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Impact of Flood Anxiety & Climate Stress on Mental Health in Riverine Areas of Patna

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Abstract

Climate change-induced flooding poses persistent physical, social, and psychological challenges for communities living along major river systems in India. This study examines the impact of flood anxiety and climate-related stress on mental health outcomes among residents of riverine areas in Patna, Bihar—a region experiencing recurrent monsoon flooding, riverbank erosion, and livelihood disruption. Using a cross-sectional survey design, data were collected from 100 adults residing in high- and moderate-risk flood zones. Standardised instruments measuring flood anxiety, climate stress, generalised anxiety (GAD-7), depressive symptoms (PHQ-9), and sleep disturbance were administered. Results indicated moderate to high levels of flood anxiety and climate stress across the sample, with significantly elevated anxiety, depression, and sleep disturbances among individuals living in high-risk zones. Correlation analyses demonstrated strong associations between environmental stressors and mental-health indicators, while regression findings showed that flood anxiety and climate stress together accounted for 46% of the variance in psychological distress. The study highlights the substantial psychological burden experienced by Patna's riverine communities and emphasises the need to integrate mental-health support, climate-sensitive policies, and community resilience strategies into disaster management frameworks in Bihar. These findings contribute important empirical evidence to the emerging literature on climate-related psychological distress in low-income, high-exposure settings.

Keywords: *Flood Anxiety; Climate Stress; Mental Health; Riverine Communities; Patna; Climate Change; Environmental Vulnerability; Depression; Anxiety Disorders*

1. Introduction

Climate change has emerged as one of the most significant determinants of population health in the twenty-first century, with growing evidence that its impacts are not limited to physical morbidity and mortality but extend deeply into the psychological domain. Global scoping and narrative reviews indicate that climate-related hazards such as floods, cyclones, droughts, heatwaves, and glacial lake outburst floods are associated with increased risks of anxiety, depression, post-traumatic stress disorder (PTSD), suicidal ideation, and a wide range of subclinical distress reactions. Mental-health consequences may arise both acutely—during and immediately after extreme events—and chronically, through prolonged displacement, livelihood disruption, and anticipatory worry about future hazards.

In recent years, the concept of “climate anxiety” or “eco-anxiety” has gained prominence to describe the emotional, cognitive, and behavioural responses to perceived climate threats. Emerging empirical work suggests that climate anxiety—typically characterised by worry about environmental degradation, rumination about the future, functional impairment, and feelings of helplessness—shows significant associations with anxiety, depressive symptoms, and sleep disturbance, particularly among younger populations. While such work has largely arisen from high-income settings, recent reviews underscore that low- and middle-income countries, including India, are likely to bear a disproportionate share of the psychological burden due to higher exposure and lower adaptive capacity.

India is widely recognised as one of the world’s most climate-vulnerable countries, with a dense population, rapidly urbanising river basins, and high dependence on climate-sensitive livelihoods. Extreme precipitation events, riverine floods, and slow-onset phenomena such as riverbank erosion and sea-level rise increasingly affect both rural and urban communities. Narrative and scoping reviews focused on India document elevated rates of anxiety, depression, stress, and PTSD following events such as cyclones in Odisha, floods in Kerala and Assam, and landslides in Wayanad; they also highlight that mental health remains marginal in national climate and disaster policy.

Within this broader landscape, Bihar—particularly the Ganga basin and its northern tributaries—has repeatedly been identified as one of the most flood-prone regions of India. Hydro-climatic analyses of North Bihar describe recurrent monsoon floods, high vulnerability, and substantial livelihood losses, with embankment-enclosed diara and Kosi sub-basin communities facing chronic environmental injustice and heightened physical and psychosocial risk. While this body of

work notes the “mental well-being” consequences of repeated flooding, systematic psychological assessment remains scarce.

Patna, the state capital, is situated along the southern bank of the Ganga and influenced by tributaries such as the Punpun and Sone. Official reports and recent news coverage highlight recurring high flood situations at Digha, Gandhi Ghat, and Hathidah, as well as flood threats in low-lying urban areas along the Ganga and Punpun. Thousands of residents from diara belts and riverbank settlements—including portions of Athmalgola, Barh, Danapur, Mokama, Kurji Bind Tola, and stretches along the J. P. Ganga Path—have periodically been displaced by river encroachment and monsoon flooding, often living for weeks in makeshift shelters with limited services. Such conditions are likely to foster chronic anticipatory fear of flooding (“flood anxiety”), uncertainty about housing and livelihoods, and broader climate-related stress, including worry about changing monsoon patterns and long-term river behaviour.

Despite this context, there is a paucity of empirical psychological research focusing specifically on riverine communities in Patna. Existing climate-mental health reviews from India predominantly emphasise coastal zones, cyclone-affected states, or heat-prone urban centres, with relatively little attention to the mental health of populations living along major river systems in the eastern Indo-Gangetic plain. In particular, the construct of “flood anxiety”—as distinct from generalised anxiety or PTSD—has not yet been systematically explored in this setting, nor have the mental-health correlates of “climate stress” understood as ongoing strain linked to climate variability and environmental uncertainty.

Against this backdrop, the present study investigates the “Impact of Flood Anxiety & Climate Stress on Mental Health in Riverine Areas of Patna.” By quantitatively assessing flood-specific anxiety, climate-related stress, and core mental-health indicators (anxiety, depression, and sleep disturbance) among adults residing in high- and moderate-risk flood zones, the study seeks to (a) document the psychological burden in these communities, (b) examine how environmental stressors relate to mental-health outcomes, and (c) contribute context-specific evidence to inform climate-sensitive mental health and disaster-risk reduction strategies in Bihar.

2. Review of Literature

2.1 Climate Change, Extreme Weather, and Mental Health

A growing corpus of international literature demonstrates that climate change and extreme weather

events have complex yet consistently adverse effects on mental health. Scoping and narrative reviews identify a spectrum of outcomes ranging from acute stress reactions and subclinical distress to clinically significant anxiety disorders, depression, PTSD, substance use, and suicidality. For instance, Charlson et al. (2021) synthesise evidence linking floods, droughts, and heatwaves with increased psychological morbidity and emphasise that poorer and marginalised populations are disproportionately affected. Cianconi et al. (2020) similarly argue that climate change-related events can precipitate both direct trauma (e.g., witnessing loss of life or property) and indirect stressors such as displacement, economic insecurity, and erosion of social networks, all of which contribute to long-term mental-health sequelae.

Lawrance et al. (2022) highlight that extreme weather and climate events are associated with increased diagnoses of PTSD, depression, anxiety, and “extreme psychological distress,” noting that these impacts often persist long after the physical event has ended. More recent reviews focusing specifically on the relationship between climate change and mental health underscore that eco-anxiety and climate worry are increasingly common, and that these phenomena can coexist with hope and motivation for climate action.

In the Indian context, narrative and scoping reviews have begun to consolidate evidence on climate-related mental-health outcomes. Ansari et al. (2024) report that higher perception of climate change is associated with anxiety, depression, stress, adjustment difficulties, and in some cases suicidal thoughts among Indian populations exposed to environmental hazards. A recent narrative review on climate change and mental health in India further documents PTSD, depressive symptoms, and distress among communities affected by floods, cyclones, and landslides, while arguing that mental health remains under-represented in climate adaptation and disaster-management policies.

Media and policy reports complement this academic evidence by describing hidden or delayed mental-health crises in the aftermath of disasters. For example, Indian experts interviewed by national media emphasise that repeated disasters and prolonged displacement fuel depression, anxiety, and PTSD, especially among low-income and younger populations. Similar narratives have been documented after glacial floods and riverine disasters in other Himalayan and South Asian settings.

2.2 Eco-Anxiety, Climate Stress, and Their Measurement

Eco-anxiety-or climate change anxiety-has been conceptualised as a multidimensional **emotional**

response to climate change, encompassing worry, fear, rumination, grief, anger, and functional impairment. Early measurement efforts include the Climate Change Anxiety Scale (CCAS) developed by Clayton and Karazsia, a 22-item instrument that assesses emotional responses, cognitive and functional impairment, and behavioural engagement related to climate change. Subsequent work has debated the optimal factor structure and shortened the scale in different cultural contexts.

Parallel developments involve the Hogg Eco-Anxiety Scale (HEAS-13), which measures four dimensions-affective symptoms, rumination, behavioural symptoms, and anxiety about one’s own environmental impact. Validation studies in Europe and elsewhere show that eco-anxiety is positively associated with general anxiety and depressive symptoms but can also be linked to pro-environmental behaviour and political engagement, suggesting a complex interplay between distress and agency.

Although most eco-anxiety research originates in high-income countries, recent work in Indian samples indicates rising climate anxiety, especially among youth. These studies report that climate anxiety co-occurs with feelings of helplessness, sleep difficulties, and concentration problems, and may influence life decisions, such as concerns about having children. However, there is limited empirical exploration of climate anxiety in low-income, high-exposure communities, such as those facing recurrent floods along major rivers, where climate stress is tightly linked to material survival rather than only global environmental concern.

The present study draws conceptually on the eco-anxiety literature but focuses more specifically on “flood anxiety”(anticipatory fear and worry related to riverine flooding) and “climate stress”(ongoing psychological strain linked to climate variability and extreme weather patterns). These constructs are understood as context-specific manifestations of broader climate-related distress, shaped by repeated exposure to flooding, displacement, and socio-economic vulnerability in riverine Patna.

2.3 Flood Disasters and Mental Health: Global and South Asian Evidence

Floods are among the most frequent climate-related disasters worldwide and have been widely implicated in mental-health morbidity. Cross-sectional and longitudinal studies in different countries report elevated rates of PTSD, depression, anxiety, and stress among flood-affected populations, often persisting months or years after the event.

In South Asia, where high population density coincides with major river basins, such impacts can be particularly pronounced. Asim and colleagues have documented significant prevalence of PTSD, anxiety, and depression among flood-affected communities in the Indian subcontinent, with socio-economic status, severity of exposure, and loss of livelihood emerging as strong predictors of mental-health outcomes. Studies of the 2018 Kerala floods, for example, found substantial levels of depression, anxiety, and stress among primary survivors, alongside variable resilience, highlighting the importance of social support and coping mechanisms. Comparative and region-specific analyses similarly show that flood exposure can lead to enduring emotional distress, with adolescents and young adults reporting heightened depression, anxiety, and stress in severely affected areas.

Beyond formal research, journalistic and policy accounts from Pakistan, Spain, and other flood-prone regions reveal narratives of persistent fear when it rains, nightmares, panic attacks, aquaphobia, and grief reactions, underlining the durable psychological imprint of catastrophic floods. These accounts mirror anecdotal reports from Indian flood contexts, yet systematic measurement of such experiences remains limited in many high-risk regions.

2.4 Flood Risk, Vulnerability, and Environmental Justice in Bihar

Bihar's flood ecology is shaped by the Ganga and its northern tributaries (including the Kosi, Gandak, and Bagmati), which carry large monsoon flows from the Himalayas and often overflow embankments and low-lying plains. Quantitative flood-risk zonation studies identify North Bihar as one of India's most severely flood-affected regions, with high hazard and vulnerability indices and repeated loss of life, crops, and infrastructure.

Qualitative work on the Kosi sub-basin further highlights environmental injustice, showing that historically marginalised communities living inside or near embankments experience disproportionate flood exposure and erosion-related displacement, with profound effects on their physical and mental well-being. Joint rapid needs assessments (JRNA) for Bihar floods similarly note increased vulnerability and mention mental-health problems among affected communities, though without detailed psychological measurement.

In and around Patna, official and media reports document recurrent high flood levels at key river gauges, extended waterlogging in low-lying neighbourhoods, and periodic displacement of thousands of households from diara and riverbank

settlements to temporary shelters along elevated infrastructure such as the J. P. Ganga Path. These dynamics generate chronic livelihood insecurity, housing instability, and disruption of education and health services, all of which are established social determinants of mental health.

Despite this high-risk context, very few empirical studies have specifically assessed anxiety, depression, or sleep disturbance in Bihar's flood-affected urban and peri-urban riverine communities. Existing environmental and social studies tend to focus on hazard mapping, hydrological patterns, or livelihood impacts, with mental health appearing only as an implicit or secondary concern. This gap underscores the need for primary psychological research in the region.

2.5 Identified Gaps and Rationale for the Present Study

The literature reviewed above suggests several key gaps that the present study seeks to address:

1. Under-representation of Indian riverine urban contexts:
2. While climate-mental health research in India is expanding, much of it focuses on coastal cyclones, heatwaves, or rural agrarian communities, with comparatively little attention to urban riverine settings such as Patna.
3. Lack of construct-specific work on "flood anxiety" and "climate stress":
4. Although eco-anxiety and climate anxiety have been conceptualised and measured in multiple countries, there is limited empirical focus on flood-specific anticipatory anxiety and contextual climate stress among populations living with recurrent riverine flooding in low-income settings.
5. Scarcity of quantitative data from Bihar:
6. Existing Bihar-specific work acknowledges mental-health concerns but rarely incorporates validated psychiatric or psychological scales to quantify anxiety, depression, or sleep problems in flood-affected groups.
7. Limited integration of climate-related distress with disaster exposure:
8. Most Indian studies treat disaster-related PTSD or depression separately from broader climate worries, without examining how event-specific exposure (e.g., floods) and ongoing climate stress jointly shape mental-health outcomes.

The present study responds to these gaps by empirically examining the impact of flood anxiety and

climate stress on mental health among adults living in riverine areas of Patna, using standardised measures of anxiety, depression, and sleep disturbance alongside context-specific indices of environmental stress. By comparing high- and moderate-risk flood zones, it aims to generate evidence that is both locally grounded and conceptually linked to the wider climate-mental health and eco-anxiety literature.

3. Methodology

3.1 Research Design

The present study employed a cross-sectional, descriptive survey design to examine the impact of flood-related anxiety and climate-induced stress on mental health outcomes among residents of riverine areas of Patna. This design was considered appropriate for assessing psychological variables as they exist naturally within the population.

3.2 Sample

The study comprised 100 adult participants (aged 18–60 years) residing in flood-prone riverine localities of Patna, including Digha–Diara, Patna City riverbank areas, Kurji, and the Punpun belt. Eligibility required a minimum of three years of residence in the locality and exposure to at least one significant flood or waterlogging event. Efforts were made to ensure representation across gender and socio-economic backgrounds.

3.3 Sampling Technique

A purposive sampling strategy was utilised to select respondents from both high-risk and moderate-risk flood zones. Households within selected clusters were approached systematically, and one eligible adult per household was included in the study.

3.4 Instruments

Data were collected using the following standardised tools:

- Flood Anxiety Scale (adapted) – to measure anticipatory and situational anxiety related to flooding.
- Climate Stress Scale (adapted) – to assess psychological stress arising from climate variability.
- GAD-7 – for evaluating generalised anxiety symptoms.
- PHQ-9 – for assessing depressive symptomatology.
- Short Sleep Quality Index – to measure sleep disturbance.

- Demographic and Flood Exposure Schedule – to record socio-demographic characteristics and past flood experiences.

All instruments were administered in Hindi to ensure comprehension.

3.5 Procedure

Data collection was conducted through household visits, during which the purpose of the study was explained and informed consent obtained. Participants completed the questionnaires individually; those with limited literacy were assisted by the researcher. Each administration required approximately 20–25 minutes.

3.6 Ethical Considerations

The study adhered to ethical principles of voluntary participation, confidentiality, and anonymity. Participants retained the right to withdraw at any stage, and data were utilised solely for academic purposes.

3.7 Data Analysis

Data were analysed using descriptive statistics, independent-sample t-tests, and Pearson's correlation coefficients to examine the associations between flood anxiety, climate stress, and mental-health indicators.

4. Results

The present study examined the impact of flood anxiety and climate-related stress on mental health indicators—namely generalized anxiety, depressive symptoms, and sleep disturbance—among residents of riverine areas of Patna. Data from 100 participants were analysed using descriptive statistics, independent-samples t-tests, and Pearson's correlations.

4.1 Descriptive Statistics

Table 1 presents the means and standard deviations of the major study variables. Participants demonstrated moderate to high levels of both flood anxiety and climate stress. Mental-health outcomes such as anxiety, depression, and sleep disturbance also showed elevated scores.

Table 1: Descriptive Statistics of Study Variables (N = 100)

Variable	Mean (M)	Standard Deviation (SD)
Flood Anxiety	29.84	6.21

Climate Stress	32.47	5.89
Generalized Anxiety (GAD-7)	11.62	4.78
Depressive Symptoms (PHQ-9)	12.15	5.34
Sleep Disturbance	7.42	2.81

Interpretation:

- Flood anxiety and climate stress are relatively high in the sample.
- Mental-health indicators fall within the moderate symptomatic range, indicating significant psychological burden among riverine residents.

4.2 Comparison Between High-Risk and Moderate-Risk Flood Zones

Independent-samples t-tests were conducted to examine whether participants from high-risk flood zones differed significantly from those in moderate-risk zones.

Table 2: Group Differences on Key Variables

Variable	High-Risk Zone (n = 50) M(SD)	Moderate-Risk Zone (n = 50) M(SD)	t-value	p-value
Flood Anxiety	32.10 (5.94)	27.58 (5.88)	3.72	.000
Climate Stress	34.02 (5.41)	30.92 (6.01)	2.67	.009
Generalized Anxiety	13.04 (4.52)	10.20 (4.67)	3.11	.002
Depressive Symptoms	13.52 (5.08)	10.78 (5.28)	2.50	.014
Sleep Disturbance	8.02 (2.67)	6.82 (2.82)	2.16	.033

Interpretation:

- Participants in high-risk flood zones scored significantly higher on flood anxiety, climate stress, anxiety, depression, and sleep disturbance.
- This indicates that geographical exposure to recurrent flooding plays a crucial role in psychological distress.

4.3 Correlation Analysis

Pearson’s correlation coefficients were computed to explore associations among the variables.

Table 3: Correlation Matrix of Major Variables

Variables	1	2	3	4	5
1. Flood Anxiety	—	.62*	.54*	.49*	.41*
2. Climate Stress	.62*	—	.57*	.45*	.38*
3. Generalized Anxiety	.54*	.57*	—	.66*	.52*
4. Depressive Symptoms	.49*	.45*	.66*	—	.47*
5. Sleep Disturbance	.41*	.38*	.52*	.47*	—

p < .01 (*) significant

Interpretation:

- Flood anxiety strongly correlates with climate stress (r = .62), suggesting that individuals worried about river flooding are also stressed by climate variability.
- Flood anxiety and climate stress show strong positive correlations with generalized anxiety and depression, confirming that environmental stressors substantially affect mental health.
- Moderate correlations with sleep disturbance indicate that climate-related worry disrupts sleep patterns, contributing to cumulative stress.

4.4 Regression Analysis

A multiple regression analysis was conducted to determine whether flood anxiety and climate stress jointly predict overall mental-health outcomes.

Table 4: Regression Model Predicting Mental Health (Anxiety + Depression Composite Score)

Predictor	β	t	p-value
Flood Anxiety	.38	4.12	.000
Climate Stress	.42	4.58	.000
R ² = .46, F(2,97) = 41.05, p = .000			

Interpretation:

- Flood anxiety and climate stress jointly explain 46% of the variance in mental-health symptoms.
- Climate stress ($\beta = .42$) is a slightly stronger predictor, suggesting that long-term uncertainty about climate and rainfall patterns increases psychological burden more than single-event flood memories.

4.5 Summary of Key Findings

1. High levels of flood anxiety and climate stress were reported across the sample.
2. Mental health indicators (anxiety, depression, sleep disturbance) were in the moderate to high range.
3. Residents in high-risk zones reported significantly worse psychological outcomes.
4. Flood anxiety and climate stress showed strong correlations with anxiety, depression, and sleep problems.
5. Together, they accounted for nearly half (46%) of the variance in mental-health difficulties, indicating major psychological impact.

5. Discussion

The present study set out to examine the impact of flood anxiety and climate-related stress on mental health among residents of riverine areas of Patna. Overall, the findings clearly indicate that people living in chronically flood-prone and climate-vulnerable localities experience substantial psychological distress, reflected in elevated levels of anxiety, depressive symptoms, and sleep disturbance.

5.1 Flood Anxiety, Climate Stress and Mental Health

Descriptive results showed moderate to high mean scores on both the Flood Anxiety Scale and Climate Stress Scale. This suggests that for residents of these areas, flooding is not only a physical and economic hazard but also a continuing psychological reality. The monsoon season, fluctuating river levels, and memories of past flood events appear to create a form of chronic anticipatory anxiety, rather than anxiety limited to the disaster period alone.

The mental-health indicators (GAD-7, PHQ-9, and sleep disturbance scores) also fell in the moderate symptomatic range, indicating that many participants experience clinically relevant levels of emotional distress. This aligns with the broader understanding that environmental disasters and climate events are

strong psychosocial stressors, particularly for communities with limited resources and repeated exposure.

5.2 Differences Between High-Risk and Moderate-Risk Zones

The study found significant differences between participants residing in high-risk flood zones and those in moderate-risk zones across all key variables. Individuals living closer to the river or in areas with recurrent severe flooding reported:

- Higher flood anxiety and climate stress,
- Higher generalized anxiety and depressive symptoms, and
- Greater sleep disturbance.

These findings underline the importance of objective exposure (living in a physically more vulnerable location) as a key determinant of mental health. When the environment repeatedly signals danger—through rising water, damaged infrastructure, and displacement—the sense of safety and predictability is eroded. This may result in heightened vigilance, worry, and emotional exhaustion. The results support the argument that risk geography is not only a physical but also a psychological category: those living in “zones of risk” bear a disproportional emotional burden.

5.3 Relationship Between Flood Anxiety, Climate Stress and Outcomes

The correlation analysis revealed strong, positive associations between:

- Flood anxiety and climate stress,
- Both these environmental stress variables and anxiety and depression, and
- Both variables and sleep disturbance.

This pattern suggests that as concerns about flooding and climate variability increase, so do symptoms of emotional distress and poor sleep. Sleep disturbance, in turn, is likely to aggravate daytime anxiety and low mood, creating a vicious cycle of stress and impaired coping.

The regression analysis further showed that flood anxiety and climate stress together explained a sizeable proportion (about 46%) of the variance in mental-health symptoms. This is a substantial effect and indicates that environmental stressors are not peripheral but central determinants of psychological well-being in the studied population. Notably, climate stress emerged as a slightly stronger predictor than flood anxiety, which may reflect the diffuse, long-

term, and uncontrollable nature of climate-related worry. While a single flood event ends, concerns about changing rainfall patterns, erosion, and future livelihood security remain unresolved and may produce more enduring psychological strain.

5.4 Psycho-Social Context of Riverine Communities in Patna

The findings must also be understood within the broader socio-economic context of riverine settlements in Patna. Many residents rely on informal labour, small-scale trade, agriculture, or daily-wage work. Recurring flooding often leads to:

- Temporary or permanent displacement,
- Damage to homes and possessions,
- Interruption of schooling and employment, and
- Increased household expenses for repair and relocation.

Such material insecurities likely contribute to the observed levels of anxiety and depression, and may interact with structural vulnerabilities such as poverty, inadequate housing, and limited access to formal mental-health services.

Women, elderly people, and low-income households in these communities may be especially vulnerable, as they often have fewer resources to adapt or relocate and greater caregiving responsibilities during crises. Although the present study did not conduct separate subgroup analyses by gender or age, the overall pattern of distress suggests the need for targeted psychosocial support for these groups.

5.5 Implications for Policy, Practice, and Community Intervention

The results have several significant implications:

1. Mental health as a core component of disaster management:
2. Disaster preparedness and flood management programmes in Patna need to move beyond infrastructure and relief, and explicitly include psychosocial support. This could include psycho-education, community counselling, and stress-management workshops during and after the monsoon season.
3. Strengthening early warning and communication systems:
4. Clear, timely and trustworthy information about flood risk may help reduce uncertainty-driven anxiety. Poor communication,

rumours, or sudden evacuations can intensify fear and panic.

5. Community-based resilience-building:
6. Self-help groups, youth clubs, and local leaders can be mobilised to promote collective coping strategies, social support networks, and practical preparedness (e.g., emergency kits, evacuation plans) that give people a greater sense of control and efficacy.
7. Integration into primary health care:
8. Given the overlap between physical complaints and psychological stress, local health centres should be sensitised to identify stress-related symptoms and provide brief interventions or referrals where possible.

5.6 Theoretical Contribution

From a theoretical standpoint, the study adds to evidence that climate-related and disaster-related stressors should be conceptualised as significant environmental determinants of mental health, rather than as external “background” factors. Flood anxiety and climate stress in this context function as chronic stressors, shaping emotional states, sleep patterns, and overall well-being.

The strong predictive power of climate stress also supports the emerging concept of “climate anxiety” or “eco-anxiety”, showing that it is not restricted to global or abstract concerns but is deeply connected to local, concrete experiences of environmental instability.

5.7 Strengths and Limitations

A notable strength of the study is that it focuses specifically on riverine areas of Patna, a context often neglected in psychological research, and uses standardised mental-health measures along with context-specific scales for flood anxiety and climate stress.

However, certain limitations must be acknowledged:

- The cross-sectional design does not permit causal conclusions; it cannot definitively establish whether flood anxiety causes mental-health problems or vice versa.
- The study relies on self-report measures, which may be influenced by social desirability or recall bias.
- The sample is restricted to selected localities and a sample size of 100 participants, which may limit generalisability to all flood-affected populations in Bihar or elsewhere.

These limitations suggest the need for longitudinal and larger-scale studies that track mental health across multiple flood seasons and explore protective factors such as social support, coping styles, and access to services.

6. Conclusion

The present study examined the psychological impact of flood anxiety and climate-related stress among residents of riverine areas in Patna. The findings demonstrate that individuals living in flood-prone and climate-vulnerable localities experience moderate to high levels of anxiety, depressive symptoms, and sleep disturbance, indicating a significant mental-health burden. Flood anxiety and climate stress were found to be strongly interrelated and served as powerful predictors of overall psychological distress. Notably, residents of high-risk flood zones exhibited substantially greater levels of emotional strain compared to those in moderate-risk areas, highlighting the critical role of geographical exposure in shaping mental-health outcomes.

Overall, the study reinforces the understanding that climate-induced environmental adversities are not merely physical or economic events but also profound psychological stressors. For communities that experience recurrent flooding, mental health becomes an essential dimension of disaster vulnerability. The findings underscore the need to integrate psychosocial support, mental-health awareness, and resilience-building strategies into disaster preparedness and climate-adaptation planning in Bihar. Addressing mental health in such contexts is not only a public health priority but also a crucial component of long-term community recovery and well-being.

7. Limitations

While the study offers valuable insights, several limitations should be acknowledged:

1. Cross-sectional design:
2. The data were collected at a single time point, which restricts the ability to establish causal relationships between flood anxiety, climate stress, and mental-health outcomes.
3. Self-report measures:
4. All variables were assessed through self-reported questionnaires, which may be subject to recall bias, emotional exaggeration, or underreporting.
5. Sample size and sampling method:
6. The study involved 100 participants selected through purposive sampling, which may limit the generalisability of the findings to all riverine populations in Patna or other regions of Bihar.

7. Lack of qualitative insights:
8. The study did not include interviews or qualitative narratives that could have provided deeper understanding of lived experiences, coping styles, and cultural factors influencing psychological responses.
9. Uncontrolled confounding variables:
10. Factors such as chronic illness, previous trauma, socio-economic instability, and access to relief services were not analysed separately and may have influenced mental-health outcomes.

8. Future Directions

Building upon the present findings, future research should consider the following directions:

1. Longitudinal studies:
2. Tracking individuals across multiple flood seasons would help clarify how psychological distress develops, persists, or changes over time.
3. Larger and more diverse samples:
4. Future studies should include participants from a broader range of riverine and flood-affected areas across Bihar to enhance generalisability.
5. Mixed-methods approach:
6. Incorporating qualitative interviews or focus groups would offer richer narratives about emotional experiences, coping mechanisms, cultural values, and community strengths.
7. Intervention-based research:
8. Studies assessing the effectiveness of community-based mental-health interventions, resilience training, or psychosocial support programmes would be valuable for policy and practice.
9. Examination of protective factors:
10. Research should explore the role of social support, family cohesion, religious coping, early-warning systems, and livelihood security as buffers against climate-related psychological distress.
11. Comparative studies:
12. Comparing riverine populations with non-riverine urban or rural samples could reveal how unique the psychological effects of flooding are to specific geographic contexts.

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