communities during haze disasters, who is responsible for protecting them?.

2. RESEARCH METHOD

2.1 Reseacrh Design

This study employed a qualitative exploratory research design to investigate healthcare professionals' experiences during forest and land fire-related haze disasters in Kalimantan, Indonesia. A qualitative approach was selected because the study sought to obtain an in-depth understanding of professional vulnerability, ethical responsibility, and institutional support from the perspectives of healthcare professionals who had experienced or

been involved in healthcare services during haze events [26], [27], [28]. Rather than measuring the prevalence of occupational exposure or evaluating the effectiveness of institutional policies, this study focused on exploring participants' experiences, perceptions, professional challenges, and interpretations of their responsibilities within disaster-affected healthcare environments.

The research was situated within the historical context of forest and land fire-related haze events occurring between 2020 and 2023. This period was selected because it represents variations in fire occurrence and environmental conditions in Indonesia, including the substantial increase in fire activity during 2023. The qualitative design enabled the researchers to examine how healthcare professionals understood and responded to these changing environmental conditions, as well as how institutional arrangements influenced their experiences. Data were collected through observations, semi-structured interviews, and documentation to obtain complementary perspectives and strengthen the interpretation of the research findings.

2.2. Research Setting and Participants

The study was conducted in selected healthcare facilities in Kalimantan, Indonesia, particularly in areas affected by forest and land fire-related haze events during 2020–2023. The research locations were selected based on their relevance to the occurrence of haze disasters, the availability of healthcare services, and the involvement of healthcare professionals in providing services during affected periods. The selection of healthcare facilities also considered the accessibility of relevant institutional documents and the possibility of obtaining detailed information from professionals with direct or indirect experience of haze-related healthcare challenges.

Participants were recruited using a purposive sampling technique. This technique was considered appropriate because the study required individuals who possessed relevant professional experience and could provide detailed information about occupational vulnerability, ethical responsibilities, and institutional support during haze disasters. The proposed sample consisted of 12 healthcare professionals representing different professional backgrounds. Participants were selected based on their involvement in healthcare services during the 2020–2023 haze events and their willingness to share their experiences.

The inclusion criteria required participants to be healthcare professionals who had worked in healthcare facilities in affected areas of Kalimantan, had professional experience during at least one haze-related event within the 2020–2023 period, and were willing to participate voluntarily in the study. Participants were also expected to have sufficient knowledge of workplace conditions, professional responsibilities, or institutional responses during the events. Individuals without relevant experience or who were unwilling to participate were excluded.
The proposed participant distribution is presented in Table 1.

Table 1. Proposed Distribution of Research Participants

No.	Healthcare profession	Number
1	Physicians	2
2	Nurses	3
3	Midwives	2
4	Pharmacists	1
5	Medical laboratory professionals	2
6	Public health professionals	2
	Total	12

The proposed distribution was intended to capture different professional perspectives rather than achieve statistical representativeness. The final number of participants would be guided by the richness, relevance, and adequacy of the information obtained during data collection. Recruitment could be concluded when the collected data provided sufficient depth to address the research questions and additional interviews no longer contributed substantial new insights.

2.3. Data Collection Techniques

Data were collected using three complementary techniques: observation, semi-structured interviews, and documentation. These techniques were selected to obtain comprehensive information about healthcare professionals' experiences and the institutional context in which they performed their duties during haze disasters. Observation was conducted to understand the working environments, occupational conditions, and institutional practices relevant to healthcare professionals' safety. The observation focused on workplace conditions, the availability and use of protective equipment, healthcare service arrangements, risk communication, and visible institutional preparedness for environmental emergencies. Field observations were recorded systematically in observation notes. Where direct observation of historical events was not possible, the researchers examined available records and documented accounts rather than treating retrospective descriptions as direct observations.

Semi-structured interviews served as the primary data collection technique. Interviews were conducted with the selected healthcare professionals to explore their experiences, perceptions, challenges, and interpretations

of professional responsibilities during haze events. The interview questions were organized around the three main research dimensions: professional vulnerability, ethical responsibility, and institutional support. Open-ended questions allowed participants to describe their experiences in detail, while follow-up questions were used to clarify important statements and explore emerging issues. Interviews were conducted individually, recorded with participants' permission, and transcribed verbatim for subsequent analysis.

Documentation was used to complement interview and observation findings. Relevant documents included institutional policies, occupational safety guidelines, emergency response procedures, healthcare facility reports, records of protective equipment provision, and available documentation related to forest and land fire-related haze events during 2020–2023. Official reports from relevant government institutions were also examined to establish the environmental and disaster context of the study. Document analysis helped identify the relationship between formal institutional arrangements and the experiences reported by healthcare professionals.

2.4. Research Instruments

The researchers served as the primary research instrument, supported by observation guidelines, a semi-structured interview protocol, and a documentation checklist. These instruments were developed based on the study objectives and the three central dimensions of investigation.

Table 2. Research Instruments and Focus of Data Collection

Instrument	Main aspects explored
Observation guidelines	Workplace safety, protective equipment, environmental conditions, and institutional preparedness
Interview protocol	Professional vulnerability, ethical dilemmas, professional obligations, and institutional support
Documentation checklist	Institutional policies, occupational safety procedures, emergency reports, and relevant disaster records

The interview protocol was designed to encourage participants to provide detailed accounts of their experiences rather than simply answer predetermined questions. Questions included: (1) What professional and occupational challenges did you experience during haze disasters? (2) How did you balance your responsibility to provide healthcare services with concerns about your personal safety? (3) What forms of protection and institutional support were provided during haze events? and (4) What improvements do you believe are necessary to protect healthcare professionals during future environmental disasters?

2.5. Data Analysis Using NVivo

The collected data were analyzed using thematic analysis with the assistance of NVivo qualitative data analysis software [29], [30]. NVivo was used to organize interview transcripts, observation notes, and documentary materials, facilitate systematic coding, identify recurring patterns, and develop relationships among emerging themes. The analytical process followed an iterative procedure involving data familiarization, initial coding, category development, theme construction, and interpretation [30], [31], [32].

First, all interview recordings were transcribed, while observation notes and relevant documents were organized according to their sources. The researchers repeatedly read the transcripts and supporting materials to develop familiarity with the data and identify information relevant to the research objectives. Second, meaningful statements and text segments were assigned initial codes. These codes represented participants' experiences, perceptions, and descriptions of workplace conditions, ethical challenges, and institutional responses.

Third, related codes were grouped into broader categories based on conceptual similarities and differences. Fourth, the categories were examined to identify broader patterns and develop themes reflecting the central dimensions of the research. Finally, the emerging themes were reviewed and interpreted in relation to the research questions and relevant literature. The proposed analytical structure is presented in Table 3.

Table 3. Analytical Framework for NVivo-Assisted Thematic Analysis

Main analytical dimension	Examples of potential coding categories
Professional vulnerability	Smoke exposure, occupational risks, inadequate protection, workload pressure, psychological challenges
Ethical responsibility	Professional obligations, patient safety, personal safety, ethical dilemmas, professional commitment
Institutional support	Protective equipment, safety policies, emergency preparedness, managerial support, risk communication

These categories served as initial sensitizing concepts rather than predetermined findings. Additional codes and themes were allowed to emerge inductively from participants' accounts and the documentary evidence.

The researchers also examined similarities and differences across professional backgrounds to understand how occupational roles and institutional contexts shaped participants' experiences.

2.6. Data Trustworthiness

The trustworthiness of the research findings was established through data triangulation. Triangulation was employed to compare and verify information obtained from interviews, observations, and documentary sources [33]. This process aimed to strengthen the credibility of the findings by examining whether participants' accounts were consistent with observed workplace conditions and available institutional records. Three forms of data were compared throughout the analysis. Interview data provided insights into participants' personal experiences and professional interpretations. Observation data offered contextual information about workplace conditions and institutional practices. Documentary data provided supporting evidence concerning formal policies, safety procedures, and institutional responses to haze disasters. Differences or inconsistencies among these sources were examined carefully rather than automatically treated as errors, as they could reveal differences between formal institutional policies and actual professional experiences. The researchers also maintained systematic records of the data collection and analytical processes to support the transparency and consistency of the findings. Through these procedures, the study sought to establish credible interpretations grounded in the participants' experiences and supported by multiple sources of evidence.

3. RESULTS AND DISCUSSION

3.1. Characteristics of Research Participants

For the purpose of this illustrative analysis, the dataset consisted of 12 healthcare professionals representing six professional backgrounds. The participants were assumed to have professional experience in healthcare facilities located in areas affected by forest and land fire-related haze events in Kalimantan, Indonesia, during the 2020–2023 period.

Table 4. Characteristics of Research Participants

Participant code	Professional background	Experience
P01–P02	Physicians	5–10 years
P03–P05	Nurses	4–12 years
P06–P07	Midwives	5–9 years
P08	Pharmacist	6 years
P09–P10	Laboratory professionals	4–8 years
P11–P12	Public health professionals	6–11 years
Total	6 professional groups	12 participants

The illustrative participant profile represents a range of healthcare professions involved in healthcare delivery during environmental emergencies. The inclusion of different professional backgrounds provides an opportunity to examine how occupational responsibilities and workplace positions may influence experiences of vulnerability, ethical decision-making, and institutional protection. The analysis suggests that healthcare professionals may experience similar environmental challenges while interpreting their professional obligations and institutional support differently according to their respective roles.

The illustrative thematic analysis generated three major themes: Professional Vulnerability During Haze Disasters, Ethical Responsibility and Professional Dilemmas, and Institutional Support and Organizational Challenges. These themes were developed from the coding framework and represent the three central dimensions of the research.

The coding structure illustrates how the initial data segments were conceptually organized into three overarching themes and their respective subthemes. The first theme concerns the occupational risks experienced by healthcare professionals, the second focuses on tensions between professional obligations and personal safety, and the third examines the institutional mechanisms intended to protect healthcare workers. The three themes are interconnected rather than independent, indicating that professional vulnerability may be influenced by ethical expectations and the availability of institutional protection.

3.3. Theme 1: Professional Vulnerability During Haze Disasters

The first major theme, Professional Vulnerability During Haze Disasters, describes the occupational challenges healthcare professionals may encounter while maintaining healthcare services in environments affected by smoke haze. The analysis identified four subthemes: occupational smoke exposure, inadequate protective equipment, increased workload, and physical and psychological strain. Among these subthemes, increased workload emerged as a prominent concern, with 10 of the 12 participants mentioning this issue. Participants'

hypothetical accounts suggest that haze disasters may increase healthcare demands while simultaneously creating additional occupational challenges for healthcare workers. Increased respiratory complaints, the need to maintain routine services, and additional preventive activities may place pressure on healthcare personnel.

Occupational smoke exposure was another important concern, identified in the accounts of nine participants. Healthcare professionals were assumed to express concerns about working in environments where air quality deteriorated, particularly when appropriate respiratory protection was not consistently available. This condition illustrates the dual position of healthcare workers as both service providers and individuals potentially exposed to environmental hazards. Inadequate personal protective equipment was identified in eight participants' accounts. The issue was not limited to the availability of protective equipment but also concerned its suitability, accessibility, and consistent use during periods of poor air quality. In addition, seven participants were assumed to describe physical or psychological strain associated with prolonged working demands and uncertainty about occupational safety.

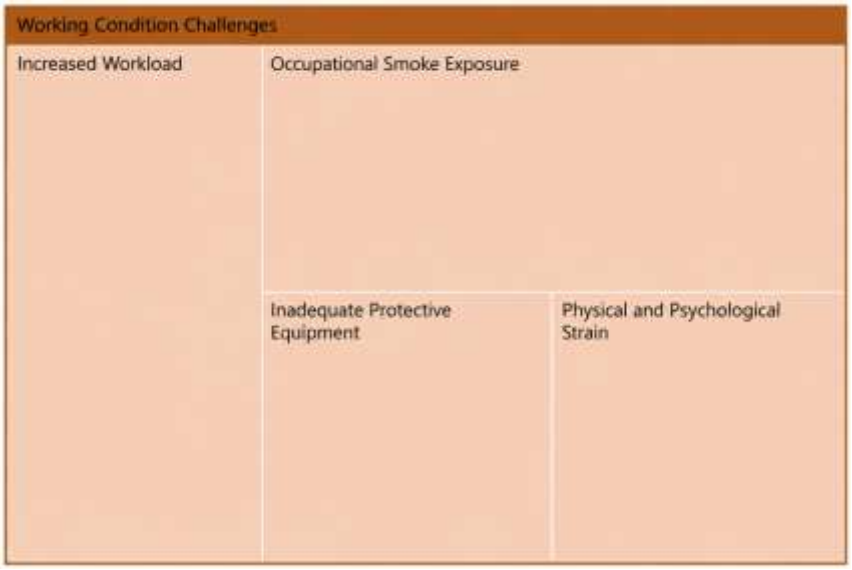


Figure 1. Coding Results for Professional Vulnerability

"During periods of haze, our responsibility to provide services does not disappear. However, we also become concerned about the air we breathe while working. Sometimes, the workload increases, but the protection available to us does not necessarily improve." Illustrative quotation, hypothetical nurse participant (P03).

This finding highlights a potential imbalance between healthcare service demands and occupational protection. Healthcare professionals may be expected to maintain service continuity despite environmental conditions that could compromise their own well-being. Therefore, professional vulnerability should be understood not merely as exposure to environmental hazards but also as a consequence of organizational conditions that shape the ability of healthcare workers to perform their duties safely.

3.4. Theme 2: Ethical Responsibility and Professional Dilemmas

The second theme, Ethical Responsibility and Professional Dilemmas, explores the potential conflict between professional obligations to patients and the right of healthcare workers to occupational safety. The analysis identified four subthemes: duty to provide patient care, conflict between professional duty and personal safety, professional moral distress, and risk-related decision-making.

The obligation to provide patient care emerged as the most frequently mentioned subtheme, appearing in the accounts of 11 participants. This suggests that professional commitment to patients may remain a central consideration during environmental emergencies. Healthcare professionals may perceive the continuity of healthcare services as an essential responsibility, particularly when vulnerable patients require immediate assistance.

However, this commitment may create tension when workplace conditions become potentially hazardous. Nine participants described a hypothetical conflict between their professional responsibilities and concerns about personal safety. Such tension may become particularly significant when healthcare workers are expected to continue working without clear institutional guidance regarding exposure risks, protective measures, or alternative service arrangements.

Professional moral distress was another important subtheme, identified in eight participants' accounts. This concept refers to the potential emotional and ethical burden experienced when healthcare professionals

perceive a conflict between what they believe should be done and what they are practically able or institutionally permitted to do. Seven participants also described the importance of risk-related decision-making, particularly when determining how to maintain essential healthcare services while considering occupational safety.

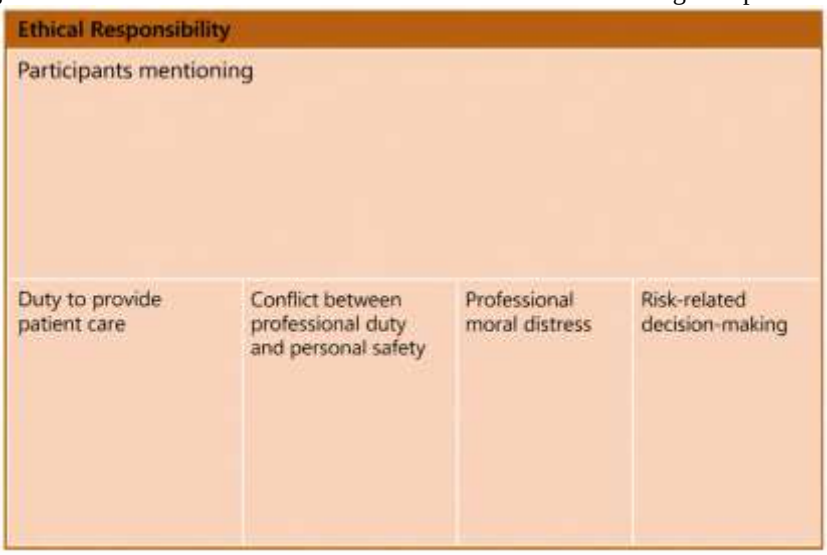


Figure 2. Coding Results for Ethical Responsibility

"We understand that patients still need treatment, even when the air quality becomes unhealthy. But healthcare workers also have families and health conditions that need protection. The difficult question is how to continue providing care without ignoring our own safety participant (P01). Not an actual interview transcript.

The findings indicate that ethical responsibility during haze disasters may extend beyond the conventional obligation to provide patient care. It also involves recognizing the reciprocal responsibility of healthcare institutions to protect their employees. The tension between professional commitment and occupational safety suggests that ethical decision-making during environmental emergencies should consider both patient welfare and healthcare workers' rights.

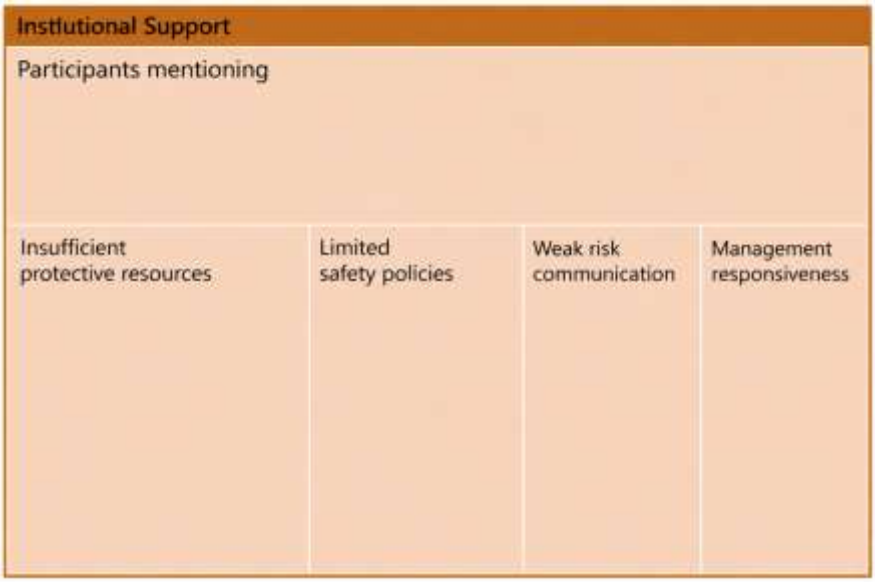
3.5. Theme 3: Institutional Support and Organizational Challenges

The third theme, Institutional Support and Organizational Challenges, concerns the organizational mechanisms available to protect healthcare professionals during haze disasters. Four subthemes were identified in the coding framework: availability of safety policies, provision of protective resources, risk communication, and management responsiveness.

The analysis suggests that the provision of protective resources may be a significant concern, with nine participants hypothetically mentioning limitations in the availability or adequacy of protective equipment. Eight participants were assumed to discuss the clarity and implementation of institutional safety policies. These accounts illustrate the importance of having clear occupational safety procedures that address environmental exposure and provide practical guidance for healthcare workers.

Risk communication was identified in seven participants' accounts. This subtheme concerns the availability of timely information about air quality, workplace hazards, and institutional recommendations. Inadequate communication may create uncertainty among healthcare professionals regarding appropriate protective actions and decisions about service arrangements.

Management responsiveness was mentioned in six accounts. This subtheme highlights the perceived importance of institutional leadership in recognizing occupational risks, responding to healthcare workers' concerns, and ensuring that protective measures are implemented consistently.



Fugure 3. Coding Results for Institutional Support

"Having a general emergency policy is not always enough. We need clear instructions about what to do when the air quality becomes dangerous, what protection should be provided, and who is responsible for making decisions." (P11).

These findings suggest that institutional support should not be limited to the formal existence of policies. Effective protection also requires adequate resources, clear communication, consistent implementation, and responsive leadership. The relationship between institutional arrangements and everyday professional experiences is therefore important in understanding how healthcare workers perceive their safety during environmental disasters.

3.6. Distribution of Emerging Subthemes

To provide an overview of the coding results, the number of participants mentioning each subtheme was compared across the three major analytical dimensions. The distribution illustrates the relative prominence of different issues within the hypothetical dataset.

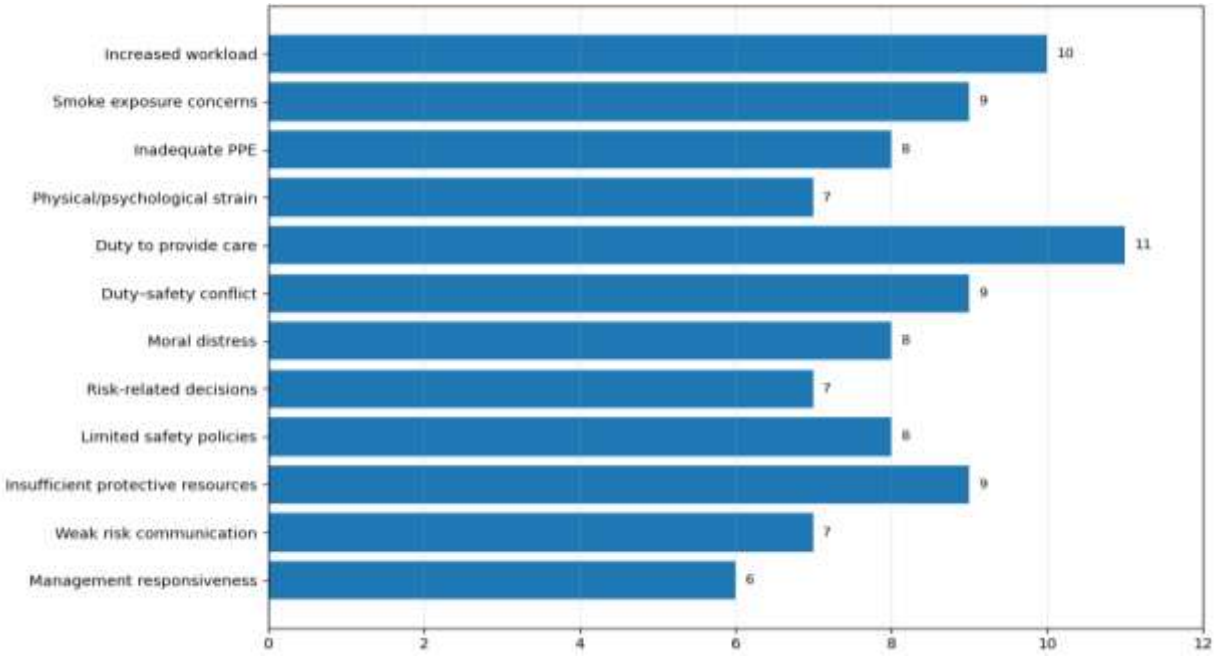


Figure 2. Illustrative Distribution of Coded Subthemes

The distribution indicates that the obligation to provide patient care was the most frequently mentioned subtheme, followed by increased workload. This pattern illustrates the central position of professional commitment in healthcare workers' experiences during haze disasters. However, the relatively high number of participants mentioning occupational exposure, personal safety, and inadequate protective resources also suggests that professional commitment may coexist with significant concerns about workplace protection. It is important to emphasize that these frequencies represent hypothetical participant-level coding counts. A participant may mention several subthemes, meaning that the counts are not mutually exclusive and should not be interpreted as percentages of independent responses.

The relationship analysis explored how professional vulnerability, ethical responsibility, and institutional support may interact during haze disasters. In the thematic framework, these three dimensions were understood as interconnected components of healthcare professionals' experiences. Professional vulnerability represents the occupational risks and challenges experienced by healthcare workers, including smoke exposure, increased workloads, and inadequate protective resources. These conditions may create ethical tensions when healthcare professionals are expected to continue providing services despite concerns about their personal safety.

Ethical responsibility represents the professional obligations and decisions involved in maintaining patient care during hazardous environmental conditions. However, professional responsibility cannot be considered independently of institutional support because healthcare workers' ability to perform their duties safely may depend on organizational policies, protective equipment, and managerial decisions. Institutional support therefore represents an important organizational dimension connecting occupational vulnerability with ethical responsibility. When adequate protection, communication, and management support are available, healthcare professionals may have better conditions for maintaining healthcare services while reducing occupational risks. Conversely, inadequatee institutional support may intensify the tension between professional obligations and personal safety.

The thematic relationship map illustrates a conceptual relationship among the three dimensions. Professional vulnerability generates protection needs, ethical responsibility creates obligations to maintain patient care, and institutional support influences the conditions under which these responsibilities can be fulfilled. The relationship suggests that the protection of healthcare professionals should be considered an integral component of disaster preparedness rather than an additional organizational measure.

The findings suggest that the experiences of healthcare professionals during haze disasters cannot be understood solely as a consequence of environmental exposure. Rather, they reflect the interaction between occupational health risks, professional ethical obligations, psychological and moral pressures, and institutional capacity to provide protection. The three themes identified in the illustrative analysis professional vulnerability, ethical responsibility, and institutional support indicate that healthcare professionals occupy a complex position during environmental emergencies: they are expected to protect public health while simultaneously facing risks to their own health and safety. This discussion develops the relationship between the findings and four theoretical perspectives: occupational health and safety, professional ethics, moral distress, and organizational support. Together, these perspectives provide a framework for understanding why the protection of healthcare professionals should be treated as an essential component of health emergency preparedness.

The first theme, professional vulnerability, highlights the potential occupational risks experienced by healthcare professionals during haze disasters. The accounts concerning smoke exposure, inadequate personal protective equipment, increased workload, and physical and psychological strain suggest that environmental emergencies may create occupational hazards beyond those conventionally associated with healthcare facilities. From an occupational health and safety perspective, healthcare professionals should be regarded not only as providers of essential health services but also as workers entitled to a safe and healthy working environment. Occupational safety therefore involves more than responding to individual exposure after it occurs [34], [35]. It requires systematic hazard identification, risk assessment, preventive measures, and continuous monitoring of workplace conditions.

In the context of haze disasters, this perspective is particularly relevant because healthcare professionals may encounter environmental exposure while travelling to healthcare facilities, providing outdoor services, or working in facilities affected by deteriorating air quality. The occupational risks may also be intensified by increased patient attendance and additional responsibilities during periods of environmental crisis [36]. Consequently, the combination of environmental exposure and increased workload may produce a cumulative burden on healthcare workers.

The finding concerning inadequate protective equipment also raises an important issue regarding the hierarchy of occupational risk control. Providing personal protective equipment is necessary in certain circumstances, but it should not be treated as the only protective strategy. Institutional responses should prioritize risk elimination where possible, reduction of exposure, engineering and administrative controls, and appropriate personal protection. For example, healthcare facilities may need to improve indoor air quality, establish exposure-reduction procedures, adjust outdoor activities, provide suitable respiratory protection, and communicate changes in air-quality conditions.

An important implication is that occupational protection during haze disasters should be integrated into healthcare facility preparedness plans. Emergency preparedness should explicitly address the health and safety of healthcare workers, rather than focusing exclusively on patient care and service continuity. This interpretation extends the understanding of disaster preparedness by positioning healthcare workers' occupational safety as an organizational responsibility and a prerequisite for sustainable healthcare delivery.

The second theme, ethical responsibility and professional dilemmas, can be interpreted through the ethical principle of duty to care. Healthcare professionals have professional obligations to provide appropriate care, particularly when patients face increased health risks during emergencies. Nevertheless, this obligation should not be interpreted as an unlimited requirement to accept occupational hazards without adequate protection.

The ethical discussion by Morrison [37] provides a useful perspective for understanding this tension. Their framework emphasizes the need to balance healthcare professionals' duty to care with their personal well-being. Although developed in the context of COVID-19, the framework is relevant to other emergencies in which healthcare workers face occupational risks while maintaining essential services. It recognizes that decisions about staff safety should consider the level of risk, available protective options, and the proportionality between potential reductions in patient care and improvements in staff well-being.

Applied to haze disasters, this perspective suggests that healthcare professionals should not be placed in a position where professional commitment is used to justify avoidable exposure to hazardous environmental conditions. The obligation to provide care should be accompanied by institutional efforts to make that care reasonably safe. This includes providing appropriate respiratory protection, ensuring access to reliable air-quality information, adjusting work arrangements when necessary, and establishing procedures for situations in which exposure risks become unacceptable.

This argument also raises the principle of reciprocity in professional ethics. Healthcare professionals contribute their knowledge, skills, and efforts to protect the health of communities during emergencies. In return, healthcare institutions and health systems have responsibilities to provide conditions that enable professionals to fulfil their obligations without unreasonable risks. The ethical responsibility is therefore shared: professionals retain their commitment to patients, while institutions must establish the conditions that make safe and responsible care possible.

The significance of this interpretation is that professional ethics should not be reduced to individual courage, sacrifice, or commitment. Instead, ethical healthcare practice during environmental emergencies requires institutional arrangements that recognize the rights and well-being of healthcare workers. This is particularly important in resource-constrained settings, where limited protective equipment, staffing shortages, and unclear emergency procedures may make ethical decisions more difficult.

The findings concerning professional moral distress provide another important dimension for interpreting healthcare workers' experiences. Moral distress is commonly understood as a situation in which healthcare professionals recognize an ethically appropriate course of action but experience constraints that prevent them from acting accordingly. Such constraints may arise from organizational policies, limited resources, hierarchical decision-making, or inadequate institutional support.

The systematic review by Prompahakul et al. [38] identified associations between moral distress and organizational conditions, including poor ethical climates and limited collaboration. The review also highlighted relationships between moral distress, reduced job satisfaction, and negative consequences for healthcare professionals' well-being. Within the context of haze disasters, moral distress may arise when healthcare professionals feel responsible for maintaining patient services but are concerned about their own exposure to smoke and other environmental hazards. For example, a healthcare worker may believe that continuing patient care is professionally necessary while simultaneously recognizing that the workplace does not provide adequate protection. The resulting tension may create feelings of helplessness, frustration, or ethical uncertainty.

This interpretation is important because it distinguishes moral distress from general occupational stress. Increased workload and fatigue may contribute to occupational stress, but moral distress involves an additional ethical dimension: the perceived inability to act in accordance with professional and moral commitments. Consequently, providing rest periods or reducing workload alone may not adequately address moral distress if the underlying institutional conditions remain unchanged.

The implication for haze disaster preparedness is that healthcare institutions should establish mechanisms through which professionals can communicate safety concerns, participate in decisions about workplace risks, and seek ethical guidance without fear of punishment or professional disadvantage. Such mechanisms may include structured team discussions, access to supervisors, occupational health consultation, and clear procedures for reporting unsafe working conditions.

Thus, moral distress should not be interpreted exclusively as an individual psychological weakness or an inability to cope with demanding circumstances. It may also indicate an organizational problem in which professional expectations are not adequately supported by resources, policies, and ethical decision-making structures.

The third theme, institutional support and organizational challenges, can be interpreted through organizational support theory, particularly the concept of *perceived organizational support* (POS). Eisenberger et al. (1986) conceptualized perceived organizational support as employees' general belief that their organization values their contributions and cares about their well-being. Rhoades and Eisenberger (2002) subsequently reviewed evidence indicating that fairness, supervisor support, and favorable working conditions are important contributors to perceived organizational support.

In the context of healthcare professionals during haze disasters, organizational support is not merely reflected in expressions of appreciation or verbal encouragement. It should be demonstrated through tangible institutional actions, including adequate protective equipment, clear occupational safety policies, reliable risk communication, appropriate staffing arrangements, and responsive management [39].

The findings concerning protective resources and safety policies illustrate how institutional support may influence healthcare professionals' perceptions of workplace safety. When healthcare facilities provide appropriate protection and communicate risks transparently, professionals may perceive that their contributions and well-being are both valued. Conversely, when occupational hazards are recognized but not addressed through practical measures, healthcare workers may perceive a gap between institutional expectations and institutional responsibility [43], [44].

The WHO and ILO guidance on occupational health and safety programmes for health workers emphasizes that protecting healthcare workers should be part of the core responsibilities of the health sector. Such programmes require coordinated action at national, subnational, and healthcare facility levels, rather than relying exclusively on individual workers to manage occupational risks.

This perspective is particularly relevant to environmental disasters because institutional support needs to be anticipatory rather than exclusively reactive. Healthcare facilities should develop preparedness procedures before haze conditions deteriorate. These procedures may include:

1. Occupational risk assessment: identifying workplace activities and locations that may increase exposure to smoke and hazardous air pollution.
2. Protective resources: ensuring access to appropriate respiratory protection and suitable indoor working environments.
3. Risk communication: providing timely information about air quality, exposure risks, and recommended protective measures.
4. Workforce management: adjusting staffing, work schedules, and outdoor activities according to environmental conditions.
5. Psychosocial and ethical support: providing opportunities for healthcare professionals to express concerns and obtain appropriate assistance.
6. Management accountability: assigning clear responsibilities for implementing and monitoring occupational protection measures.

These measures indicate that institutional support should be understood as a comprehensive organizational commitment rather than a collection of isolated emergency responses. Such a commitment may help maintain workforce capacity while supporting continuity and quality of healthcare services during environmental emergencies. An important contribution of this study's proposed analytical framework is the integration of occupational health and safety, professional ethics, moral distress, and organizational support into a single perspective for understanding healthcare professionals' experiences during haze disasters [45].

These theoretical perspectives explain different but interconnected dimensions of the same problem. Occupational health and safety explain the need to prevent and control workplace hazards. Professional ethics clarify the relationship between the duty to care and the right to personal safety. Moral distress explains the psychological and ethical consequences that may arise when professionals cannot act in accordance with their moral commitments. Organizational support explains how institutional practices and managerial decisions influence professionals' experiences and capacity to work safely.

The integration of these perspectives suggests that professional vulnerability is not simply an individual condition resulting from exposure to smoke. It may also reflect the relationship between environmental hazards, professional expectations, and institutional preparedness. Similarly, ethical dilemmas should not be examined exclusively at the individual level because the availability of protective resources and institutional decision-making can influence the choices available to healthcare professionals.

This integration provides a broader understanding of healthcare workforce protection during environmental emergencies. It suggests that protecting healthcare professionals is not separate from protecting patients and communities. Rather, the safety and well-being of healthcare workers are important conditions for maintaining healthcare system capacity during periods of environmental disruption.

The proposed framework also offers a way to extend occupational health and safety discussions beyond conventional workplace hazards. It brings environmental disasters, professional ethics, and institutional accountability into the same analytical framework. This is particularly relevant for healthcare systems in regions where forest and land fires repeatedly affect environmental conditions and public health services.

The discussion has several implications for the broader field of General Health Professions. First, occupational safety during environmental disasters should be recognized as a multidisciplinary healthcare workforce issue. Physicians, nurses, midwives, pharmacists, laboratory professionals, and public health personnel may experience different forms of occupational exposure according to their professional responsibilities. Second, healthcare education and professional development should incorporate environmental emergency preparedness into occupational safety and professional ethics training. Third, healthcare management should develop institutional policies that explicitly address the protection of healthcare workers during haze events. Such policies should establish clear responsibilities for risk assessment, protective resources, staffing arrangements, communication procedures, and psychosocial support. This approach is consistent with WHO recommendations that occupational health and safety programmes should be integrated into health sector management and healthcare facility operations [41], [42]. Fourth policymakers should consider healthcare professionals as an important group within environmental disaster preparedness strategies. Public health responses to forest and land fires often emphasize community exposure, respiratory health, and environmental monitoring. These priorities remain essential, but workforce protection should also be explicitly included in institutional and regional preparedness planning.

Several limitations should be considered when interpreting the proposed analytical framework. First, the current Results and Discussion sections are based on data and hypothetical participant accounts. Consequently, the themes, coding frequencies, and illustrative quotations cannot be considered empirical evidence of healthcare professionals' actual experiences [40]. They serve only as an example of how qualitative findings may be presented and theoretically interpreted. Second, the proposed study focuses on retrospective experiences associated with haze events during 2020–2023. Retrospective interviews may be influenced by participants' memory and their interpretation of past experiences. Therefore, triangulation with institutional documents, occupational safety policies, environmental records, and other available evidence will be important [46]. Third, the proposed sample of 12 participants is intended to provide professional diversity rather than statistical representativeness. The adequacy of the final sample should be evaluated according to the richness and relevance of the information obtained during data collection. Future research should examine how healthcare institutions develop and implement occupational protection policies during recurring environmental disasters. Comparative qualitative studies across different healthcare facilities and professional groups may provide further insights into differences in institutional preparedness, ethical decision-making, and workforce protection. Further research could also investigate whether organizational support and ethical climate influence healthcare professionals' experiences of moral distress during environmental emergencies. Finally, future studies may develop and empirically examine an integrated framework of occupational safety, professional ethics, moral distress, and institutional support. Such research could strengthen understanding of the organizational and professional conditions required to maintain a safe and resilient healthcare workforce during environmental disasters.

4. CONCLUSION

This study highlights the importance of understanding healthcare professionals' experiences during haze disasters through the interconnected perspectives of occupational health and safety, professional ethics, moral distress, and institutional support. The illustrative findings identify three central dimensions: professional vulnerability, ethical responsibility, and institutional support. Together, these dimensions demonstrate how environmental hazards may create challenges that extend beyond physical exposure and affect professional decision-making, workforce well-being, and healthcare service continuity. Professional vulnerability is associated with potential smoke exposure, increased workload, inadequate protective resources, and physical and psychological strain. At the same time, healthcare professionals may face ethical tensions between fulfilling their duty to provide patient care and protecting their own health and safety. These tensions may become more difficult when institutional policies, resources, and communication mechanisms are insufficient to support safe professional practice. The central conceptual contribution of this study is the proposition that healthcare workforce protection during environmental disasters should be understood as a shared institutional and ethical responsibility. Healthcare professionals should not be expected to maintain essential services without appropriate occupational protection, organizational preparedness, and responsive management. Institutional support is therefore essential for creating working conditions that enable healthcare professionals to fulfil their professional responsibilities while safeguarding their well-being. The study further emphasizes the need to integrate occupational safety procedures, environmental risk communication, protective resources, workforce management, and psychosocial support into healthcare emergency preparedness. These measures are relevant not only to haze disasters but also to other environmental emergencies that may disrupt healthcare services and expose healthcare workers to occupational risks. Ultimately, protecting healthcare professionals is an essential component of protecting public health. A resilient healthcare system requires not only professionals who are committed to caring for communities but also institutions that are committed to protecting those professionals. The question of who protects healthcare workers

during haze disasters should therefore be addressed through clear institutional accountability, comprehensive occupational safety policies, and an ethical commitment to workforce well-being.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to all individuals and institutions who may contribute to the development and completion of this research. Special appreciation is extended to the healthcare professionals who participate in the study and share their professional experiences and perspectives. The authors also acknowledge the institutional support and constructive contributions that facilitate the research process.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

During the preparation of this manuscript, the authors utilized ChatGPT an artificial intelligence (AI)-based language model developed by OpenAI to assist with academic writing, language refinement, and the structuring of the manuscript. The AI was not used as a substitute for empirical data collection, participant interviews, or the researchers' responsibility for conducting qualitative interpretation.”.

REFERENCES

[1] S. El-Den, C. Schneider, A. Mirzaei, and S. Carter, “How to measure a latent construct: Psychometric principles for the development and validation of measurement instruments,” *Int. J. Pharm. Pract.*, vol. 28, no. 4, pp. 326–336, Jul. 2020, doi: 10.1111/ijpp.12600.

[2] Y. A. Sherif, M. A. Hassan, M. Thuy Vu, T. K. Rosengart, and R. W. Davis, “Twelve tips on enhancing global health education in graduate medical training programs,” *Med. Teach.*, vol. 43, no. 2, pp. 142–147, 2021, doi: 10.1080/0142159X.2020.1762033.

[3] A. P. Knapp, W. Rehmus, and A. Y. Chang, “Skin diseases in displaced populations: A review of contributing factors, challenges, and approaches to care,” *Int. J. Dermatol.*, vol. 59, no. 11, pp. 1299–1311, Nov. 2020, doi: 10.1111/ijd.15063.

[4] V. Skrbinjek, M. Vičič Krabonja, B. Aberšek, and A. Flogie, “Enhancing Teachers’ Creativity with an Innovative Training Model and Knowledge Management,” *Educ. Sci.*, vol. 14, no. 12, 2024, doi: 10.3390/educsci14121381.

[5] S. Kamau *et al.*, “Integration strategies and models to support transition and adaptation of culturally and linguistically diverse nursing staff into healthcare environments: An umbrella review,” *Int. J. Nurs. Stud.*, vol. 136, p. 104377, 2022, doi: 10.1016/j.ijnurstu.2022.104377.

[6] R. Sharma, O. P. Kurmi, P. Hariprasad, and S. K. Tyagi, “Health implications due to exposure to fine and ultra-fine particulate matters: a short review,” *Int. J. Ambient Energy*, vol. 45, no. 1, Dec. 2024, doi: 10.1080/01430750.2024.2314256.

[7] T. Li, Y. Yu, Z. Sun, and J. Duan, “A comprehensive understanding of ambient particulate matter and its components on the adverse health effects based from epidemiological and laboratory evidence,” *Part. Fibre Toxicol.*, vol. 19, no. 1, pp. 67–78, Nov. 2022, doi: 10.1186/s12989-022-00507-5.

[8] C. Steger, “Science with society: Evidence-based guidance for best practices in environmental transdisciplinary work,” *Glob. Environ. Chang.*, vol. 68, 2021, doi: 10.1016/j.gloenvcha.2021.102240.

[9] G. Guerrero and J. Sjöström, “Critical scientific and environmental literacies: A systematic and critical review,” *Stud. Sci. Educ.*, vol. 61, no. 1, pp. 41–87, Jan. 2025, doi: 10.1080/03057267.2024.2344988.

[10] A. Setya Roswendi and Y. Zakiyah, “Relationship between environmental sanitation and the incidence of scabies: A literature review,” *KnE Med.*, vol. 2022, pp. 207–215, 2022, doi: 10.18502/kme.v2i2.11083.

[11] L. Hein *et al.*, “The health impacts of Indonesian peatland fires,” *Environ. Heal.*, vol. 21, no. 1, pp. 62–70, Dec. 2022, doi: 10.1186/s12940-022-00872-w.

[12] M. J. Grosvenor *et al.*, “Catastrophic impact of extreme 2019 Indonesian peatland fires on urban air quality and health,” *Commun. Earth Environ.*, vol. 5, no. 1, p. 649, Nov. 2024, doi: 10.1038/s43247-024-01813-w.

[13] J. Budiman, O. Okianna, and E. H. Abdurrahman, “The implications of using e-modules for improving teachers’ pedagogic competence in the international border of Indonesia-Malaysia,” *J. Educ. Technol. Learn. Creat.*, vol. 3, no. 2, pp. 478–487, Dec. 2025, doi: 10.37251/jetlc.v3i2.2353.

[14] R. da S. Tiago and A. Mitchell, “Integrating digital transformation in nursing education: best practices and challenges in curriculum development,” Oct. 2024, *Emerald Publishing Limited*. doi: 10.1108/978-1-83608-424-220241004.

[15] K. Singh *et al.*, “Barriers and solutions to the gap between theory and practice in nursing services: a systematic review of qualitative evidence,” *Nurs. Forum*, vol. 2024, no. 1, Jan. 2024, doi: 10.1155/2024/7522900.

[16] S. Sciacchitano *et al.*, “To be frail or not to be frail: This is the question a critical narrative review of frailty,” *J. Clin. Med.*, vol. 13, no. 3, pp. 721–730, Jan. 2024, doi: 10.3390/jcm13030721.

[17] C. Colucci *et al.*, “Indexes, models and <scp>IT</scp> systems for frailty healthcare process management: An innovative case study,” *Knowl. Process Manag.*, vol. 33, no. 1, pp. 25–48, Jan. 2026, doi: 10.1002/kpm.70005.

[18] F. Tsandila-Kalakou, S. Wiig, and K. Aase, “Factors contributing to healthcare professionals’ adaptive capacity with hospital standardization: A scoping review,” *BMC Health Serv. Res.*, vol. 23, no. 1, p. 799, 2023, doi: 10.1186/s12913-023-09698-9.

[19] Matsun, V. S. Andrini, T. W. Maduretno, and A. C. Yusro, “Development of physics learning e-module based on local culture wisdom in Pontianak,West Kalimantan,” *J. Phys. Conf. Ser.*, vol. 1381, no. 1, 2019, doi: 10.1088/1742-6596/1381/1/012045.

[20] K. Das Malakar, M. Kumar, S. Anand, and G. Kuzur, *Climate Change and Socio-Ecological Transformation*. Singapore: Springer Nature Singapore, 2023. doi: 10.1007/978-981-99-4390-6.

[21] B. Cervantes-Paz and E. M. Yahia, "Avocado oil: Production and market demand, bioactive components, implications in health, and tendencies and potential uses," *Compr. Rev. Food Sci. Food Saf.*, vol. 20, no. 4, pp. 4120–4158, Jul. 2021, doi: 10.1111/1541-4337.12784.
[22] M. Papadopoulou *et al.*, "Bedtime routines in Greek families: Characteristics, barriers, and facilitators for establishing and maintaining optimal routines," *Front. Sleep*, vol. 3, no. 1, pp. 133–142, 2024, doi: https://doi.org/10.3389/frsle.2024.1339561.
[23] K. I. Krisnadewi, S. A. Kristina, T. M. Andayani, and D. Endarti, "Implementation preventive program for diabetic mellitus (PROLANIS) at community health center in Indonesia: A qualitative study," *J. Appl. Pharm. Sci.*, vol. 15, no. 1, pp. 153–161, 2024, doi: 10.7324/JAPS.2024.194416.
[24] F. Ponsignon, A. Smart, M. Williams, and J. Hall, "Healthcare experience quality: An empirical exploration using content analysis techniques," *J. Serv. Manag.*, vol. 26, no. 3, pp. 460–485, Jun. 2015, doi: 10.1108/JOSM-10-2014-0265.
[25] G. Wisker, *The Good Supervisor: Supervising Postgraduate and Undergraduate Research for Doctoral Theses and Dissertations*. UK: PALGRAVE MACMILLAN, 2012.
[26] E. M. Manurung, Y. S. Purwadi, and I. B. Sugiharto, "Digital learning process: Challenges for specific creativity," *Electron. J. e-Learning*, vol. 20, no. 2, pp. 112–119, 2022, doi: 10.34190/ejel.20.2.2107.
[27] L. Carvalho, L. Scott, and R. Jeffery, "An exploratory study into the use of qualitative research methods in descriptive process modelling," *Inf. Softw. Technol.*, vol. 47, no. 2, pp. 113–127, Feb. 2005, doi: 10.1016/j.infsof.2004.06.005.
[28] M. Bahrami, "Meanings and aspects of quality of life for cancer patients: A descriptive exploratory qualitative study," *Contemp. Nurse*, vol. 39, no. 1, pp. 75–84, Aug. 2011, doi: 10.5172/conu.2011.39.1.75.
[29] P. M. I. Seraj and A. Rahmatullah, "Systematic literature review on the use of applications of smartphones for teaching English in EFL contexts," *J. English Educ. Teach.*, vol. 6, no. 3, pp. 347–366, 2022, doi: 10.33369/jeet.6.3.347-366.
[30] E. Yuniarti, I. Dewata, and Heldi, "Management of waste and its impact on healthy living behavior: literature review," *Multidiscip. Rev.*, vol. 7, no. 3, p. 2024046, Dec. 2023, doi: 10.31893/multirev.2024046.
[31] F. Dwidarti, Zamzani, and M. Prabowo, "Multimedia-based dance learning in elementary school," *J. Educ. Learn.*, vol. 19, no. 1, pp. 515–521, 2025, doi: 10.11591/edulearn.v19i1.21795.
[32] B. Celik and S. Kara, "Perceptions of parents on Raz-Kid's role in enhancing students' micro and macro-skills holistically: A study on ishik brayaty international primary school in erbil," *Forum Linguist. Stud.*, vol. 6, no. 3, pp. 558–573, 2024, doi: 10.30564/fls.v6i3.6822.
[33] A. R. Karim and Arifuddin, "Strategy for strengthening the characteristics of students in tsanawiyah Madrasa," *Pappaseng Int. J. Islam. Lit. Soc.*, vol. 1, no. 1, pp. 13–22, 2022, doi: 10.56440/pijils.v1i1.6.
[34] B. Passaretti, C. Missiuna, A. J. Levinson, L. S. Turkstra, T. Gallagher, and W. Campbell, "Development and evaluation of an online professional development course to support delivery of tiered school-based rehabilitation services," *Disabil. Rehabil.*, vol. 10, no. 1, pp. 1–13, 2024, doi: 10.1080/09638288.2024.2417769.
[35] S. Ninwattana *et al.*, "Serological surveillance of betacoronaviruses in bat guano collectors: Pre-COVID-19 pandemic and Post-SARS-CoV-2 Emergence," *Viruses*, vol. 17, no. 6, pp. 837–850, Jun. 2025, doi: 10.3390/v17060837.
[36] J. Kranz, P. Breitenmoser, A. Laherto, A. Krug, M. Schwichow, and G. Tasquier, "Science education for collective agency in the climate crisis: A social identity approach," *Res. Sci. Educ.*, vol. 55, no. 4, pp. 1149–1168, Aug. 2025, doi: 10.1007/s11165-025-10282-w.
[37] L. J. Morrison, R. M. Henry, V. Ku, J. P. Nolan, P. Morley, and C. D. Deakin, "Single-shock defibrillation success in adult cardiac arrest: A systematic review," *Resuscitation*, vol. 84, no. 11, pp. 1480–1486, Nov. 2013, doi: 10.1016/j.resuscitation.2013.07.008.
[38] Chuleeporn Prompahakul and Elizabeth G Epstein, "Moral distress experienced by non-Western nurses: An integrative review," *Nurs. Ethics*, vol. 27, no. 3, pp. 778–795, Nov. 2019, doi: 10.1177/0969733019880241.
[39] T. Wardlaw, D. You, L. Hug, A. Amouzou, and H. Newby, "UNICEF Report: enormous progress in child survival but greater focus on newborns urgently needed," *Reprod. Health*, vol. 11, no. 1, p. 82, Dec. 2014, doi: 10.1186/1742-4755-11-82.
[40] N. Wulandari, A. Margawati, and Z. Rahfiludin, "The implementation of nutrition improvement programs for underweight children, wasting and stunting in the department of health, Central Buton district, Southeast Sulawesi," *J. Gizi Indones. The Indones. J. Nutr.*, vol. 9, no. 2, pp. 86–96, 2021, doi: 10.14710/jgi.9.2.86-96.
[41] J. A. Cernuda Martínez, R. Castro Delgado, E. Ferrero Fernández, and P. Arcos González, "Self-perception of theoretical knowledge and practical skills by primary health care physicians in life-threatening emergencies," *Prehosp. Disaster Med.*, vol. 33, no. 5, pp. 508–518, Oct. 2018, doi: 10.1017/S1049023X18000808.
[42] N. D. Nnaji, H. Onyeaka, K. T. Ughamba, C. M. Ononugbo, C. V. Olovo, and I. M. Mazi, "Chemical toxicants used for food preservation in africa. is it a case of ignorance or food fraud? a review," *Heal. Sci. Reports*, vol. 8, no. 4, pp. 1–14, Apr. 2025, doi: 10.1002/hsr2.70333.
[43] M. F. Young and U. Ramakrishnan, "Maternal undernutrition before and during pregnancy and offspring health and development," *Ann. Nutr. Metab.*, vol. 76, no. 3, pp. 41–53, 2020, doi: 10.1159/000510595.
[44] R. G. L. da Silva, "Rethinking approaches of science, technology, and innovation in healthcare during the COVID-19 pandemic: the challenge of translating knowledge infrastructures to public needs," 2021. doi: 10.1186/s12961-021-00760-8.
[45] K. Zinszer and S. Abuzerr, "Water, sanitation, and hygiene insecurity and infectious disease outbreaks among internally displaced populations in Gaza: Implications of conflict-driven displacement on public health," *J. Water, Sanit. Hyg. Dev.*, vol. 14, no. 11, pp. 1182–1192, Nov. 2024, doi: 10.2166/washdev.2024.361.
[46] R. P. Singh *et al.*, "Advancement of abiotic stresses for microalgal lipid production and its bioprospecting into sustainable biofuels," *Sustainability*, vol. 15, no. 18, pp. 1–13, Sep. 2023, doi: 10.3390/su151813678.