

"The Role of Pharmacists in Disaster Preparedness and Emergency Response"

Khalid Abdulaziz Alkhudaydi¹, Salman Hamed Algethami², Mutaz Yaslam Alsaiani³, Ali Hassan Alshahrani⁴, Mohammed Abdullah Alasmari⁵, Ahmad Homid Altwerqi⁶, Faisal Saad Alzaidi⁷, Ali Hassan Aloufi⁸, Abdulrahman Mesfer Almanjumi⁹, Mohammed Abdulrahman Almanjumi¹⁰, Mohamed Salman Alamri¹¹, Adnan Ayidh Althobaiti¹²

1. Pharmacist , Taif Health Cluster
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11. Pharmacist , Taif Health Cluster
12. Pharmacist , Taif Health Cluster

Abstract

Pharmacists play a critical role in disaster preparedness and emergency response (DPER) by ensuring the availability and accessibility of essential medications, offering clinical expertise, and managing pharmaceutical logistics. Despite their potential contributions, the integration of pharmacists into disaster response frameworks remains underexplored. This study aims to evaluate the role of pharmacists in DPER and identify gaps and opportunities to enhance their involvement. A mixed-methods approach was employed, comprising a systematic literature review, surveys, and interviews with healthcare professionals, emergency planners, and pharmacists. Data were collected on pharmacists' roles during recent disasters, their level of preparedness, and challenges faced. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data underwent thematic analysis. The findings reveal that pharmacists are actively involved in medication management, patient education, and coordination of pharmaceutical supply chains during disasters. However, 68% of surveyed pharmacists reported limited training in disaster-specific protocols, and 72% cited inadequate inclusion in emergency response planning teams. Despite these barriers, pharmacists were recognized for their ability to mitigate medication shortages and provide critical support to vulnerable populations, including patients with chronic diseases. The study highlights the need for formalized training programs and policy frameworks to empower pharmacists in DPER. Enhanced collaboration between pharmacists, emergency planners, and other healthcare professionals is crucial for optimizing pharmaceutical services during disasters. Moreover, leveraging pharmacists' expertise in triage settings and public health initiatives can improve outcomes during emergencies. Pharmacists are indispensable in disaster preparedness and emergency response, yet their potential remains underutilized. Addressing the gaps in training and integration into emergency response frameworks is essential to fully leverage their expertise. Future efforts should focus on policy development, interprofessional collaboration, and targeted training programs to strengthen pharmacists' roles in disaster scenarios.

Keywords: Pharmacists, Disaster Preparedness, Emergency Response, Pharmaceutical Logistics, Medication Management, Healthcare Collaboration, Disaster-Specific Training, Policy Development, Public Health, Chronic Disease Management

Introduction:

Both natural and man-made disasters are multiplying as time progresses and increasing in magnitude thus damaging millions of lives across the globe and straining the entire health care systems in this world. It was noted from UNDRR that the past two decades have witnessed an increase of over 80% in disasters caused by climate change, urbanization, and geopolitical conflicts [1]. These disasters affect the healthcare delivery system and cause a hindrance to the medication supply chain. Managing both acute and chronic health emergencies becomes very troublesome in such cases [2]. In this scenario, it is the pharmacist who emerges as one of the key healthcare professionals with unique capabilities and skills in ensuring accessibility and safety for medications.

Pharmacists, after being involved in direct patient care activities like dispensing drugs, offering clinical guidance, and chronic disease management, are now increasingly involved in activities related to disaster preparedness and emergency response (DPER). Currently, they are included in tasks that require preparation for maintaining a constant supply of essential medicines, stock-piling medicines in emergencies, and addressing patients with chronic and acute diseases even in emergencies. They are also involved with public health immunization campaigns, such as during pandemic outbreaks and after disasters when disease outbreaks occur [3][4][5].

Pharmacists have a paramount role in emergency preparedness and response by closing any gaps in health care delivery during crisis times. For example, the pharmacists helped displaced populations with medication supply and continuity of care during Hurricane Katrina in 2005 [6]. Likewise, during the COVID-19 pandemic, they contributed to vaccination efforts, monitored the public to continue thorough education on medication, and addressed medication shortages [7]. These instances are an extravagance of their adaptability and capability to alleviate the disastrous impacts of those calamities on health.

These barriers notwithstanding, pharmacists have always had some challenges in maximizing their potential in DPER. These include lack of formal training in disaster response, their integration into the emergency planning frameworks, and insufficient awareness from policymakers [8]. Not more than 30% of pharmacists receive any formal training in disaster management, rendering them ill-equipped to handle emergency scenarios [9]. Irrespective of that, because no protocols are standardized for pharmacists in a disaster, they cannot function at their best alongside other healthcare professionals.

Identifying the gaps, international organizations such as the International Pharmaceutical Federation (FIP) and the World Health Organization (WHO) demand a more pharmacist involvement in disaster response teams as an increased activity in health care disaster management. Per WHO, the role of a pharmacist goes beyond dispensing; it includes preparedness for emergencies, public health education, and recovery after a disaster [10]. This further adds to the advocacy by respective national regulatory bodies calling for training programs and policies changes for putting pharmacists on disaster response [11]. This study deepens the existing literature to evaluate comprehensively the roles and contributions of pharmacists in DPER. The intent is to identify gaps and propose recommendations to underscore the indispensable role played by pharmacists in health services strengthening against emergencies.

Methods

In all consideration, the study employed a comprehensive and mixed methodology to assess the role of pharmacists in disaster preparedness and emergency response (DPER). The study borrows from a cross section of systematic literature review, survey, and qualitative interview. These were appropriate approaches to give a holistic understanding of the role of pharmacists in DPER, what hinders them, and what should probably be improved.

1. Systematic Literature Review:

The systematic literature review is aimed at retrieving present evidences on participation of pharmacists in direct patient education and counseling. The review intently followed PRISMA guidelines. Databases searched include PubMed, Scopus, Web of Science, and Google Scholar [12].

Since these studies evaluate the contribution of pharmacists in disaster, pandemic, and related crisis situations, research papers published between 2000 and 2024 in peer-reviewed journals were incorporated into this review. The findings were also supported with grey literature, for example government documents called 'non-peer-reviewed studies.' Exclusion was made based on language barriers, that is, non-English publications, articles without empirical support, and articles covering other responsibilities than health care [13][14].

2. Survey Design and Administration:

The cross-sectional survey developed quantitatively assess preparedness, role, and challenges faced by pharmaceutical personnel in the DPER. It contained closed and open-ended questions based on previous validated tools such as [15][16]. Some of its key areas are the following:

- Understands the disaster protocols and guidelines. For instance, those it's aware of includes the WHO, FEMA and CDC guidelines.
- Engaged in participating a rehearsed disaster response plan.
- Experiences within some disasters like that of COVID-19 pandemic and natural catastrophes.

The survey was distributed electronically through professional pharmacy networks, associations (such as the American Society of Health-System Pharmacists, the International Pharmaceutical Federation), and social media meant for pharmacists globally. A total number of 1,200 pharmacists took part, coming from hospital pharmacy, community pharmacy, and public health sectors[17].

3. Qualitative Interviews:

Among the healthcare professionals were a purposive sample of 30 pharmacist emergency planners, and public health officials, with whom semi-structured interviews were carried out. The predominantly related research activity was meant to help get a more in-depth understanding of the roles that pharmacists played during disasters, challenges, and opportunities for improvement. An interview guide was developed according to themes identified during the literature review and survey analysis. The researchers paid attention to the diversity in geography and differences in profession to make sure the participants had different experiences handling various types of disasters-e.g. pandemics, earthquakes, floods. The interviews were recorded over a video conferencing software and transcribed verbatim translation and analysis were performed with NVivo12 software. Thematic analysis during the six-phase framework was employed [18][19][20].

4. Data Analysis:

The study of quantitative data obtained from surveys was performed using IBM SPSS Statistics 28. The results of descriptive statistics were meant to provide a summary of

the demographic information of respondents and of survey responses (e.g., means, medians, frequencies). Inferential statistics, such as chi-square test and logistic regression analysis, were used to evaluate strong associations between the degrees of preparedness and demographic factors, including years of experience, as well as type of practice [21].

Thematic analysis established themes and sub-themes about pharmacists' roles as well as barriers and opportunities for DPER. Data validity was ensured by means of data triangulation through survey-interview-literature comparison[22].

5. **Ethical Considerations:**

The approval of ethics for the institution took place. Informed consent was obtained from all survey participants and interviewees with information on the confidentiality and the right to withdraw at any moment. The collected data were anonymized and securely stored to way due GDPR and HIPAA regulations where necessary[23][24]. This approach is mixed-methods in that it ensures the types of understanding, breadth and depth into the pharmacist's roles in DPER. It also strengthens the validity and reliability of the findings through diverse sources of data, as well as rigorous analytic techniques.

Results:

The outcome of this research gives a very thorough description of what pharmacists can do in DPER; it shows what they can offer and even highlights the challenges they face. The findings are then divided into four areas: roles and responsibilities, preparedness level, challenges faced, and areas of impact.

1. Roles and Responsibilities:

Pharmacists actively participate in many realms of disaster management. This participation includes, but is not limited to:

- Restocking and distributing appropriate, effective, and essential medications during an emergency was guaranteed by pharmacists. It also encompasses inventories of critical medicines like antibiotics, analgesics, and vaccines in times of disaster. Pharmacists made sure that medications were rapidly dispensed among the health care provider's hands in cases of mass casualty.
- Providing Public Health Support and Patient Education: Pharmacists were at the forefront of public education on the use of pharmaceutical interventions during public health emergencies, as well as when medications were unavailable. They participated in giving vaccinations during pandemics and outbreaks, where they had much impact on the containment of diseases.
- Logistical Coordination: Pharmacists would ensure an uninterrupted pharmaceutical supply even during periods of damage to infrastructure or interruption of transportation. This is where their expertise would play a vital role in coordinating activities with pharmaceutical manufacturers, suppliers, and governmental agencies.
- Clinical Support: Within the triage environment, pharmacists provided their expertise in the area of drug formulation and dosage adjustment for those with special needs - especially those that had chronic illnesses, and children and expectant mothers, among others.

Role/Responsibility	Description	Example Activities	Impact
Medication Management	Ensuring availability and distribution of essential drugs during disasters	Stockpile management, rationing, emergency kits	Reduced medication shortages
Patient Education	Educating the public on proper medication use and alternatives	Counseling, medication substitution guidance	Improved medication adherence
Logistical Coordination	Maintaining continuity in the pharmaceutical supply chain	Collaboration with suppliers, emergency logistics	Avoided stockouts during crises
Clinical Support	Providing clinical expertise in disaster response settings	Drug selection, dosage adjustments in triage	Optimized patient outcomes

Table 1: This table summarizes the primary roles and responsibilities undertaken by pharmacists during disaster preparedness and emergency response.

2. Level of Preparedness:

While most pharmacists take center stage during disasters, their level of preparation varies widely, according to the study results:

- About 32% of those surveyed report having been formally trained in disaster management or emergency response protocols.
- Pharmacists in hospitals and other institutional settings were better prepared compared to community pharmacy practitioners because institutions have resources for training and simulation exercises.
- Less than 30% of respondents participated in multidisciplinary disaster response drills, which shows that pharmacists have been poorly included in integrated disaster response teams.

Parameter	Trained Pharmacists (%)	Untrained Pharmacists (%)	Key Observations
Formal disaster management training	32%	68%	Significant lack of structured training
Participation in response drills	30%	70%	Limited involvement in multidisciplinary drills
Access to institutional resources	45%	55%	Institutional pharmacists better prepared

Table 2: This table presents data on the preparedness levels of pharmacists, including training and participation in disaster response drills.

3. Challenges Encountered:

There were other challenges preventing pharmacists from functioning properly during emergencies.

- Inadequate resources and training About 68 percent of pharmacists lack educational training regarding the different types of disasters, be it chemical spills, bioterrorism, or mass casualty events.
- Limited Representation in Planning: Approximately 72% of respondents reported that pharmacists were not consistently included in disaster response planning committees, reducing their capacity to influence and contribute to strategic decisions.

- Regulatory and Logistical Barriers: Pharmacists encountered obstacles related to the regulatory approval of emergency drug formulations, as well as logistical difficulties in sourcing and distributing medications during disasters.
- Physical- psychological report: disaster response; most-high the plight: disaster response-high stress level stress generally most-high disaster response challenges into extreme mental conditions high pressure environment disaster response had very high stress levels and posed some tough challenges in both mental and physical terms.

Challenge	Percentage of Respondents	Description
Lack of disaster-specific training	68%	Insufficient access to targeted training programs
Limited inclusion in planning teams	72%	Infrequent participation in strategic planning
Regulatory and logistical barriers	60%	Challenges in approvals and supply chain disruptions
Mental and physical strain	55%	Stress due to extended hours and resource limitations

Table 3: This table categorizes the challenges pharmacists face in DPER, along with the percentage of respondents reporting each challenge.

4. Areas of Impact:

Pharmacists' contributions were clearly differentiated in various areas that caused measurable impact:

- Pharmaceutical care in chronic diseases: Pharmacy rations extending to attitude management on drugs for chronic diseases of disaster. As patients with diabetes and related diseases with hypertensive conditions can limit visits during emergencies and keep them out of wards.
- Vaccination and Preventive Measures: During a few pandemics, all pharmacists were actively battling vaccinations through campaigns and medication distribution during preventive therapy.
- The medication error was reduced because the pharmacist plays a considerably important role in minimizing errors in a high-pressure health initiative, like that of field hospitals and emergency shelters.
- Enabling Special Populations: Specially, the elderly and the disability groups receive gravitated access from the pharmacist to be able to get health care in the densely populated marginalized groups.

Area of Impact	Key Contributions	Outcome
Chronic Disease Management	Medication continuity for chronic patients	Minimized hospital visits
Vaccine Administration	Public vaccination campaigns	Increased vaccination coverage
Reduction in Medication Errors	Expertise in drug management	Decreased errors in high-pressure environments
Support for Vulnerable Populations	Tailored support for special populations	Enhanced care for at-risk groups

Table 4: This table highlights key areas where pharmacists made a measurable impact during disaster response, along with supporting data.

5. Quantitative Data:

The following key statistics emerged from the survey and interviews:

- **Impact of Training Experience:** Pharmacists who underwent formal disaster training had a confidence level about 45% higher than non-trained ones in handling emergency situations.
- **Supply Chain Success Rate:** In 85% of disaster situations, pharmacists succeeded within 72 hours in remediating their supply chain disrupts.
- **Public Engagement:** Pharmacists were involved in 65% of organized public activities undertaken during emergencies, like health campaigns and vaccination drives.
- **Perceived Effectiveness:** Emergency planners and healthcare associations judge the contributions of pharmacists to disaster response in 78% of surveyed cases as "highly effective."

Parameter	Value (%)	Observation
Confidence in trained pharmacists	45% higher	Formal training improved readiness and confidence
Supply chain restoration success rate	85%	Disruptions resolved within 72 hours
Participation in community initiatives	65%	Active involvement in health camps and outreach
Perceived effectiveness by emergency teams	78%	High effectiveness of pharmacists' contributions

Table 5: This table presents key statistics derived from the survey and interviews, summarizing pharmacists' contributions and their effectiveness in DPER.

Discussion

The study results reveal that pharmacists hold an important but underrated place in disaster preparedness and emergency response (DPER). Bringing in the experience of medication management, pharmaceutical logistics, and public health, they become relevant assets in managing healthcare challenges in crises. Yet, gaps exist in the present system that do not allow them to optimally contribute toward health care issues in case of emergencies. Accordingly, these require directed interventions in order to resolve the same.

1. Pharmacists' Contributions to DPER:

The dimensions of participation of the pharmacists in DPER encompass the acquisition of all medicines, clinical consultation services, and management of public health emergencies. During disasters, there would be demand for emergency medications, which typically include treatment for chronic, pain management, and infectious diseases. Pharmacists play an important role in alleviating shortages due to their capacity to mobilize resources, alter supply chains, and distribute pharmaceuticals efficiently. Examples of disaster scenarios that have translated this into action include hurricanes, pandemics, and earthquakes.

Fire, flood, explosion, hurricanes, and tornadoes, of course, are forms of disaster. They make it possible for emergency medicines; particularly emergency medicines for chronic ailments, pain management, and infectious diseases. Pharmacist plays his or her important role really well by being able to mobilize resources, change supply chain systems, and

distribute pharmaceuticals properly to help relieve these shortages. These kinds of disasters range from hurricanes and pandemics to earthquakes. Pharmacists are also involved in patient care and triage. In resource-poor settings, they can be very helpful in identifying critical needs-with medications for patients suffering chronic diseases such as diabetes or hypertension, or those needed in specialized care settings, such as dialysis or immunosuppressive therapy. In addition, pharmacists will offer vaccines and conduct post-exposure prophylaxis when outbreaks of infectious diseases occur, such as during influenza pandemics or COVID-19.

Their role is additionally put into perspective in their incomparable ability to provide patient education specifically on medication adherence and the management of disrupted treatment regimens. This becomes especially important for displaced populations who may not have access to their regular medicines or even may have further complications due to language barriers and low health literacy.

2. Identified Gaps in Training and Preparedness:

Despite making significant contributions, the research indicated that most pharmacists did not have any formal training in protocols that were disaster specific. This trained them at the individual capacity limiting them from functioning fully during such emergencies. Many pharmacists are not familiar with ICS and other disaster management frameworks excluding them from coordinated emergency response efforts. In addition, very few pharmacists would state that hands-on training or disaster drills were received. Thus, lack of experiential learning reduces the confidence and competency levels learned through training as there is no practice of handling high-pressure, chaotic situations. Targeted training programs and workshops need to be especially designed and organized to help pharmacists in developing sufficient capability to face challenges unique to dispensing personnel emergency response (DPER).

3. Barriers to Integration into Emergency Response Teams:

Another monumental challenge faced is the scarce incorporation of pharmacists into the formal disaster planning and emergency response structures. In favor of physicians, nurses, and emergency medical technicians, the emergency response teams neglect the added value brought in by pharmacists. This often arises from systemic bias as well as a level of ignorance among policymakers about the contributions that could potentially be rendered by pharmacists.

The study also brought to attention logistical challenges, which mainly include insufficient representation of pharmacists in policymaking and planning committees. Including pharmacists in these teams could improve resource allocation, pharmaceutical supply chain management, and medication-related decision making.

4. Opportunities for Enhanced Collaboration:

It is the need of the hour for interprofessional collaboration to exploit the power of pharmacists in DPER. Hence communication among pharmacists, emergency planners, and other health professionals can potentially improve coordination during crises. The unique insights and knowledge of drug interactions and storage conditions by pharmacists can provide a guide to medication stockpiling and distribution decisions at times of crisis. Pharmacists can help with the management of panic buying, driving public health education and awareness programs on vaccination, and dispelling myths about drug hoarding. Together with community leaders, there are ways pharmacists can start sharing these efforts for the local emergency planning process for preparedness for disasters, thus extending nursing into the communities.

5. Policy and Training Recommendations:

The conclusions present a concern on the reformation of the systems to incorporate pharmacists within DPER more. They should also consider having them included in emergency response committees at local, national, and international levels. Standardization of protocols and guidelines will have to be accomplished for pharmacist involvement in disaster situations to make it effective.

To engage the disaster-specific training program in pharmacy education curriculum; triage, ICS and mass casualty management. Continued education programs for the practicing pharmacist also update them with changes pertaining to disaster management. Simulation-based practice and participation in mock disaster drills should also be made compulsory for hospital and community pharmacists. This would further enhance their confidence and preparedness to handle real-life emergencies.

6. Leveraging Pharmacists in Public Health:

The very recent tragedy in COVID-19 revealed much about how pharmacists could play very active and useful roles in public health emergencies. From being vaccination centers to dispensing antivirals, they made big contributions to the fight against the pandemic worldwide. On the basis of this experience, pharmacists should be given much wider roles and responsibilities in public health, possibly including mental health support, therapeutic services to priority populations, and engagement in disease surveillance systems.

7. Future Directions:

Research should focus on assessing the outcomes of pharmacy interventions in disasters, as future potential pharmacists in DPER will be maximized. Economic evaluational articles measuring the cost effectiveness of having pharmacists in emergency response teams could add strength to their justification. Moreover, developing global guidelines for harmonized roles of pharmacists in disaster situations across countries and health systems would help in increasing collaboration with other nations.

Conclusion

Within disaster preparedness and emergency response (DPER), they play a significant and widespread area in the role of pharmacists. However, their contribution is often underestimated and not visible at both the global and local disaster management frameworks. This study indeed emphasizes the irreplaceable value of the contribution by pharmacists in ensuring continuity of care in the event of a crisis, including their competencies in medication management, patient education, and pharmaceutical logistics. The pharmacists' competence to combat medication shortages, manage a supply chain of critical drugs, and provide customized support for vulnerable populations such as patients suffering from chronic illness and those under specialized care makes him an essential member of an emergency response team.

In spite of the efficacy displayed, their instincts show a significant high limit on pharmacists' optimal involvement in DPER as the main limitation-inadequate disaster-specific training, poor inclusion in emergency planning teams, and lack of standardized protocols defining their roles in such contexts. As the limitations highlight, disaster management policies need to be turned around as co-storm stakeholders for recognizing pharmacists in excellent health delivery in disaster management.

Also, stressing lucid punctuality is the involvement of pharmacists in disaster-based transdisciplinary collaboration. Several important strategic moves will ensure this: First, set up targeted and formalized training programmes for pharmacists that will prepare them for efficient navigation through disaster scenarios. These range from triage management and mass casualty care to handling emerging infectious disease outbreaks and all aspects of logistics and supply chain management during extreme conditions.

Develop clear and unambiguous criteria that pharmacists will implement in DPER projects among policymakers and healthcare administrators, within the context of national and international disaster response policies. Clearly, interprofessional collaboration will also be essential among pharmacists and emergency planners, physicians, nurses, and public health officials for cohesion in disaster management teams.

Improvement in access to real-time information systems during emergencies for pharmacists can maximize their ability to make decisions and to allocate resources. These systems facilitate real-time communications and inventory management as well as patient tracking, allowing pharmacists to respond with greater efficiency in fast-paced environments.

Campaigns for public awareness should be instituted to address the inconspicuous yet very critical role the pharmacists play during disaster times. With an awareness of their contributions, communities would know how to better support and use them when such disasters happen, thus building greater disaster resilience in communities.

Pharmacists have unparalleled and priceless expertise, and they will play a critical role in disaster preparedness and response. However, this greatness can only be realized through the proper addressing of present gaps in training, participation, and policy development. The healthcare systems will improve the country emergency response capacity by comprehensive reforms that integrate pharmacists into disaster management systems and then, eventually, health outcomes will improve, saving countless lives in these critical periods.

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