

Post-Disaster PTSD, Psychological Resilience, and Coping Among Flood and Cyclone Survivors in India: A Multi-State Study of Determinants, Implications, and Recommendations

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Abstract

This study examined the prevalence, severity, and determinants of post-traumatic stress disorder (PTSD), and the protective roles of psychological resilience and coping behaviour, among 1,156 disaster survivors drawn from five Indian states — Kerala, Uttarakhand, Odisha, Assam, and Madhya Pradesh — who had been exposed to major flood and cyclone events between 2013 and 2022. Data were collected between January 2022 and June 2023 using three internationally validated instruments: the PTSD Checklist for DSM-5 (PCL-5), the Connor-Davidson Resilience Scale (CD-RISC-25), and the Brief COPE Inventory. Results indicated that 74.5% of survivors reported clinically significant PTSD symptoms, with 30.1% meeting criteria for severe PTSD. Resilience emerged as the strongest independent protective factor ($r = -0.68$, $p < .001$), partially mediating the relationship between disaster loss severity and PTSD. Adaptive coping strategies, particularly planning, acceptance, and active coping, were associated with lower PTSD, while maladaptive strategies — substance use, behavioural disengagement, and self-blame — were associated with substantially higher PTSD. PTSD and resilience were both socially patterned, with women, older adults, rural residents, low-income households, and widowed survivors bearing disproportionate psychological burden. Disaster type (flood versus cyclone) did not independently predict outcomes, whereas regional disparities in psychological profile tracked underlying differences in disaster-management infrastructure. A hierarchical regression model explained 53.6% of the variance in PTSD severity. These findings support Conservation of Resources theory, extend dynamic models of resilience, and contextualise the transactional model of coping within an Indian cultural setting. The study concludes with theoretical, policy, clinical, and future-research implications aimed at building an equity-centred, resilience-focused disaster mental health system in India.

Keywords: post-traumatic stress disorder; psychological resilience; coping; natural disasters; India; flood; cyclone; disaster mental health policy

1. Introduction

Natural disasters produce psychological consequences that frequently outlast the physical destruction they cause, yet disaster response systems in many low- and middle-income countries continue to prioritise physical reconstruction over psychological recovery. India, one of the most disaster-exposed countries in the world, experiences recurring floods and cyclones that displace millions of people and disrupt livelihoods, social networks, and community infrastructure. Despite this recurring exposure, the country lacks a comprehensive, evidence-based understanding of the psychological toll such disasters exact on survivors, and it lacks a dedicated policy architecture for addressing that toll.

This article reports the findings, implications, and recommendations of a large, multi-site study examining PTSD severity, psychological resilience, and coping behaviour among disaster survivors across five Indian states. The intellectual purpose of the study was to move beyond simply documenting the existence of post-disaster psychological distress and toward understanding its determinants, its structural social patterning, and its modifiability through protective mechanisms that can be targeted by intervention and policy. The study was guided by four theoretical traditions in disaster mental health and trauma psychology: Hobfoll's (1989, 2001) Conservation of Resources (COR) theory, dynamic and ecological models of resilience (Luthar et al., 2000; Masten, 2001; Southwick et al., 2014), Lazarus and Folkman's (1984) transactional model of stress and coping, and cross-hazard frameworks of disaster mental health (Goldmann & Galea, 2014).

The remainder of this article is organised as follows. Section 2 outlines the study's method. Section 3 presents the principal empirical findings. Section 4 discusses the theoretical implications of those findings. Sections 5 through 7 translate the findings into policy, clinical, and community-level recommendations. Section 8 discusses limitations and future research directions, and Section 9 concludes.

2. Method

The study employed a cross-sectional, quantitative design to examine PTSD severity, psychological resilience, and coping behaviour among 1,156 disaster survivors recruited from five Indian states — Kerala, Uttarakhand, Odisha, Assam, and Madhya Pradesh — who had experienced major flood ($n = 954$) or cyclone ($n = 201$) events between 2013 and 2022. Data collection took place between January 2022 and June 2023. Three internationally validated, standardised instruments were administered: the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013), which assesses the twenty DSM-5 symptoms of PTSD; the Connor-Davidson Resilience Scale (CD-RISC-25; Connor & Davidson, 2003), which measures psychological resilience across dimensions such as personal competence, tolerance of negative affect, and acceptance of change; and the Brief COPE Inventory (Carver, 1997), which assesses the frequency of use of fourteen adaptive and maladaptive coping strategies.

Analyses proceeded hierarchically. Bivariate associations were examined between PTSD, resilience, coping subscales, and socio-demographic and disaster-exposure variables. Mediation analyses with bootstrapped indirect-effect estimation examined whether resilience and coping mediated the relationship between disaster loss severity and PTSD, following the logic of Baron and Kenny (1986). Finally, a hierarchical multiple regression model was constructed, entering demographic variables, disaster-exposure variables, and protective psychological variables in sequential blocks to assess the incremental and combined explanatory power of each domain.

3. Results

3.1 PTSD Is a Population-Level Mental Health Burden

Of the 1,156 survivors sampled, 74.5% reported clinically significant PTSD symptoms (moderate or severe categories), and 30.1% met criteria for severe PTSD. The mean PCL-5 score for the sample was 30.8 ($SD = 15.7$), a value squarely within the moderate-to-severe range. Even in the longest-recovery subgroup (6–10 years post-disaster), the mean PCL-5 score remained clinically significant at 28.6, indicating that spontaneous recovery over time was insufficient for a large proportion of survivors.

3.2 Resilience Is the Dominant Protective Factor

Psychological resilience showed a strong, robust, and independent negative association with PTSD severity ($r = -0.68$, $p < .001$; partial $r = -0.61$ after controlling for loss severity; $\beta = -0.54$ in the final regression model). Resilience mediated 23.6% of the total effect of disaster loss severity on PTSD severity (bootstrapped indirect effect = 0.21, 95% CI [0.16, 0.27]). Resilience itself varied systematically with income, education, gender, age, loss severity, and coping behaviour, and declined progressively across loss-severity quartiles, from a mean of 56.4 in the lowest-loss quartile to 44.6 in the highest.

3.3 Coping Strategy Selection Amplifies or Attenuates Risk

Adaptive coping strategies — including planning ($r = -0.42$), acceptance ($r = -0.39$), and active coping ($r = -0.38$) — were consistently associated with lower PTSD severity. Maladaptive strategies — particularly substance use ($r = 0.64$), behavioural disengagement ($r = 0.58$), and self-blame ($r = 0.52$) — were strongly associated with higher PTSD. Adaptive coping partially mediated the resilience–PTSD relationship ($\beta = 0.24$ in the resilience model). The three most frequently used coping strategies overall were religion ($M = 6.4$), acceptance ($M = 6.2$), and emotional support ($M = 6.0$), reflecting the culturally embedded character of coping in Indian disaster-affected communities.

3.4 PTSD and Resilience Are Socially Patterned

Psychological outcomes were not randomly distributed across the sample but were systematically shaped by socio-demographic position. The following table summarises the principal subgroup differences observed.

Subgroup	Mean PTSD (PCL-5)	Mean Resilience (CD-RISC)
Female survivors	32.6 (vs. 28.6 males; $p < .001$)	49.2 (vs. 52.8 males; $p < .001$)
Older survivors (61+ years)	35.4	44.6
Rural residents	32.6 (vs. 27.2 urban; $p < .001$)	48.2 (vs. 55.2 urban)
Lowest income ($< ₹10,000/\text{month}$)	33.8	47.2
Illiterate survivors	34.2 (vs. 28.4 higher-educated; $p < .001$)	—
Widowed survivors	36.8 (highest of all groups)	44.8 (lowest of all groups)
Survivors with 6+ dependents	35.8	45.6

This patterning is consistent with Peek's (2008) structural vulnerability framework, which holds that disaster impact is filtered through pre-existing social inequalities.

3.5 Disaster Type Does Not Independently Predict Outcomes

No statistically significant differences were found between flood survivors ($n = 954$) and cyclone survivors ($n = 201$) on any primary outcome: PTSD ($F = 1.24$, $p = .266$), resilience ($F = 0.52$, $p = .470$), adaptive coping ($F = 0.38$, $p = .539$), or maladaptive coping ($F = 0.94$, $p = .332$). This null finding supports a psychosocial rather than hazard-specific explanation of disaster mental health outcomes.

3.6 Regional Disparities Reflect Structural Differences

Kerala showed the most favourable psychological profile across all outcomes: lowest PTSD ($M = 26.4$), highest resilience ($M = 54.8$), highest adaptive coping ($M = 44.2$), and lowest loss severity ($M = 18.6$). Madhya Pradesh and Assam showed the most adverse profiles. Notably, Uttarakhand — despite high disaster severity and the

oldest mean time since disaster (9.8 years) — showed the highest resilience in the sample ($M = 56.4$), suggesting that temporal recovery, community social capital, and culturally specific resilience resources can substantially attenuate long-term psychological burden.

3.7 An Integrated Model Achieves High Explanatory Power

The final hierarchical regression model achieved an R^2 of 0.536, explaining 53.6% of variance in PTSD severity. Explanatory power increased across sequential blocks: demographic variables alone explained 8.9% of variance ($R^2 = 0.089$), disaster-exposure variables raised this to 26.8% ($R^2 = 0.268$), and the addition of protective psychological factors raised the total to 53.6% ($R^2 = 0.536$). This stepwise architecture demonstrates that no single domain explains PTSD outcomes adequately, and that an integrated, multi-domain approach yields the most explanatory and clinically actionable framework.

4. Discussion: Theoretical Implications

4.1 Advancing Conservation of Resources Theory

Hobfoll's (1989, 2001) Conservation of Resources (COR) theory received strong empirical support. COR theory's central prediction — that psychological disorder is most likely when valued resources are lost or threatened — was confirmed by the robust association between loss severity and PTSD ($r = 0.52$), by the depletion of resilience under conditions of high loss (loss severity $\beta = -0.18$ in the resilience model), and by the mediation of 23.6% of the loss–PTSD pathway through resilience erosion. These findings operationalise COR theory's 'loss spiral' concept within a large, real-world disaster-survivor context (Hobfoll et al., 2007), and the dose-response income–PTSD and rural–urban gradients extend the theory's applicability to low-to-middle-income settings in South Asia, where resource-caravan conditions are structurally constrained by poverty, agricultural dependence, and limited institutional infrastructure.

4.2 Refining Dynamic Resilience Theory

This study provides large-sample quantitative evidence for resilience as a dynamic, contextually sensitive process rather than a fixed personality trait. Significant variation in resilience by income, gender, age, education, loss severity, and region contradicts purely dispositional models of resilience and aligns with ecological-systems perspectives (Luthar et al., 2000; Masten, 2001; Southwick et al., 2014). The progressive decline of resilience across loss-severity quartiles provides empirical grounding for the concept of 'resilience depletion' under extreme adversity, suggesting that resilience-focused interventions should be calibrated to disaster impact severity rather than delivered as a uniform, one-size-fits-all programme. The bidirectional regression findings — PTSD predicting resilience and resilience predicting PTSD — further advance Agaibi and Wilson's (2005) argument that PTSD and resilience are interlocking, mutually reinforcing dimensions of post-traumatic adjustment rather than simple opposites on a single continuum.

4.3 Contextualising the Transactional Coping Model in India

Lazarus and Folkman's (1984) transactional model of stress and coping was both supported and culturally extended. The model's core prediction — that coping mediates the relationship between stressor appraisal and psychological outcomes — was confirmed by the strong differential associations of adaptive and maladaptive coping with PTSD. However, the model's historically Western orientation receives important contextual qualification: in the Indian disaster setting, emotion-focused, spiritually grounded, and collectively embedded

coping strategies — religion, acceptance, and emotional support — were dominant, protective, and culturally legitimate, rather than signs of passive failure to manage stressors. This is consistent with Pargament's (1997) framework of spiritual coping as a primary regulatory resource in the face of catastrophic, uncontrollable loss, and calls for the explicit incorporation of cultural context into coping theory and assessment.

4.4 Supporting a Unified, Cross-Hazard Model of Disaster Mental Health

The null finding on disaster type supports a unified theoretical model of disaster mental health that transcends hazard-specific frameworks, challenging the assumption in some disaster psychology literature that different disaster types produce qualitatively distinct psychological responses (Goldmann & Galea, 2014). Instead, the evidence points toward a common psychosocial mechanism — loss severity, social resource availability, and individual protective capacity — that operates similarly across disaster types and should organise both research and intervention design.

5. Policy Implications

5.1 The Need for a National Disaster Mental Health Policy Framework

India currently lacks a comprehensive, dedicated national policy addressing the mental health consequences of natural disasters. The finding that 74.5% of survivors across five states reported clinically significant PTSD symptoms, years after the precipitating events, makes a compelling case for a National Disaster Mental Health Policy that would:

- Mandate standardised psychological screening (using validated tools such as the PCL-5) as a routine component of post-disaster rapid needs assessments
- Establish minimum mental health service standards for disaster response at district and block levels
- Allocate dedicated funding streams for post-disaster psychosocial support, separable from general health emergency budgets
- Integrate mental health indicators — PTSD prevalence, resilience levels, coping profiles — into national disaster impact assessment frameworks alongside physical and economic damage metrics

The World Health Organization's Comprehensive Mental Health Action Plan 2013–2030 (WHO, 2021) specifically calls for the integration of mental health into disaster risk reduction frameworks, a call that the present evidence strongly supports and operationalises for the Indian context.

5.2 Equity-Centred Resource Allocation

The social patterning of PTSD and resilience — with women, older adults, rural residents, low-income households, and widowed survivors bearing the greatest burden — demands a fundamental reorientation of disaster mental health resource allocation toward those with the highest burden and the lowest access. This requires that post-disaster assessments routinely collect socio-demographic data to identify high-burden subgroups, that outreach programmes actively prioritise rural communities, and that gender-responsive trauma services be established. This is consistent with the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR, 2015), which calls for inclusive, equitable, and accessible disaster risk reduction strategies that reach the most marginalised.

5.3 Integrating Economic Recovery and Mental Health Programming

The dose-response relationship between household income and both PTSD severity and resilience implies that economic recovery functions as a mental health intervention. Policy implications include framing cash-transfer and livelihood-restoration programmes as integral components of psychosocial recovery, routinely measuring household economic recovery alongside mental health indicators in Disaster Needs Assessments, and incorporating provisions for ongoing livelihood support — not merely one-time compensation — within India's National Disaster Response Fund.

5.4 Strengthening Disaster Preparedness Infrastructure

Kerala's significantly better psychological outcomes, despite severe flood exposure, confirm the systemic value of robust disaster preparedness, early warning systems, and organised post-disaster rehabilitation. Investment in preparedness infrastructure generates mental health returns as well as physical safety returns; the National Disaster Management Authority should therefore integrate psychosocial resilience outcomes as a performance metric for state-level disaster preparedness ratings.

6. Recommendations for Clinical Practice

The findings yield eight evidence-grounded recommendations for mental health clinicians, social workers, and healthcare professionals working in disaster-affected communities.

1. Systematic PTSD screening using validated, culturally adapted tools (e.g., the PCL-5 in regional languages) at three standard intervals — within 30 days, at six months, and at twelve months post-disaster — embedded within primary healthcare encounters rather than confined to specialist settings (Foa et al., 2009).
2. Prioritised trauma-focused treatment — including TF-CBT, Prolonged Exposure, and EMDR — for high-risk groups such as widowed survivors, those with three or more family bereavements, survivors with complete livelihood loss, and the lowest income bracket.
3. Structured, community-based resilience-building programmes — self-efficacy enhancement, emotional regulation training, social support mobilisation, and problem-solving skills — deployed within the first three months of disaster response, drawing on Masten's (2001) ordinary magic framework.
4. Targeted coping-skills interventions addressing maladaptive coping, particularly substance use, behavioural disengagement, and self-blame, using Carver's (1997) Brief COPE framework as a scalable clinical template.
5. Culturally adapted service delivery that complements rather than displaces religious and community-based coping resources, including collaboration with religious leaders, local healers, and community organisations (Pargament, 1997).
6. Long-term follow-up services sustained for at least five years post-disaster, given that clinically significant PTSD persisted 6–10 years after the precipitating event.
7. Caregiver-specific support for survivors with high dependent burden (6+ dependents), a group shown to carry both elevated PTSD and depleted resilience.
8. Gender-responsive programming addressing women's specific vulnerabilities, including protection against post-disaster gender-based violence, caregiver-burden reduction, economic empowerment, and women-led support groups.

7. Recommendations for Disaster Management Agencies and Community Organisations

- Pre-disaster resilience building: India's community disaster-preparedness programmes (e.g., NDMA's Community-Based Disaster Risk Management) should explicitly incorporate mental health literacy, stress management, and social-support strengthening as core preparedness activities (Hobfoll et al., 2007).
- Training of frontline workers in Psychological First Aid (PFA): NDRF personnel, ASHA workers, Anganwadi workers, and panchayat officials should receive mandatory PFA training as a standardised, non-clinical, scalable method of initial emotional support (WHO, 2011).
- Community-based psychosocial support networks: village-level peer support groups, facilitated by trained volunteers and supervised by mental health professionals, should be established in disaster-prone areas as a sustainable, culturally embedded support model (Tol et al., 2011).
- Mental Health Impact Assessments: major disaster events should trigger a standardised, rapid assessment within 72 hours of stabilisation, disaggregated by gender, age, income, and residential location to guide equitable resource allocation.

8. Limitations and Directions for Future Research

As with any cross-sectional design, causal inference is constrained: while mediation analyses clarify statistical pathways among loss severity, resilience, coping, and PTSD, only longitudinal data can establish temporal precedence and true causal direction. The reliance on self-report instruments, although validated and internationally standardised, may also be subject to recall and social-desirability biases, particularly for sensitive constructs such as substance use and self-blame. With these limitations in view, seven concrete directions for future research follow from the present findings.

9. Prospective longitudinal studies employing multi-wave designs to track survivors from the immediate post-disaster phase through long-term recovery, essential for establishing causal pathways and testing whether interventions produce durable change (Norris et al., 2002).
10. Randomised controlled trials of resilience-building interventions, given that resilience was the strongest modifiable predictor of PTSD, evaluating both individual (CBT-based) and community-based (peer-support, faith-integrated) programme models.
11. Mixed-methods and qualitative research to illuminate the lived experience of resilience and coping, how survivors construct meaning from disaster loss, how religious coping is practised, and what structural barriers prevent help-seeking.
12. Cross-cultural and cross-national comparative studies against other disaster-prone low-to-middle-income countries (e.g., Bangladesh, Nepal, the Philippines) to advance understanding of cultural universality versus specificity in disaster mental health.
13. Integration of biomarkers and neurobiological measures — salivary cortisol, inflammatory cytokines, telomere length, neuroimaging — to establish the biological pathways through which resilience and coping moderate PTSD.
14. Pre-disaster baseline cohort studies in high-risk disaster zones, enabling change-score analyses and the strongest available causal evidence for the role of pre-disaster resilience and coping.

15. Research on disaster mental health service utilisation, examining the roles of stigma, geographic access, cultural acceptability, and cost in explaining disparities in service uptake.

9. Original Contributions of the Study

- Empirical contribution: one of the largest multi-site, multi-disaster quantitative studies of post-disaster PTSD, resilience, and coping conducted in India (N = 1,156), filling a significant gap in the South Asian disaster mental health literature.
- Theoretical contribution: the first large-sample empirical test of Hobfoll's (1989, 2001) Conservation of Resources theory in the specific context of Indian disaster survivors, extended across diverse disaster types, regions, and demographic groups.
- Methodological contribution: a hierarchical mediation–regression analytical design employing three validated instruments with bootstrapped indirect-effect estimation, offering a template for integrated bio-psychosocial disaster mental health research in low-resource settings.
- Policy contribution: systematic documentation of the socio-demographic patterning of PTSD and resilience, identifying income, gender, age, and residence as powerful structural moderators and providing a framework for equity-centred disaster mental health policy.
- Cultural contribution: documentation of religion, acceptance, and communal emotional support as dominant, protective coping strategies, challenging Western-centric coping models and positioning indigenous spiritual and social resources as legitimate objects of clinical and policy attention.

10. Conclusion

The psychological aftermath of natural disaster is not an inevitable, fixed, or uniform consequence of exposure. It is shaped, modulated, and potentially transformed by the quality of individuals' psychological resources, the character of their coping strategies, the depth of their social and economic safety nets, and the responsiveness of the institutions and communities within which their recovery unfolds. This study has demonstrated, with considerable statistical precision and theoretical grounding, that resilience is the most powerful single determinant of post-traumatic psychological outcomes in disaster-affected populations — more influential in the final model than even the severity of objective disaster loss.

This conclusion carries a message of both urgency and possibility. The urgency lies in the scale of unmet need: 74.5% of survivors in this study carried clinically significant psychological distress, often years after their disaster, often without access to formal support, and in communities that lacked even the most basic mental health infrastructure. The possibility lies in resilience's demonstrated malleability: it varies with income, education, coping behaviour, and social context — all of which are, to varying degrees, modifiable. It can be strengthened.

Psychological recovery after disaster is not a luxury. It is a precondition for economic recovery, family functioning, community rebuilding, and the sustainable restoration of normal life. An India that invests systematically in the psychological resilience and mental health of its disaster-affected communities will not only reduce suffering — it will accelerate the full range of human and developmental recovery outcomes that disaster events so profoundly disrupt. As Masten (2001, p. 227) observed, resilience does not require extraordinary resources or exceptional individuals; it requires the recognition, cultivation, and equitable distribution of the ordinary human capacities for adaptation that are available, but not always accessible, to those who have suffered most.

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