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RESEARCH

Personal Coping Strategies of First Responders in an Islamic Culture: A retrospective qualitative case study post-Derna floods (2023)

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ABSTRACT

Context: First responders are susceptible to significant psycho-social trauma, especially in large disasters. Limited research has explored the impact of the Derna disaster on this workforce. Therefore, it is important to understand its effects and the coping mechanisms used within the Islamic cultural context.

Methods: The study used the civilian PCL-4 to assess PTSD symptoms. Eighteen semi-structured interviews with first responders were conducted from October 2024 to January 2025. Data collected included demographics, PTSD symptoms, post-disaster experiences, and coping strategies.

Results: All respondents used at least one coping method, with self-distraction and avoidance being the most common. Most responders showed "possible" or "probable" PTSD, with some at high risk. Adaptive coping methods, such as planning, active coping, and religious practices, were linked to fewer PTSD symptoms, while avoidance and isolation correlated with greater distress. Doctors favored communication and acceptance, while support staff relied more on active coping and isolation. Doctors and support staff, however, exhibited similar levels of distress. Longer disaster exposure increased PTSD symptoms, suggesting cumulative stress effects.

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Implications: Targeted mental health interventions that promote adaptive coping, considering occupational roles, and limiting exposure duration, may mitigate long-term psychological impacts. We recommend developing comprehensive training programs that address personal recovery and organizational support. Training should incorporate adaptive coping methods such as structured planning, active problem-solving, seeking social support, and recognizing the importance of religious and spiritual coping. Research is needed to identify resilience factors, including spirituality, to inform targeted interventions that enhance first responders' psycho-spiritual-social well-being.

Keywords: coping strategies; Derna; floods; mechanism; responders; PTSD; disaster; mental health

الملخص

السياق: يُعد المستجيبون الأوائل عرضة لصدمات نفسية واجتماعية كبيرة، لا سيما في الكوارث الكبرى. وقد تناولت دراسات محدودة تأثير كارثة درنة على هذه الفئة من العاملين. لذلك، من المهم فهم آثارها وآليات التكيف المستخدمة ضمن السياق الثقافي الإسلامي.

المنهجية: استخدمت الدراسة مقياس اضطراب ما بعد الصدمة المدني 4 لتقييم أعراض الاضطراب. تم إجراء ثماني عشرة مقابلة شبه منظمة مع المستجيبين الأوائل خلال الفترة من أكتوبر 2024 إلى يناير 2025. وشملت البيانات التي تم جمعها الخصائص الديموغرافية، وأعراض اضطراب ما بعد الصدمة، و تجارب ما بعد الكارثة، واستراتيجيات التكيف.

النتائج: استخدم جميع المستجيبين أسلوبًا واحدًا على الأقل من أساليب التكيف، وكان التشتيت الذاتي والتجنب هما الأكثر شيوعًا. أظهر معظم المستجيبين أعراض اضطراب ما بعد الصدمة "محتملة" أو "مرجحة"، مع وجود البعض في فئة الخطر العالي. ارتبطت أساليب التكيف التكيفية، مثل التخطيط والتكيف النشط والممارسات الدينية، بأعراض أقل للاضطراب، بينما ارتبط التجنب والعزلة بضيق أكبر. فضّل الأطباء التواصل والتقبّل، بينما اعتمد موظفو الدعم بشكل أكبر على التكيف النشط والعزلة. ومع ذلك، أظهر الأطباء وموظفو الدعم مستويات متقاربة من الضيق أدى التعرض الطويل للكارثة إلى زيادة أعراض اضطراب ما بعد الصدمة، مما يشير إلى تراكم آثار الإجهاد.

الآثار المترتبة: إن التدخلات الصحية النفسية المستهدفة التي تعزز التكيف التكيفي، مع مراعاة الأدوار المهنية والحد من مدة التعرض، قد تخفف من الآثار النفسية طويلة المدى. نوصي بتطوير برامج تدريبية شاملة تتناول التعافي الشخصي والدعم المؤسسي. ينبغي أن يتضمن التدريب أساليب التكيف التكيفية مثل التخطيط المنظم، وحل المشكلات النشط، وطلب الدعم الاجتماعي، والاعتراف بأهمية التكيف الديني والروحي. هناك حاجة إلى إجراء بحوث لتحديد عوامل الصمود، بما في ذلك الروحانية، لتوجيه التدخلات المستهدفة التي تعزز الرفاه النفسي والروحي والاجتماعي للمستجيبين الأوائل.

الكلمات المفتاحية: استراتيجيات التكيف; درنة; الفيضانات، الآلية; المستجيبون; اضطراب ما بعد الصدمة; كارثة; الصحة النفسية.

RESUMEN

Contexto: El personal de primera respuesta es susceptible de sufrir traumas psicosociales significativos, especialmente en desastres de gran magnitud. Investigaciones limitadas han explorado el impacto del desastre de Derna en esta fuerza laboral. Por lo tanto, es importante comprender sus efectos y los mecanismos de afrontamiento utilizados dentro del contexto cultural islámico.

Métodos: El estudio utilizó la escala PCL-4 civil para evaluar los síntomas del TEPT (Trastorno de Estrés Postraumático). Se realizaron dieciocho entrevistas semiestructuradas con socorristas entre octubre de 2024 y enero de 2025. Los datos recopilados incluyeron demografía, síntomas de TEPT, experiencias post-desastre y estrategias de afrontamiento.

Resultados: Todos los encuestados utilizaron al menos un método de afrontamiento, siendo la autodistracción y la evitación los más comunes. La mayoría de los socorristas mostraron un TEPT «posible» o «probable», con algunos en alto riesgo. Los métodos de afrontamiento adaptativos, como la planificación, el afrontamiento activo

y las prácticas religiosas, se vincularon con menos síntomas de TEPT, mientras que la evitación y el aislamiento se correlacionaron con un mayor malestar. Los médicos favorecieron la comunicación y la aceptación, mientras que el personal de apoyo confió más en el afrontamiento activo y el aislamiento. No obstante, ambos grupos exhibieron niveles similares de angustia. La exposición prolongada al desastre aumentó los síntomas de TEPT, lo que sugiere efectos de estrés acumulativo.

Implicaciones: Las intervenciones de salud mental dirigidas que promuevan el afrontamiento adaptativo, considerando los roles ocupacionales y limitando la duración de la exposición, pueden mitigar los impactos psicológicos a largo plazo. Recomendamos desarrollar programas de capacitación integrales que aborden la recuperación personal y el apoyo organizacional. La capacitación debe incorporar métodos de afrontamiento adaptativos como la planificación estructurada, la resolución activa de problemas, la búsqueda de apoyo social y el reconocimiento de la importancia del afrontamiento religioso y espiritual. Se requiere investigación adicional para identificar los factores de resiliencia, incluida la espiritualidad, para informar intervenciones que mejoren el bienestar psico-espiritual-social de los socorristas.

Palabras clave: estrategias de afrontamiento; Derna; inundaciones; mecanismo; socorristas; TEPT; desastre, salud mental

First responders play a crucial role during and after natural disasters, often placing themselves at significant personal risk to aid others. However, this exposure can have profound psychological and emotional consequences. The 2023 Derna floods, one of the most devastating disasters in Libya's recent history, presented unprecedented challenges to response team members who provided first aid and are now navigating the recovery phase of the Chain of Survival Behaviors (IJFAE, 2025). As a first aid domain, it exists for both the victims and responders to work back toward "normalcy." Recovery for first responders involves restoring both daily functioning and operational readiness, with outcomes enhanced through social support and long-term care.

The Derna Floods were breaches in the levee systems that resulted in significant infrastructure damage, including the failure of communication systems and backup power. Entire neighborhoods were submerged, leaving thousands of people homeless. They became a humanitarian crisis, characterized by widespread displacement and an urgent need for assistance in both immediate health and safety and long-term recovery (Altaeb, 2024; Smith, 2023; Taher, 2024).

According to DSM-5, post-traumatic stress disorder (PTSD) involves four symptom clusters: intrusion, avoidance, negative cognitive/mood alterations, and hyperarousal symptoms (American Psychiatric Association, 2013). First responders are at elevated risk for PTSD due to repeated exposure to traumatic events through their occupational duties. Unlike the general population, first responders meet Criterion A for PTSD exposure through indirect exposure to aversive traumatic events, while in service to others.

Physical exhaustion from demanding work environments represents a significant occupational stressor for first responders that directly impacts both immediate operational performance and long-term mental health outcomes. In the context of the Derna floods, the rugged terrain and demanding rescue operations caused substantial physical exertion and fatigue among responders. Cumulative fatigue from repeated exposure without adequate rest creates cascading cognitive deficits, reduced decision-making capacity, burnout, anxiety, and PTSD, compounding psychological and operational challenges (Marvin, et al., 2023).

While fatigue and stress represent significant risk factors for PTSD and burnout, evidence-based coping strategies, particularly physical activity, provide protective mechanisms that enhance mental health outcomes among first responders. A comprehensive meta-analysis examining 218 randomized controlled trials with 14,170 participants found that various exercises (e.g., yoga or

strength training) significantly alleviate symptoms of depression, which may be enhanced when done in groups (Singh et al., 2024).

Beyond physical exercise, adaptive coping techniques include constructive behaviors that help individuals manage stress and promote overall well-being (e.g., problem-solving, seeking social support, and practicing relaxation methods) (Lazarus & Folkman, 1984). Research comparing adaptive versus maladaptive coping strategies indicates that first responders using adaptive strategies such as planning and active coping show fewer PTSD symptoms, while those relying on maladaptive behaviors (e.g., avoidance, compartmentalizing, substance abuse, and isolation) correlate with greater distress (Tjin et al., 2022).

In culturally grounded contexts such as Libya, spiritual and religious coping mechanisms represent endemic sources of resilience that merit investigation alongside Western psychological frameworks. Spiritually integrated interventions for first responders, defined as "intervention protocols incorporating spiritual elements, … have demonstrated improvements in mental health, physical health, gratitude, meaning-making, and purpose in life" (Kaufman & Rosmarin, 2024, p 3).

In Islamic cultural contexts, constructs such as Tawakkul and religious community support provide culturally congruent pathways to psychological healing. The integration of spiritual beliefs and practices into trauma recovery is particularly relevant in post-disaster contexts where systemic formal mental health support may be limited and where religious and spiritual frameworks constitute primary sources of meaning-making and resilience.

ISLAMIC PSYCHOSOCIAL SUPPORT

We examined Tawakkul (entrusting outcomes to Allah while exerting personal effort), a construct central to Islamic resilience (Pargament, 1997). Programs like the Islamic Trauma Healing, designed by Bentley et al. (2021), represent a cost-effective, faith-based program that integrates evidence-based PTSD treatments with Islamic principles to promote psychological healing and community reconciliation among Muslims. The Maqasid Shariah Islamic Psychosocial Support Model proposed by Saidon et al. (2021) combines psychological and spiritual elements to foster positive outcomes for individuals affected by disasters. It spans all domains of the Chain of Survival Behaviors, from preparation to recovery. The model emphasizes both tangible preparations and the development of inner resilience.

Aprilianti (2024) highlights the differences between Islamic psychology and Western psychology. Islamic psychology is rooted in religious teachings emphasizing Tawakkul and Quranic authority, contrasting with Western psychology's empirical focus on observable behaviors. In contrast but not exclusively, Western psychology relies on scientific methods focused on observable behaviors and mental processes, aiming to enhance life satisfaction. Although these approaches differ fundamentally in their core values, they are increasingly being integrated to provide a more comprehensive understanding of human well-being.

The reviewed literature offers insight into the psychological challenges and coping mechanisms of first responders across various disaster settings. The emotional burden of their work often results in long-lasting psycho-spiritual-social health challenges, but many employ personal coping mechanisms, seek peer support, or turn to spiritual practices for relief. Social and organizational structures also play a vital role in shaping their recovery and resilience. These themes are particularly relevant in post-crisis Libya, where systemic support is limited and cultural frameworks such as religion take on added significance. This study builds upon global findings by examining the unique, culturally grounded strategies used by first responders in the aftermath of the Derna floods.

METHODOLOGY

We aimed to understand the coping strategies employed by first responders after a major disaster. In the context of the Derna Floods, we wanted to gain insight directly from those who experienced the challenges of emergency response. Thus, this exploratory study involved qualitative data analysis derived from face-to-face and online open-ended interviews.

The civilian version of the PTSD Checklist for DSM-IV (PCL-4; 17 items) was selected for three primary reasons. First, the PCL-4 requires 5–10 minutes to complete, making it feasible in the high-demand

disaster response environment and reducing burden when assessments are conducted by non-mental health personnel (paramedics, nurses, support staff) lacking formal psychiatric training. Second, the PCL-4's three-cluster symptom structure (re-experiencing, avoidance, hyperarousal/numbing) provides conceptual clarity suited to field-based screening by diverse occupational groups, whereas the PCL-5's four-cluster structure is more complex for non-specialist administrators. Third, the PCL-4 possesses established validation literature specifically documenting its use in international, cross-cultural, and disaster response settings (Lang et al., 2012), whereas comparable validation for the PCL-5 in field-based international disaster contexts remains limited. Research confirms substantial agreement between PCL-4 and PCL-5 for PTSD case identification (LeardMann et al., 2021), supporting the validity of using the established PCL-4 instrument for this international disaster-based cohort study.

Participants rated each PCL item on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely), to assess symptoms across three clusters: re-experiencing (e.g., reliving traumatic events through flashbacks, nightmares, or intrusive thoughts) (5 items), hyperarousal (e.g., irritability, sleep disturbances, and hypervigilance) (7 items), and avoidance (e.g., efforts to avoid trauma-related stimuli and emotional detachment) (5 items). The total score, from 0 to 68, was obtained by summing the individual items. Higher scores indicate greater severity and frequency of PTSD symptoms, whereas lower scores suggest fewer symptoms. All the questions were translated into Arabic, and the PCL questions were distributed among the other questions to avoid any bias toward negativity.

We recruited participants through announced requests on different social media platforms (e.g., Facebook & X), social events, and field visits for volunteers from various organizations. The Research Ethical Board (REB) at Benghazi Medical Center (BMC) approved this research. Per the interview protocol, each first responder was asked the same set of questions; the open-ended format allowed the person to comment freely on the topics. A total of 18 interviews were conducted in October 2024 through January 2025. Interview lengths ranged from 20 minutes to 1.5 hours. Quantitative data collected included demographic characteristics including age, gender, marital status, education level, occupation, residency, and nationality, and the PCL-4 items. Qualitative data included descriptions of the experience after returning home, and coping mechanisms after the Derna Floods disaster to describe the influence of Tawakkul, Sabr, and overall Islamic religious teachings. The mixed methods strengthen the inquiry to be able to understand trends within demographics and the context for recovery.

RESULTS

Demographics

From a convenience sample, 30 invitations were sent out to participate, of which 18 people agreed to participate in a researcher-administered questionnaire (60%). These first responders ranged in age from 19 to 50 years old (mean age = 29.72, SD = 7.81). Gender distribution was 15 (83.3%) male, and 2 (11.1%) were married. Regarding educational attainment, 4 (22.2%) had postgraduate degrees, 10 (55.5%) held a bachelor's degree, and 4 (22.2%) had only completed secondary school. All participants except one were Libyan (94.5%). No participants were from Derna, 16 lived in Benghazi, and two from Tripoli. See Table 1 for details.

PCL Outcomes

According to the PCL-4 scale, among the 18 responders, four showed no PTSD symptoms (score ≤ 29), 11 exhibited possible symptoms (30 ≤ score ≤ 43), two had probable symptoms (44 ≤ score ≤ 50), and one was at high risk for PTSD (score ≥ 51), see Table 2 & Figure 1. The four individuals who exhibited no symptoms of post-traumatic stress disorder shared a consistent use of adaptive coping strategies. Specifically, they reported engaging in planning, active coping, and seeking support through communication with relatives, as well as employing additional religious practices. An examination of the association between first responders' organizational affiliations and the presence of PTSD symptoms indicated that a high risk for PTSD was present in only one first responder: a soldier serving in the army. Maladaptive coping mechanisms mentioned included avoidance and isolation.

Participant #	Age in years	Gender (1 = male, 2 = nonmale)	Marital status (1 = single; 2 = married)	Occupation	Nationality (1 = Libyan; 2 = non-Libyan	Experience as a first responder (Years)	Post-Dam Breach Arrival (Days)	On-site in Derna (Days)
1	<30	1	1	Doctor	1	5	3	15
2	30–40	1	2	Doctor	1	6	2	10
3	30–40	1	1	Doctor	1	2	2	6
4	<30	1	1	Support staff	1	2	2	3
5	<30	1	1	Support staff	1	<1	4	3
6	<30	1	1	Support staff	1	7	2	5
7	30–40	1	1	Doctor	1	5	5	8
8	41–50	2	1	Doctor	1	21	5	5
9	<30	1	1	Doctor	1	4	3	14
10	<30	1	1	Support staff	1	<1	7	3
11	30–40	1	1	Doctor	1	3	3	7
12	<30	1	1	Support staff	1	<1	5	7
13	<30	1	1	Doctor	2	1	2	7
14	30–40	2	1	Doctor	1	7	3	14
15	41–50	2	2	Doctor	1	15	3	5
16	<30	1	1	Support staff	1	2	2	20
17	<30	1	1	Support staff	1	<1	3	31
18	<30	1	1	Support staff	1	<1	2	31

Table 1 Description of participants.

Participant #	PCL score	PCL interpretation	Coping mechanisms
1	35	Possible PTSD	Communication with relatives & isolation
2	43	Possible PTSD	Acceptance
3	37	Possible PTSD	Avoidance
4	17	No PTSD	None self-identified
5	35	Possible PTSD	Active coping
6	24	No PTSD	Active coping & planning
7	29	No PTSD	Communication with relatives
8	39	Possible PTSD	Avoidance & self-distraction
9	36	Possible PTSD	Isolation
10	32	Possible PTSD	Isolation
11	44	Probable PTSD	Self-distraction
12	48	Probable PTSD	Avoidance
13	37	Possible PTSD	Religion
14	37	Possible PTSD	Self-distraction
15	30	Possible PTSD	Religion & Acceptance
16	50	Highly likely PTSD	Avoidance & Physical activity
17	27	No PTSD	Religion
18	40	Possible PTSD	Self-distraction

Table 2 PCL Scores.

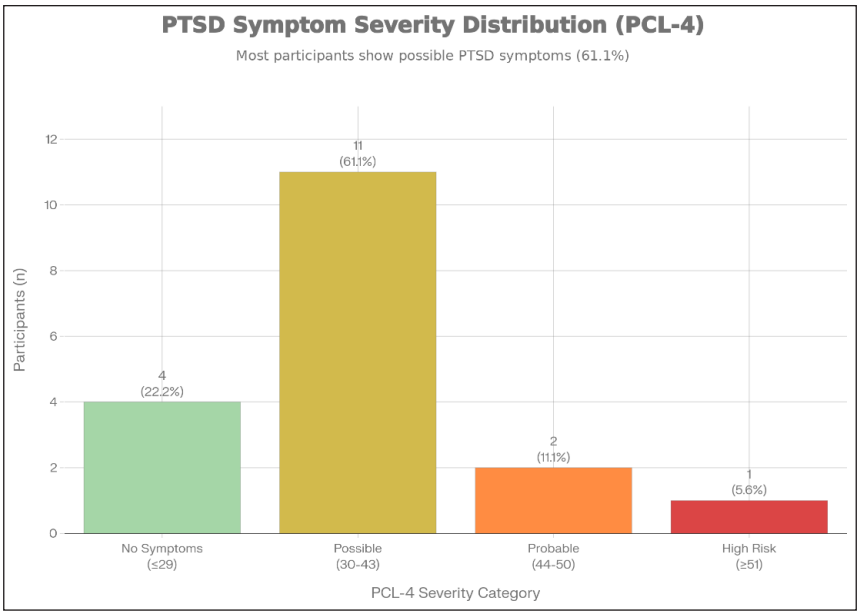

Figure 1 Distribution of PTSD Symptom Severity by PCL-4 Categories (n = 18).

Comparison by Group

Both doctors and support staff (including physical therapists, anesthesia technicians, soldiers, students, tutors, and part-time teachers) demonstrated vulnerability to PTSD symptomatology following disaster deployment. Doctors (n = 8, M = 36.7, SD = 4.79) and support staff (n = 10, M = 34.13, SD = 11.53) exhibited similar overall PCL-4 scores, with both groups screening into the "possible PTSD" range (30–43). An independent samples t-test indicated no statistically significant difference between occupational groups, t(16) = 0.59, p = .56, d = 0.28, 95% CI [–6.69, 11.83]. The small effect size suggests that PTSD symptom severity was comparable across occupational roles.

Length of Exposure Analysis

Participants were categorized as short-term responders (fewer than 6 days on-site; n = 7) or long-term responders (7 or more days on-site; n = 11). This division aligns with National Response Team (2009) disaster fatigue management guidelines, which recommend structured rotation cycles including 48 hours of recovery time after 14 consecutive days of work. The 6/7-day threshold approximates the point where cumulative fatigue and burnout risk significantly increase without adequate recovery periods (U.S. National Response Team, 2009).

First responders were stratified by duration of on-site deployment in Derna. Short-term responders (fewer than 6 days on-site; n = 7, M = 4.29 days, SD = 1.25) demonstrated significantly lower PCL-4 scores (M = 30.57, SD = 7.76) compared with long-term responders (7 or more days on-site; n = 11, M = 14.9 days, SD = 8.97; M = 38.73, SD = 7.21). An independent samples t-test indicated that this difference was statistically significant, t(16) = 2.27, p = .04, d = –1.22, 95% CI [–15.77 to –0.55]. The large effect size indicates that exposure duration is a clinically meaningful predictor of PTSD symptom severity. Short-term participants scored in the "no to possible PTSD" range, while long-term participants consistently demonstrated "possible PTSD" symptomatology, suggesting that cumulative exposure to disaster environments significantly increases psychological distress.

Years of experience

Years of experience as a first responder did not significantly predict PTSD symptom severity. First responders with ≤ 1 year experience (n = 6, M = 35.08, SD = 9.05) demonstrated similar PCL-4 scores to those with > 1 year experience (n = 12, M = 36.83, SD = 6.68). An independent samples t-test indicated no statistically significant difference between groups, t(16) = –0.47, p = .68, d = –0.23, 95% CI [–9.70,

6.20]. The negligible effect size suggests that prior disaster response experience does not substantially buffer against acute traumatic stress from exposure to the Derna floods, indicating that even experienced first responders are vulnerable to psychological distress in large-scale disasters.

Qualitative Results

We identified three themes across the qualitative data, arranged from immediate response through recovery.

Theme 1: Immediate Psychological Impact and Coping Initiation

Participants described intense initial shock characterized by overwhelming visual and emotional stimuli. One first responder noted, "You remain silent from the shock the whole time" (Participant #13). Initial coping was reactive and emotionally driven, with first responders employing immediate distancing strategies (silence, emotional detachment) as involuntary responses to the scale of destruction. Participants reported scenes of overturned vehicles, collapsed infrastructure, and mass casualties that far exceeded their expectations and psychological capacity to process immediately.

Theme 2: Adaptive vs. Maladaptive Coping Strategies in Daily Recovery

Coping strategies emerged along two trajectories. Adaptive approaches included social engagement, self-distraction, and active problem-solving. Participants employing adaptive strategies reported increased social interaction and help-seeking behaviors. Conversely, maladaptive strategies included isolation and avoidance of disaster-related conversations. One participant noted, "I usually prefer to go to sleep or distract myself with something else like the internet" (Participant #11), illustrating how self-distraction functioned across both categories depending on implementation.

Adaptive strategies were more prevalent among participants with minimal PTSD symptoms, while maladaptive strategies were distributed across higher severity categories (Table 3, Figure 2). This distribution suggests that coping strategy selection may serve as both a symptom indicator and potential intervention target for post-disaster recovery.

Coping Strategy	No PTSD (n = 4)	Possible PTSD (n = 11)	Probable/ High Risk (n = 3)
Adaptive Strategies			
Religion/Acceptance	1	3	0
Active Coping	1	1	0
Planning	1	0	0
Communication	1	1	0
Self-Distraction	0	3	1
Maladaptive strategies			
Avoidance	0	2	2
Isolation	0	3	0

Table 3 Cross-Tabulation of Coping Strategies by PTSD Symptom Severity.

3: RELIGIOUS AND SPIRITUAL COPING AS CULTURAL RESILIENCE FACTOR

Participants identified four primary spiritual practices supporting psycho-social well-being: prayer, Quranic engagement, mortality reflection, and communal worship.

Prayer and Supplication (Dua)

Nine participants emphasized prayer (dua) as a vital coping mechanism for managing stress and anxiety. Prayer functioned as a calming ritual that provided a sense of connection, reassurance, and personal agency during crisis. This act of spiritual submission offered participants a structured method for processing uncertainty and fear.

Quranic Engagement and Meaning-Making

Three participants reported that reading or listening to the Quran provided spiritual support and helped them interpret their experiences within a meaningful religious framework. Combined with reflection on mortality and life's transience, this practice fostered deeper spiritual purpose and resilience.

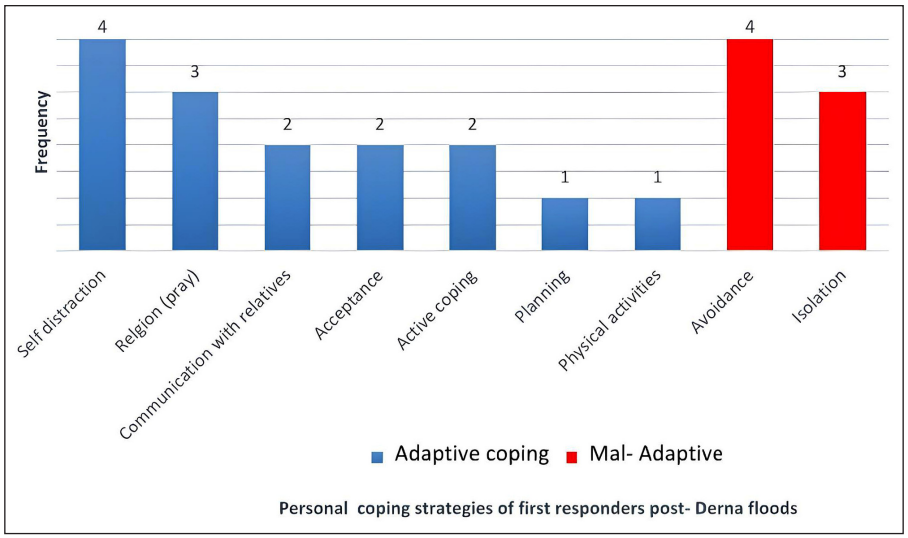

Figure 2 Distribution of Coping Strategies.

Communal Worship and Social Integration

Community-based spiritual practices (e.g., mosque attendance, congregational Quranic study) offered dual benefits: spiritual nourishment and social support. These activities reinforced belonging, shared purpose, and collective resilience factors critical for mental well-being during crisis recovery.

Clinical Significance

Across all four spiritual practices, religious faith emerged as a dominant protective coping mechanism among participants with minimal PTSD symptoms. Notably, as shown in Table 3, all participants who utilized religion and acceptance as coping mechanisms exhibited PTSD levels ranging from none to possible. These findings suggest religious and cultural practices warrant inclusion in post-disaster psycho-social interventions, particularly in populations where faith is a central identity component.

DISCUSSION

This study investigated coping mechanisms that promoted resilience among first responders following the Derna Floods Disaster. Participants detailed their coping strategies upon returning from the disaster. The findings highlight the dynamic and diverse nature of coping in such situations. Each of the respondents reported using at least one coping method, with self-distraction and avoidance being the most frequently cited mechanisms.

The absence of a statistically significant difference in PCL scores between doctors and support staff may be attributed to comparable exposure to trauma and stressors during deployment, combined with limitations related to sample size and the sensitivity of the PCL scale. While useful, the scale may not fully capture subtle differences in PTSD symptoms specific to each occupational group, thereby masking potential true differences in psychological impact.

In the Derna floods context, participants with deployment durations exceeding 7 days demonstrated significantly higher PTSD symptom severity, suggesting that adherence to evidence-based rotation schedules would mitigate cumulative psychological stress. It is important to consider that extended involvement in disaster response can lead to cumulative stress and burnout, thereby exacerbating PTSD symptoms and recovery.

The Risk-Hazard Cascade leads to systemic consequences. There is evidence of operational impacts with skill degradation in 22% of trauma-exposed providers (SAMHSA, 2018), leaving operational readiness uncertain for organizations. And at the end, premature workforce attrition (linked to untreated PTSD). In this small sample, almost 17% reconsidered their role as a first responder. The majority, however, reflect a resilient and dedicated workforce. However, the presence of even a small percentage of uncertainty highlights the need for ongoing attention to mental health and support services to ensure the long-term well-being of all first responders and organizations.

Intervention strategies to disrupt the cascade and limit suffering follow a revised Chain of Survival Behavior, see Figure 3. Effective approaches identified through research include resilience training and psychological first aid (aka Mental Health First Aid). McDonald et al. (2021) found that self-compassion programs reduced depersonalization by 18% and boosted compassion satisfaction. Trauma-informed shifts or scheduling seek to prevent trauma or mitigate its build-up (SAMHSA, 2018). Building peer support networks in the Plan & Prepare domain reduces emotional isolation.

Despite similar overall distress levels between doctors and support personnel, qualitative analysis revealed occupational nuances in coping strategy selection. Doctors favored adaptive coping mechanisms, including communication with relatives and acceptance of the event, whereas support staff more frequently employed active coping strategies and isolation. These occupational differences in coping approach, however, did not translate into differential psychological outcomes, suggesting that the disaster's psychological impact overwhelmed occupational-specific protective or risk factors. The comparable distress across occupational groups indicates that first responder vulnerability to PTSD is not substantially mediated by professional role or training level in large-scale disaster contexts.

This may inform organizational reforms, like mandatory mental health screening, to help within the domain of early recognition by the organization and the individual (Rowe et al., 2022). The integration of telehealth, offering 24/7 confidential counseling access, offers first aid and opportunities to establish advanced care through professionals. Peers and even the first responders themselves, trained in psychosocial or mental health first aid, can provide a safety net to identify signs and symptoms of acute or chronic stress and connect to resources (Schoultz, et. al., 2022).

In the Self-care/Advanced care and Resiliency domains, when asked about what coping mechanisms were challenging or ineffective, one-third responded that talking about it was not helpful or even harmful due to being retraumatized. Several of these people did find refuge in sports and spirituality. The question of cultural acceptance of talking about mental health and trauma needs further investigation. Talking socially or to non-mental health professionals could not be identified as a general strategy. No participants engaged in professional counseling.

Overall, the respondents' narratives illustrate that their religious beliefs and practices served as vital psychosocial resources, offering emotional support, fostering resilience, and instilling a sense of hope and acceptance in the face of life's uncertainties. In this culture, the sense of a divine presence led to the belief that Allah hears their prayers, fostering a deep sense of reassurance. This connection alleviated feelings of loneliness and despair, knowing that they were not alone in their struggles. This led to perseverance and understanding loss. For one person, it led to becoming less attached to worldly possessions.

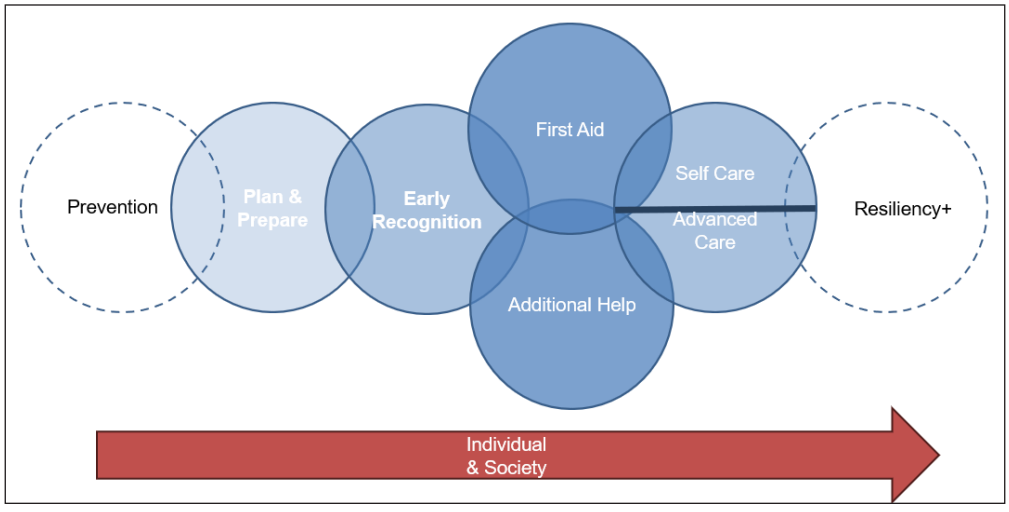

Figure 3 Revised Chain of Survival Behavior.

Psychologically, people benefited from these practices in developing a peace of mind through reassurance and comfort. Participant #15 described this as, "*Trusting in Allah and the feeling that everything is in His hands removes anxiety,"* while Participant #6 concluded, "*It calmed and softened the bitterness of the loss*."

This evidence underscores the critical need for systemic psycho-spiritual-social health protection in first responder organizations. Without intervention, the cascading effects of trauma exposure risk create a workforce unable to sustain its vital emergency response role. Proactive measures combining individual resilience-building with institutional support structures offer the most promising path forward but must be systematically devised, as through the Chain of Resiliency Behaviors of individuals and organizations, to interrupt the cascade and reduce sequela.

Limitations

We acknowledge several limitations of this project to help frame the veracity of recommendations and the opportunity to push forward on future research. The participants were selected through a convenience sampling method, which may limit the representativeness of the results. We did not explicitly ask questions regarding previous traumatic experiences or how they may have prepared, protected, or made individuals more vulnerable. Additionally, the sample size was relatively small, limiting the generalizability of our findings.

It is important to note that the PCL-4 functions as a screening instrument rather than a diagnostic tool; therefore, findings derived from this measure should be interpreted as indicators of symptom severity rather than definitive clinical diagnoses. Future research would benefit from a longitudinal approach, along with diagnostic tools, to know the onset and duration of symptoms and their impact on the quality of daily life.

Studying spiritual experiences is inherently difficult because they are often indescribable and transcend literal language, making it challenging for individuals to clearly express their inner changes. This difficulty is further compounded by the subjectivity of researchers, as their personal beliefs may influence and potentially skew their interpretation of these experiences. This work should be thought of as a snapshot in time, with no follow-up on coping strategies for psycho-spiritual-social health or other reflections on what was helpful in the long term.

Recommendations

Several recommendations emerge to enhance the preparedness and recovery of first responders. These include implementing a comprehensive training program, inclusive of planning for personal recovery and ongoing resources. Providing psychological support services and coping strategies, and resources, both during and after a disaster to mitigate longer-term psycho-spiritual-social trauma. This could also cascade to reduce stress on first responders' families and social relationships.

Organizations could incorporate training on adaptive coping strategies as part of their standard protocols for high-risk personnel. This training should cover specific techniques like creating a structured approach to a problem, taking direct action to deal with a stressor, and communicating with family, friends, and peers. Acknowledge and support the use of religious and spiritual coping mechanisms by providing resources or creating an environment where individuals feel comfortable utilizing their faith as a source of strength.

Further research is essential to identify protective factors among first responders that foster resilience and aid in recovery. The role of spirituality, specific to the Muslim faith, also needs further exploration as a practice and resource throughout the disaster life cycle. This will allow disaster managers an evidence base to solicit mental health professionals to develop targeted interventions that strengthen the resilience of their workforce and model psycho-spiritual-social health to vulnerable populations being served in disasters.

CONCLUSION

This study highlights the unique coping strategies of first responders within an Islamic cultural context after the 2023 Derna floods. Most responders showed possible or probable PTSD symptoms, with some at high risk. Adaptive coping methods like planning, active coping, social support, and religious practices were linked to fewer PTSD symptoms, while avoidance and isolation correlated with greater distress. Different responder groups showed distinct coping styles: doctors favored

communication and acceptance, support staff relied more on active coping and isolation. Doctors and support staff, however, exhibited similar PTSD risks. Longer exposure to the disaster increased PTSD symptoms, suggesting cumulative stress effects. The results call for targeted mental health interventions that promote adaptive coping, consider occupational roles, and exposure duration, to reduce long-term psychological impacts. These findings emphasize the need for targeted mental health interventions that promote adaptive coping and address occupational and exposure-related risk factors among first responders to mitigate the long-term psychological impact of disaster response and promote recovery.

ETHICAL APPROVAL

This research was approved by the Research Ethics Committee Board, Benghazi Medical Centre, NBC: 005. H. 24. 7.

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COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

ZA proposed the research idea. SF, ZA, AA, AK contributed to the initial conceptualization of the study. SF, ZA, AA developed the study design and methodology and drafted the initial manuscript. SF organized the questionnaire. AA, SF, ZA, Ak conducted the interviews, AA played a key role in this process. ZA and AK translated the responses from Arabic into English. JP, SF, ZA performed the data analysis. JP, SF, ZA interpreted the results, conducted the literature review, and led the main drafting of the manuscript. JP, SF designed the figures and tables. JP, SF, ZA, participated in manuscript editing. JP provided mentorship and guidance throughout the project. All authors read and approved the final version of the manuscript and share collective responsibility for its content and integrity.

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