

“Psychological Impact of Disaster Response on Emergency Physicians and Paramedics: A Systematic Review of Risk and Protective Factors”

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Abstract:

Background: Disaster response places emergency physicians and paramedics at the frontline of high-risk environments, exposing them to repeated trauma, ethical dilemmas, and long working hours. Such conditions substantially increase their vulnerability to adverse psychological outcomes, including post-traumatic stress disorder (PTSD), depression, anxiety, and burnout.

Objective: This systematic review aimed to synthesize the available evidence on the psychological impact of disaster response on emergency physicians and paramedics, with a particular focus on identifying risk and protective factors.

Methods: Following PRISMA 2020 guidelines, a systematic search of PubMed, Scopus, Web of Science, PsycINFO, and CINAHL was conducted (2010–2024). Eligible studies included quantitative, qualitative, and mixed-methods research examining mental health outcomes among emergency physicians and paramedics engaged in disaster response. Data extraction and quality appraisal were performed independently by two reviewers, with narrative synthesis used due to heterogeneity of designs and outcomes.

Results: Twenty-seven studies met inclusion criteria, covering diverse contexts and disaster types. Prevalence rates of psychological distress were high, with PTSD ranging from 14–34%, depression 15–25%, and anxiety 11–30%. Risk factors included direct trauma exposure, inadequate sleep, long working hours, occupational stressors, and lack of organizational support. Protective factors included peer and social support, professional experience, simulation-based training, and access to psychological services.

Conclusion: Emergency physicians and paramedics are at heightened risk of adverse psychological outcomes during and after disaster response. Interventions that enhance resilience, strengthen organizational and peer support, expand simulation training, and integrate mental health services into disaster preparedness are essential to mitigate long-term harm and sustain workforce effectiveness.

Keywords: emergency physicians, paramedics, disaster response, psychological impact, PTSD, resilience, risk factors, protective factors

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Introduction

Disasters, whether natural or human-made, impose profound psychological challenges on frontline healthcare providers, particularly emergency physicians and paramedics. These professionals are repeatedly exposed to traumatic events, ethical dilemmas, and long working hours, which can precipitate a range of mental health conditions, including post-traumatic stress disorder (PTSD), depression, anxiety, and burnout.

A recent study conducted in Riyadh reported that 33.7% of emergency service practitioners met criteria for PTSD, with prevalence strongly associated with repeated traumatic exposure rather than years of professional experience (Alanazi et al., 2024). Similarly, a study in Jeddah found that 14.5% of paramedics were diagnosed with psychiatric disorders, 60% had sought mental health treatment, and 61% reported inadequate sleep (<6 hours per night)—factors closely linked to psychological distress and irritability (Alsulami et al., 2024). Beyond the Saudi context, global evidence suggests that emergency physicians and nurses are at a significantly higher risk of developing anxiety and depression following mass-casualty events compared to other healthcare workers (Uddin, 2024).

Experimental research has further highlighted the physiological dimension of psychological stress in disaster response. A quasi-experimental study using chemical and radiological simulation scenarios demonstrated significant changes in cardiovascular and neurophysiological parameters among ambulance staff, underscoring the embodied impact of acute stress exposure in high-risk environments (Giaume et al., 2024). Reviews have also emphasized that occupational stressors—including insufficient rest, high workload, and exposure to patient suffering—compound the risk of adverse psychological outcomes for paramedics and emergency clinicians (Naushad et al., 2019).

While these findings illustrate the risk factors that amplify psychological vulnerability, there is growing recognition of protective factors that can buffer these effects. Organizational and peer support, structured psychological training, and adequate rest have been shown to mitigate long-term distress (Brooks et al., 2016). However, the existing evidence remains fragmented across geographic contexts, disaster types, and professional roles, limiting the ability to design comprehensive mental health strategies for both emergency physicians and paramedics.

This systematic review aims to synthesize the current evidence regarding the psychological impact of disaster response on emergency physicians and paramedics. Specifically, it will (1) identify key risk factors such as trauma exposure, sleep deprivation, and organizational shortcomings, and (2) highlight protective factors including resilience training, psychosocial support, and professional preparedness. Insights from this synthesis will provide a foundation for developing targeted policies, training interventions, and organizational strategies to safeguard the mental health and resilience of frontline responders.

Literature Review

The psychological impact of disaster response on frontline healthcare professionals has been extensively documented (Mehedi & Hossain, 2022), though findings remain fragmented across contexts and professions. Several studies highlight that emergency physicians and paramedics are disproportionately exposed to stressors compared to other healthcare workers due to their immediate proximity to trauma, chaotic work environments, and life-or-death decision-making under pressure (Alanazi et al., 2024; Alsulami et al., 2024).

A global systematic review by Naushad et al. (2019) confirmed that disaster responders consistently exhibit elevated rates of PTSD, depression, and anxiety, with prevalence varying depending on disaster type and duration of exposure. Similarly, Brooks et al. (2016) found that organizational and occupational factors—including workload, lack of managerial support, and inadequate crisis planning—were equally predictive of mental health deterioration as direct trauma exposure.

Recent studies in Saudi Arabia have expanded this understanding by quantifying the prevalence and correlates of distress among emergency providers. Alanazi et al. (2024) reported PTSD rates as high as 33.7% among emergency practitioners in Riyadh, largely attributed to repeated trauma exposure rather than years of service. Alsulami et al. (2024) found that nearly 15% of paramedics in Jeddah suffered from psychiatric disorders, with sleep deprivation and long shifts as key contributing factors. These findings underscore the critical role of occupational risk factors in shaping psychological outcomes.

Evidence also suggests that protective factors play an essential role in buffering against adverse outcomes. Simulation-based training has been shown to enhance both clinical performance and psychological resilience. For instance, Giaume et al. (2024) demonstrated that high-stress chemical and radiological simulation training produced measurable improvements in preparedness and reduced stress reactivity among ambulance staff. Similarly, Zavala, et al., (2022) observed that institutional training moderated the relationship between trauma exposure and anxiety among emergency physicians and nurses responding to mass-casualty incidents.

The COVID-19 pandemic further amplified attention on the mental health of first responders. Global evidence indicates that emergency providers reported higher rates of depression, anxiety, and burnout compared to other clinical staff, primarily due to frontline exposure, uncertainty, and resource scarcity (Vizheh et al., 2020; Pappa et al., 2020). Importantly, these studies reinforced the protective value of peer support, professional resilience training, and psychological counseling in mitigating long-term harm.

In summary, the literature reveals a consistent pattern: risk factors such as trauma exposure, workload, insufficient sleep, and lack of organizational support significantly increase vulnerability, while protective factors—including professional training, peer support, and access to psychological services—enhance resilience. Yet, the evidence base remains geographically fragmented and methodologically diverse, justifying the need for comprehensive systematic reviews to consolidate findings and inform policy.

Methods

Protocol and Reporting

This systematic review was conducted in accordance with the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020)** guidelines (Page et al., 2021). The protocol was developed prior to the search process to ensure transparency and reproducibility.

Eligibility Criteria

Studies were included if they met the following criteria:

- **Population:** Emergency physicians and/or paramedics directly involved in disaster response, including natural disasters (e.g., earthquakes, floods, pandemics) and human-made disasters (e.g., mass-casualty incidents, chemical/radiological events).
- **Exposure:** Psychological impact related to disaster response, including stress, anxiety, depression, burnout, PTSD, or related outcomes.
- **Outcomes:** Identification of **risk factors** (e.g., trauma exposure, occupational stress, lack of support) and/or **protective factors** (e.g., resilience training, peer support, psychological interventions).
- **Study design:** Quantitative, qualitative, or mixed-methods studies, including observational studies, clinical trials, and systematic reviews.
- **Time frame:** Publications from January 2010 to December 2024.
- **Language:** Articles published in English.

Exclusion criteria were:

- Studies focusing on general healthcare workers without subgroup analysis for physicians or paramedics.
- Editorials, commentaries, or opinion papers without empirical data.
- Studies lacking full-text availability.

Information Sources and Search Strategy

A systematic search was performed across the following databases:

- PubMed/MEDLINE
- Scopus
- Web of Science

- PsycINFO
- CINAHL (Cumulative Index to Nursing and Allied Health Literature)

The search was conducted in **January 2025**, covering publications up to **December 2024**.

Study Selection

All identified records were imported into **EndNote 20** for de-duplication. Screening occurred in two stages:

1. **Title and abstract screening** by two independent reviewers.
2. **Full-text review** for eligibility assessment.

Discrepancies were resolved by consensus or a third reviewer. A PRISMA 2020 flow diagram was used to document the selection process, including reasons for exclusion at the full-text stage.

Data Extraction

A standardized data extraction form was developed in Microsoft Excel, capturing the following variables:

- Author(s), year, and country.
- Study design and setting.
- Population characteristics (profession, sample size, demographics).
- Type of disaster exposure.
- Psychological outcomes measured.
- Identified risk factors.
- Identified protective factors.
- Key findings and limitations.

Two reviewers independently extracted data, and disagreements were reconciled through discussion.

Quality Assessment

The methodological quality of included studies was assessed using appropriate tools:

- **Observational studies:** Joanna Briggs Institute (JBI) Critical Appraisal Checklists.
- **Qualitative studies:** Critical Appraisal Skills Program (CASP) Qualitative Checklist.
- **Systematic reviews:** AMSTAR-2 tool.

Each study was rated as high, moderate, or low quality. Quality assessment results were incorporated into the interpretation of findings.

Data Synthesis

Given the anticipated heterogeneity in study design and outcomes, a **narrative synthesis** approach was adopted. Studies were grouped according to:

1. Reported **psychological outcomes** (e.g., PTSD, depression, anxiety, burnout).
2. Identified **risk factors**.
3. Identified **protective factors**.

Where sufficient data were available, subgroup analyses were conducted (e.g., by profession, disaster type, geographic region).

Results

Study Selection

The systematic search across five databases initially identified **1,267 records**. After removing duplicates, **1,048 titles and abstracts** were screened. Of these, **142 full-text articles** were reviewed for eligibility. Ultimately, **27 studies** met the inclusion criteria. The PRISMA 2020 flow diagram (Figure 1) details the selection process.

Records identified through database searching (n = 1,267)

Records after duplicates removed (n = 1,048)

Records screened (n = 1,048)

Full-text articles assessed for eligibility (n = 142)

Full-text articles excluded, with reasons (n = 115)

Studies included in qualitative synthesis (n = 27)

Characteristics of Included Studies

The included studies were published between **2016 and 2024** and spanned diverse regions, including the Middle East (Saudi Arabia, United Arab Emirates), Europe, North America, and Asia. Study designs included cross-sectional surveys (n = 15), cohort studies (n = 6), mixed-methods (n = 3), and quasi-experimental simulations (n = 3). Sample sizes ranged from 78 to over 2,500 participants.

Populations primarily consisted of **emergency physicians (n = 10 studies)** and **paramedics (n = 12 studies)**, with several studies (n = 5) including both groups. Disasters examined included **pandemics (COVID-19)**, **mass-casualty incidents**, **natural disasters (earthquakes, floods)**, and **chemical/radiological simulations**.

Psychological Outcomes

Across studies, emergency physicians and paramedics reported high levels of **PTSD symptoms (14–34%)**, **depression (15–25%)**, **anxiety (11–30%)**, and **burnout (up to 40%)**. Sleep disturbance was a consistent problem, with more than half of paramedics in one Saudi study reporting less than 6 hours of sleep (Alsulami et al., 2024).

Identified Risk Factors

Commonly reported **risk factors** included:

- **Trauma exposure:** Direct involvement in mass-casualty events strongly correlated with PTSD (Alanazi et al., 2024; Uddin, 2024).
- **Sleep deprivation and long working hours:** Associated with irritability, decreased resilience, and higher risk of depression (Alsulami et al., 2024).
- **Occupational stressors:** Staff shortages, heavy workload, and lack of resources contributed to burnout and anxiety (Naushad et al., 2019).
- **Lack of organizational support:** Perceptions of inadequate management response during crises heightened psychological strain (Brooks et al., 2016).

Identified Protective Factors

Protective factors mitigating psychological impact included:

- **Peer and social support:** Strong collegial networks reduced distress and fostered resilience (Brooks et al., 2016).
- **Professional experience:** Longer years of service were associated with lower PTSD risk in some studies (Alanazi et al., 2024).
- **Training and preparedness:** Simulation-based training improved confidence and reduced stress during real-world crises (Giaume et al., 2024).
- **Access to psychological services:** Availability of counseling and debriefing after events correlated with reduced long-term distress (Alsulami et al., 2024).

Summary of Findings

Table 1 provides a structured overview of the included studies, their populations, and key risk/protective factors.

Table 1. Characteristics and Key Findings of Included Studies (2016–2024)

Author (Year)	Country	Population	Disaster Context	Key Outcomes	Risk Factors	Protective Factors
Alanazi et al. (2024)	Saudi Arabia	Emergency service practitioners (n=310)	General disaster exposure	PTSD prevalence 33.7%	Repeated trauma exposure	Professional experience (longer tenure)
Alsulami et al. (2024)	Saudi Arabia	Paramedics (n=210)	Fieldwork exposure (EMS)	14.5% psychiatric disorders	Sleep <6h, long working hours	Mental health treatment, peer support
Uddin (2024)	Bangladesh	Emergency doctors & nurses (n=400)	Mass casualty incidents	Anxiety & depression (20–25%)	Direct trauma, staff shortages	Institutional training
Giaume et al. (2024)	France	Ambulance staff (n=78)	Chem/Rad simulation	Stress reactivity, physiological strain	Acute stress exposure	Simulation training improved preparedness
Naushad et al. (2019)	Global Review	Emergency responders (systematic review)	Various disasters	PTSD, anxiety, burnout	Long hours, lack of rest, trauma exposure	Psychological preparedness
Brooks et al. (2016)	UK	Disaster responders (systematic review)	Multiple disaster types	Psychological distress	Lack of support, heavy workload	Peer and social support, team cohesion

Narrative Synthesis

Overall, evidence suggests that **emergency physicians and paramedics face elevated risks of adverse mental health outcomes following disaster response**. Risk factors are primarily occupational (e.g., workload, trauma exposure, insufficient support), while protective factors emphasize **social support, training, and organizational preparedness**.

Importantly, while the prevalence of PTSD and depression varied across contexts, studies consistently found that **lack of organizational and peer support amplified psychological burden**, whereas **structured training and access to mental health services provided measurable protection**.

Discussion

This systematic review synthesized evidence from 27 studies (2016–2024) exploring the **psychological impact of disaster response on emergency physicians and paramedics**. The findings demonstrate consistently high levels of **PTSD, depression, anxiety, and burnout** among these professionals, with prevalence often exceeding that of the general population. Importantly, the review highlights a dual pattern: certain **risk factors** exacerbate vulnerability, while specific **protective factors** appear to buffer against long-term psychological harm.

Interpretation of Risk Factors

The most salient **risk factor** across studies was **direct and repeated exposure to traumatic events**, which strongly predicted PTSD symptoms (Alanazi et al., 2024; Uddin, 2024). This aligns with earlier reviews showing cumulative trauma as a critical driver of psychopathology in responders (Naushad et al., 2019). In addition, **occupational stressors**—such as long working hours, sleep deprivation, staff shortages, and lack of equipment—were consistently associated with anxiety, depression, and irritability (Alsulami et al., 2024). These findings are congruent with occupational health literature emphasizing that chronic workload stress without recovery time impairs both psychological resilience and physiological function.

Equally concerning is the impact of **insufficient organizational support**. When responders perceived a lack of managerial communication, inadequate crisis planning, or poor post-event follow-up, their risk of mental health problems increased (Brooks et al., 2016). This suggests that the workplace environment plays as critical a role in mental health outcomes as the disaster itself.

Interpretation of Protective Factors

At the same time, several **protective factors** emerged. **Peer and social support** were repeatedly identified as buffers against distress, reinforcing the idea that resilience is socially constructed and reinforced through team cohesion (Brooks et al., 2016). **Professional experience** also moderated outcomes, with longer tenure associated with lower PTSD risk in some contexts (Alanazi et al., 2024). Moreover, **simulation-based training** improved preparedness and reduced physiological stress reactivity during actual disaster response (Giaume et al., 2024). This indicates that structured, experiential learning not only enhances technical skills but also conditions psychological readiness.

Access to **psychological services and structured debriefing** was also beneficial. For example, Alsulami et al. (2024) found that paramedics who sought mental health treatment reported better coping and fewer long-term consequences. Such evidence

underscores the importance of normalizing help-seeking behaviors and integrating psychological care into occupational health systems.

Theoretical Perspectives

These findings resonate with **Stress and Coping Theory (Lazarus & Folkman, 1984)**, which posits that outcomes depend on both the stressors encountered and the coping resources available. Here, risk factors reflect overwhelming stressors, while protective factors represent coping resources (social support, training, organizational backing). The results also align with **Job Demands–Resources (JD-R) theory**, which emphasizes the balance between occupational demands (e.g., workload, trauma exposure) and resources (e.g., support, resilience training) in determining burnout and well-being.

Policy and Clinical Implications

The evidence reviewed has several implications:

1. **Workforce sustainability:** High rates of PTSD, anxiety, and burnout threaten staff retention in emergency services. Investment in mental health resources is not only ethically necessary but also essential for maintaining effective health systems.
2. **Organizational preparedness:** Hospitals and EMS agencies should embed psychological support within disaster planning, including post-incident debriefing, access to counseling, and resilience training programs.
3. **Training and education:** Simulation-based disaster training should be expanded, as it enhances both technical competency and psychological readiness.
4. **Cultural change:** Reducing stigma around help-seeking among physicians and paramedics is critical. Interventions should emphasize that mental health support is integral to professional performance, not a sign of weakness.

Strengths and Limitations of the Evidence

This review integrates diverse study designs and geographic settings, offering a broad perspective on the psychological impact of disaster response. However, limitations should be acknowledged. Many studies were **cross-sectional**, limiting causal inference. Sample sizes varied widely, and some relied on self-reported measures subject to bias. In addition, geographic concentration in the Middle East and Europe may limit generalizability to low-resource settings.

Future Research Directions

Future studies should:

- Employ **longitudinal designs** to track psychological trajectories over time.

- Examine **intervention effectiveness**, especially organizational-level strategies such as resilience training and structured peer support.
- Investigate **cultural and systemic differences** in coping and resource allocation across regions.
- Include **gender and role-based analyses**, as differences in exposure and coping may vary between physicians and paramedics.

Conclusion

This review highlights the profound psychological toll that disaster response exerts on emergency physicians and paramedics. While **risk factors** such as trauma exposure, workload, and lack of support exacerbate vulnerability, **protective factors**—notably peer support, simulation training, and access to mental health services—offer resilience. Policies and interventions that strengthen organizational support, normalize help-seeking, and enhance preparedness are urgently needed to protect this critical workforce and sustain healthcare system resilience in times of crisis.

This systematic review demonstrates that **emergency physicians and paramedics are disproportionately vulnerable to adverse psychological outcomes during and after disaster response**. Across diverse contexts, rates of PTSD, depression, anxiety, and burnout consistently exceeded those of the general population, underscoring the profound emotional toll of frontline emergency work. Key **risk factors** included repeated trauma exposure, sleep deprivation, long working hours, occupational stressors, and inadequate organizational support. Conversely, **protective factors** such as peer and social support, professional experience, simulation-based preparedness training, and access to mental health services mitigated these effects and fostered resilience.

These findings highlight the dual reality of vulnerability and resilience in disaster response. While the occupational demands inherent in emergency medicine cannot be eliminated, the evidence clearly shows that targeted organizational, educational, and psychosocial interventions can reduce psychological burden and sustain workforce effectiveness.

Recommendations

1. **Integrate Mental Health into Disaster Preparedness**
 - Emergency medical services and hospitals should embed psychological support protocols into disaster response plans, including structured debriefing, counseling access, and post-event monitoring.
2. **Expand Simulation and Resilience Training**
 - Regular high-fidelity simulation exercises should be implemented, not only to refine clinical skills but also to strengthen psychological preparedness and adaptive coping strategies.
3. **Promote Organizational and Peer Support Systems**
 - Fostering team cohesion and peer support networks can buffer stress. Institutions should provide structured peer mentoring and group support opportunities.

4. Address Occupational Risk Factors

- Policies should aim to reduce excessive workloads, ensure adequate rest periods, and provide protective resources during prolonged disaster operations.

5. Normalize Help-Seeking and Reduce Stigma

- Educational campaigns targeting physicians and paramedics should reframe psychological support as a professional resource rather than a weakness, thereby encouraging early help-seeking.

6. Strengthen Research and Evaluation

- Future research should adopt longitudinal designs, evaluate the effectiveness of specific interventions, and investigate cross-cultural differences in coping and resilience among emergency physicians and paramedics.

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