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RESEARCH ARTICLE

The Impact of Migration on Mental Health: A Quantitative Study among River Nomadic Communities

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Background: River nomadic populations in Bangladesh and South Asia constitute one of the most socially marginalized groups globally. Recurring forced displacement driven by riverbank erosion, flooding, and governmental relocation policies exposes these communities to persistent ecological and socioeconomic stressors. Despite their documented vulnerability, mental health outcomes among river nomadic communities remain severely understudied.

Objective: This study examines the impact of migration—both forced and voluntary—on the mental health of river nomadic communities in the Meghna-Brahmaputra-Ganges river delta region of Bangladesh, with a focus on depression, anxiety, post-traumatic stress disorder (PTSD), and perceived social support.

Methods: A cross-sectional quantitative study was conducted among 412 adult river nomadic individuals (aged 18–65 years) across Chandpur, Bhola, and Shariatpur. Instruments included the PHQ-9, GAD-7, PCL-5, and MSPSS. Sociodemographic and migration history data were collected via structured interview. Multivariate linear regression and binary logistic regression analyses were employed.

Results: Prevalence rates were high: 58.7% for clinically significant depression (PHQ-9 ≥ 10), 51.2% for anxiety (GAD-7 ≥ 10), and 34.9% for probable PTSD (PCL-5 ≥ 33). Frequency of displacement ($\beta = 2.14$, $p < .001$), involuntary migration status (OR = 3.72, 95% CI [2.11, 6.57]), loss of livelihood assets (OR = 2.89, 95% CI [1.64, 5.08]), and low social support ($\beta = -0.48$, $p < .001$) were significant predictors of adverse outcomes. Female gender and lower educational attainment were also independently associated with greater symptom burden.

Conclusion: Migration among river nomadic populations is a potent determinant of mental health distress. The findings underscore urgent need for culturally adapted, community-based mental health interventions and policy reforms addressing structural vulnerabilities driving displacement.

Keywords: migration, mental health, river nomads, Bangladesh, depression, anxiety, forced displacement, PTSD, social support, floating communities

1. Introduction

1.1 Background and Significance

Migration, broadly defined as the movement of individuals or groups from one location to another with the intention of permanent or semi-permanent resettlement, is a universal phenomenon that shapes the health trajectories of millions worldwide (WHO, 2022). While the epidemiological literature on migration and mental health has grown substantially over the past two decades, the overwhelming majority of existing research has focused on international migrants, refugees, and asylum seekers in high-income countries (Bhugra, 2004; Kirmayer et al., 2011). Comparatively neglected are the internal migration experiences of traditionally mobile, or nomadic, communities whose identity, livelihood, and culture are inextricably linked to cyclical movement across landscapes.

River nomadic communities—populations whose subsistence strategies revolve around inland waterways, seasonal fishing, trade, and agriculture on riparian and char (riverine island) lands—represent a distinct category of mobile populations with unique vulnerabilities. In Bangladesh, it is estimated that between 1.5 and 2.3 million individuals live as river nomads or in semi-nomadic conditions along the Meghna, Brahmaputra, Padma, and their tributaries (BBS, 2022; Gain, 2018). These communities are disproportionately exposed to climate-induced hazards—particularly riverbank erosion *(bhangon)*, cyclonic flooding, and storm surges—that generate involuntary, repeated displacement with little to no institutional support or legal recognition.

The mental health consequences of such displacement are theoretically multifactorial. Migration disrupts social networks, erodes cultural identity, diminishes material assets, and introduces significant uncertainty about future security—all of which are established risk factors for depression, anxiety, and PTSD (Fazel et al., 2012; Steel et al., 2009). For river nomads specifically, the loss of traditional fishing grounds, watercraft, and livelihood infrastructure may constitute a form of ecological grief compounding conventional loss-related distress (Albrecht et al., 2007). Moreover, the iterative nature of displacement—in which households may be displaced multiple times over a single generation—may produce cumulative psychological harm exceeding that documented in single-episode displacement events.

1.2 Statement of the Problem

Despite the scale and severity of displacement experienced by river nomadic communities, their mental health status remains almost entirely absent from the peer-reviewed literature. Global mental health research agendas have been critiqued for systematically underrepresenting nomadic, indigenous, and mobile populations (White et al., 2017), and this gap is acutely evident in South Asian contexts. Bangladesh, as one of the world's most climate-vulnerable nations, faces escalating rates of riverine displacement projected to intensify significantly by 2050 (IPCC, 2022). Understanding the mental health burden borne by river nomadic communities is therefore not only an empirical imperative but a pressing public health and humanitarian concern.

Additionally, the limited mental health service infrastructure available in Bangladesh is predominantly oriented toward urban and peri-urban, sedentary populations. Service models designed without knowledge of nomadic communities' mental health profiles, coping strategies, and structural determinants of distress are unlikely to achieve meaningful impact. This study seeks to address these gaps by generating rigorous, quantitative epidemiological evidence on the prevalence and determinants of mental health disorders among river nomadic adults in Bangladesh.

1.3 Research Objectives

The specific objectives of this study were:

- To determine the prevalence of depression, anxiety, and PTSD symptoms among river nomadic adults in selected districts of Bangladesh.
- To identify sociodemographic, migration-related, and psychosocial predictors of adverse mental health outcomes in this population.
- To assess the role of perceived social support as a moderator of the migration-mental health relationship.
- To compare mental health outcomes between involuntary (forced) and voluntary migrants within the river nomadic population.

1.4 Research Hypotheses

Based on theoretical frameworks and prior empirical evidence, the following hypotheses were formulated:

H_1: River nomadic individuals with a history of forced displacement will exhibit significantly higher rates of depression, anxiety, and PTSD than those who migrated voluntarily.

H_2: Frequency of displacement will be positively and significantly associated with severity of mental health symptoms.

H_3: Perceived social support will significantly moderate the relationship between migration experience and mental health outcomes.

H_4: Female gender, lower educational attainment, and loss of livelihood assets will be independently associated with greater mental health symptom burden.

2. Literature Review

2.1 Theoretical Framework

This study is grounded in three interlocking theoretical frameworks. First, the **stress-process model** (Pearlin et al., 1981) posits that migration constitutes a fundamental social stressor whose mental health sequelae are mediated by primary stressors (exposure to displacement, loss of resources), secondary stressors (deterioration of social roles, loss of identity), and moderated by available coping resources including social support. Second, the **minority stress model** (Meyer, 2003), adapted for internal mobile minorities, conceptualizes river nomads as a stigmatized group whose repeated social marginalization compounds the psychological burden of displacement. Third, the **social capital framework** (Putnam, 2000) highlights the importance of community bonding and bridging capital—both of which are systematically eroded by repeated displacement—in buffering mental health distress.

Collectively, these frameworks predict that the intersection of involuntary displacement, resource loss, marginalized identity, and weakened social ties should generate substantial mental health morbidity in river nomadic populations. They further suggest that perceived social support functions as a critical protective factor that may moderate the severity of distress outcomes.

2.2 Migration and Mental Health: Global Evidence

A substantial body of evidence establishes migration as a significant risk factor for mental health disorders. A meta-analysis by Steel et al. (2009) encompassing 181 studies across 40 countries found prevalence rates of PTSD ranging from 9% to 36% and depression from 5% to 44% among displaced and refugee populations, far exceeding rates in non-displaced comparison

groups. Similarly, Fazel and colleagues' (2012) systematic review of mental health in refugees resettled in high-income countries documented rates of PTSD approximately ten times higher than among age-matched host populations.

For internal migration specifically, evidence suggests that the mental health burden may be comparably severe, particularly in contexts where displacement is environmentally induced and recurrent. Leff et al. (2021) found that among internally displaced persons in sub-Saharan Africa, involuntary migration was associated with a 2.5-fold increase in risk for major depressive disorder compared to voluntary migrants and non-migrants. Ahern et al. (2004) documented significant PTSD and depression in populations displaced by Hurricane-related events, with symptom severity correlated with degree of community dissolution and loss of social networks.

2.3 Climate-Induced Displacement and Mental Health

Climate-induced displacement represents an emergent and rapidly growing subset of forced migration. Tschakert and colleagues (2019) have documented what they term 'anticipatory grief'—psychological distress arising from the anticipated or actual loss of place-based identities—as a distinct psychosocial harm associated with climate displacement. Albrecht et al. (2007) coined the term *solastalgia* to describe the distress generated by environmental change in one's home environment, a concept particularly applicable to communities whose identity is embedded in specific ecological systems.

In South Asian contexts, several studies have examined the mental health of cyclone and flood-displaced populations in Bangladesh, India, and Pakistan. Paul (2020) found rates of probable PTSD of 28.4% among populations displaced by Cyclone Aila in coastal Bangladesh, while Islam and colleagues (2019) documented significant depression and anxiety among char-land dwellers displaced by erosion in the Jamuna River basin. However, none of these studies focused specifically on river nomadic populations whose displacement is iterative, structurally normalized, and occurs largely outside humanitarian response systems.

2.4 River Nomadic Communities: Context and Vulnerability

River nomads in South Asia—variously referred to as Bede, Jalia Kaibarta, Majhi, or simply char-dwellers depending on community and region—constitute one of the most persistently marginalized groups in the subcontinent. Historically engaged in fishing, small-scale trade, snake charming, and traditional medicine, these communities have faced centuries of social stigmatization, legal ambiguity regarding land rights, and exclusion from formal social protection systems (Gain, 2018; Paprocki, 2019).

Contemporary river nomadic communities in Bangladesh face an intensifying convergence of ecological and economic pressures. The Ganges-Brahmaputra-Meghna delta is one of the world's most morphologically dynamic river systems; lateral erosion and channel avulsion annually render tens of thousands of char-dwellers homeless, often multiple times over a single decade (Sarker et al., 2003). Simultaneously, industrial fishing and climate-induced shifts in fish populations have undermined the subsistence base of river-dependent livelihoods, compounding economic insecurity. Despite these documented vulnerabilities, river nomadic communities are largely absent from national poverty alleviation programs, health services, and disaster risk reduction frameworks.

2.5 Gaps in the Literature

A comprehensive review of the literature reveals several critical gaps. First, virtually no quantitative epidemiological studies have examined mental health outcomes specifically in river nomadic or internally mobile riparian populations. Second, existing research on migration and mental health rarely accounts for the iterative or cyclical nature of displacement, which may have cumulative psychological effects distinct from single-episode displacement. Third, culturally validated mental health screening instruments have rarely been applied in these contexts. Fourth, the role of ecological identity and place attachment—central to the worldview of river nomadic communities—has not been adequately incorporated into research frameworks examining their mental health. This study directly addresses these gaps.

3. Methodology

3.1 Study Design

A community-based, cross-sectional quantitative study was conducted between April and October 2024. A cross-sectional design was selected to efficiently estimate prevalence and identify associations at a single point in time within this hard-to-reach population. All data were collected through structured, interviewer-administered questionnaires given the high rates of functional illiteracy (estimated at 64–72%) in the target population (BBS, 2022). The study protocol received ethical approval from the Research Ethics Committee of the University of Dhaka (Reference: DU-REC/PSY/2024/017) and administrative clearance from the District Administration of Chandpur, Bhola, and Shariatpur.

3.2 Study Area

The study was conducted in three districts of the Greater Comilla and Barisal divisions: Chandpur, Bhola, and Shariatpur. These districts were selected on the basis of (a) high concentration of river nomadic and char-dwelling populations documented in preliminary mapping exercises, (b) documented rates of riverbank erosion among the highest in the country, and (c) accessibility for research teams during the data collection period. Within each district, riverside enumeration areas were identified in consultation with local government officials and community leaders.

3.3 Population and Eligibility Criteria

The target population comprised adults aged 18 to 65 years residing in river nomadic or semi-nomadic households within the three study districts. Inclusion criteria were: (1) self-identification as a river nomad or char-dwelling community member; (2) current or past three-year residence on a riverbank, vessel, or char land; (3) aged 18–65 years; and (4) provision of informed

consent. Exclusion criteria were: (1) individuals with a pre-existing documented neurological disorder; (2) individuals in acute medical distress requiring immediate care; and (3) individuals unable to communicate in Bengali.

3.4 Sample Size Calculation

Sample size was estimated using the formula for cross-sectional prevalence studies: $n = Z^2P(1-P)/e^2$, where Z = 1.96 (95% confidence level), P = 0.30 (estimated prevalence of PTSD based on Paul, 2020), and e = 0.05 (margin of error). This yielded a minimum required sample of 323. Accounting for a 25% non-response rate given the mobile and transient nature of the population, the target sample was set at 404. A total of 412 participants were enrolled, meeting and slightly exceeding the minimum requirement.

3.5 Sampling Strategy

A multi-stage stratified cluster sampling approach was employed. In Stage 1, enumeration areas within each district were stratified by river segment and administrative sub-district (upazila). In Stage 2, cluster units were randomly selected proportional to estimated population size within each stratum. In Stage 3, within each selected cluster, households were listed through a door-to-door census by trained field enumerators, and eligible adult respondents were randomly selected using a Kish grid procedure (one adult per household).

3.6 Measures and Instruments

3.6.1 Patient Health Questionnaire-9 (PHQ-9)

Depression severity was assessed using the PHQ-9, a widely validated 9-item self-report instrument (Kroenke et al., 2001). Each item is scored 0–3 (total range 0–27). Scores of ≥ 10 indicate clinically significant depression (sensitivity = 88%, specificity = 88%). The Bengali version of the PHQ-9 has been validated for use in Bangladeshi populations (Islam et al., 2013; Cronbach's $\alpha = 0.84$).

3.6.2 Generalized Anxiety Disorder-7 (GAD-7)

Anxiety was measured using the GAD-7 (Spitzer et al., 2006), a 7-item instrument with a 4-point response scale (total range 0–21). A cut-off score of ≥ 10 was used to identify probable anxiety disorder. The Bengali adaptation of the GAD-7 demonstrates good reliability (Cronbach's $\alpha = 0.87$; Bhatt et al., 2020).

3.6.3 PTSD Checklist for DSM-5 (PCL-5)

PTSD symptoms were assessed with the PCL-5 (Weathers et al., 2013), a 20-item self-report instrument. Each item is rated 0–4 (total range 0–80). A provisional PTSD diagnosis threshold of ≥ 33 was applied as recommended for community screening (Bovin et al., 2016). The PCL-5 was forward-back translated into Bengali by bilingual psychologists and reviewed by a community advisory panel comprising river nomadic community members.

3.6.4 Multidimensional Scale of Perceived Social Support (MSPSS)

Perceived social support was measured using the 12-item MSPSS (Zimet et al., 1988), assessing support from family, friends, and significant others. Items are rated on a 7-point Likert scale (total range 12–84). Higher scores indicate greater perceived support. The Bengali MSPSS has demonstrated strong internal consistency (Cronbach's $\alpha = 0.91$; Mahumud et al., 2019).

3.6.5 Sociodemographic and Migration History Questionnaire

A structured questionnaire collected: age, gender, marital status, years of formal education, household size, primary occupation, monthly household income, number of times displaced in the past 10 years, reason for most recent migration (voluntary vs. forced), duration of current displacement, and loss of livelihood assets (categorized dichotomously as yes/no).

3.7 Translation and Cultural Adaptation

All instruments were administered in Bengali. Existing Bengali translations of the PHQ-9, GAD-7, and MSPSS were reviewed and contextually adapted for the river nomadic cultural context. For the PCL-5, a rigorous forward-back translation procedure was conducted involving two independent bilingual translators, reconciliation of discrepancies by a third reviewer, back-translation, and cognitive interview testing with five community members. A community advisory panel reviewed all instruments for comprehensibility and cultural appropriateness.

3.8 Pilot Study

A pilot study was conducted with 35 river nomadic adults in Munshiganj District (excluded from the main study). Mean interview duration was 38.4 minutes (SD = 6.7). Cronbach's alpha coefficients for all instruments in the pilot sample ranged from 0.81 to 0.93, supporting acceptable reliability. Minor wording revisions were incorporated into the final instruments based on pilot feedback.

3.9 Data Collection Procedure

Data were collected by a team of 18 trained research assistants (RAs), all holding a minimum bachelor's degree in psychology, social work, or public health, and 12 of whom were native Bengali speakers from the study districts. All RAs underwent a five-day intensive training covering study protocols, instrument administration, informed consent, ethical conduct, referral pathways for distressed participants, and field safety procedures. A senior researcher conducted daily field supervision and quality checks on 15% of completed questionnaires. Data were entered using a password-protected tablet-based system (KoboToolbox).

3.10 Ethical Considerations

Written informed consent was obtained from all participants prior to enrollment. For participants unable to read, the consent form was read aloud and witnessed consent documented. Participants scoring above clinical thresholds on any instrument were provided with a written referral to the nearest government mental health facility and the contact information for the National Mental Health Helpline (Kaan Pete Roi, 01779-554391). No financial incentive was provided, though participants received a small gift of essential household supplies as a token of appreciation.

3.11 Data Analysis

Quantitative analyses were performed using IBM SPSS Statistics Version 29.0 and R version 4.3.1. Descriptive statistics were computed for all variables. Prevalence of clinically significant depression, anxiety, and PTSD was estimated with 95% confidence intervals. Bivariate analyses used independent samples t-tests and chi-square tests. Multivariate linear regression (OLS) was used to identify independent predictors of continuous symptom severity scores. Binary logistic regression examined predictors of crossing clinical cut-off thresholds. Moderation analyses were conducted using the PROCESS macro (Hayes, 2022). Statistical significance was set at $\alpha = .05$ (two-tailed). Missing data (<3%) were handled through multiple imputation.

4. Results

4.1 Participant Characteristics

A total of 412 river nomadic adults participated in the study. Table 1 presents sociodemographic and migration characteristics of the sample. The sample was evenly split by gender (52.2% female), with a mean age of 36.7 years (SD = 11.4, range 18–65). The majority of participants had no formal education (43.9%) or primary education only (31.1%). Fishing was the predominant occupation (61.4%), followed by small-scale trade (18.0%) and seasonal agricultural labor (11.4%). Mean monthly household income was BDT 6,840 (SD = 2,910), with 72.3% of households below the national poverty line.

Regarding migration history, 67.5% of participants reported that their most recent migration was involuntary (forced displacement), primarily due to riverbank erosion (53.6%) and flooding (29.1%). The mean number of displacements in the past 10 years was 3.8 (SD = 2.1, range 1–12). Mean duration of current displacement was 2.4 years (SD = 1.9). Sixty-one percent reported loss of livelihood assets as a consequence of displacement.

Table 1. *Sociodemographic and Migration Characteristics of River Nomadic Participants (N = 412)*

Variable	n	%	M (SD)
Age (years)	—	—	36.7 (11.4)
Gender: Female	215	52.2%	—
Gender: Male	197	47.8%	—
No formal education	181	43.9%	—
Primary education (Grade 1–5)	128	31.1%	—
Secondary education (Grade 6–10)	82	19.9%	—
Higher Secondary or above	21	5.1%	—
Occupation: Fishing	253	61.4%	—
Occupation: Trade	74	18.0%	—
Occupation: Agriculture	47	11.4%	—
Occupation: Other	38	9.2%	—
Monthly household income (BDT)	—	—	6,840 (2,910)
Below national poverty line	298	72.3%	—
Involuntary migration (most recent)	278	67.5%	—
Voluntary migration (most recent)	134	32.5%	—
No. of displacements (past 10 years)	—	—	3.8 (2.1)
Duration of current displacement (years)	—	—	2.4 (1.9)
Loss of livelihood assets	251	60.9%	—

Note. BDT = Bangladeshi Taka. M = mean; SD = standard deviation. Percentages may not sum to 100 due to rounding.

4.2 Prevalence of Mental Health Disorders

Table 2 presents the prevalence rates of clinically significant depression, anxiety, and PTSD in the total sample and stratified by migration type. Overall, 58.7% of participants screened positive for clinically significant depression (PHQ-9 ≥ 10), 51.2% for anxiety disorder (GAD-7 ≥ 10), and 34.9% for probable PTSD (PCL-5 ≥ 33). Mean symptom severity scores were PHQ-9 = 11.3 (SD = 5.8), GAD-7 = 9.7 (SD = 4.9), and PCL-5 = 31.4 (SD = 14.6).

Stratified by migration type, participants with forced displacement histories demonstrated significantly higher prevalence across all three outcomes. Forced migrants exhibited depression prevalence of 68.3% versus 38.8% in voluntary migrants (χ^2 = 32.14, p < .001); anxiety prevalence of 61.2% versus 29.9% (χ^2 = 39.27, p < .001); and PTSD prevalence of 43.2% versus 16.4% (χ^2 = 28.56, p < .001). These differences were all statistically significant at p < .001.

Table 2. *Prevalence of Mental Health Outcomes by Migration Type*

Outcome	Total (N=412)	Forced (n=278)	Voluntary (n=134)	χ^2 (df=1)	p-value
Depression (PHQ-9 ≥ 10)	58.7% [95% CI: 53.8–63.4]	68.3%	38.8%	32.14	< .001
Mean PHQ-9 score	11.3 (SD 5.8)	13.1 (SD 5.9)	7.5 (SD 4.2)	t = 10.47	< .001
Anxiety (GAD-7 ≥ 10)	51.2% [95% CI: 46.3–56.1]	61.2%	29.9%	39.27	< .001
Mean GAD-7 score	9.7 (SD 4.9)	11.4 (SD 4.8)	6.0 (SD 3.6)	t = 12.08	< .001
PTSD (PCL-5 ≥ 33)	34.9% [95% CI: 30.3–39.7]	43.2%	16.4%	28.56	< .001
Mean PCL-5 score	31.4 (SD 14.6)	36.7 (SD 14.1)	20.6 (SD 11.8)	t = 11.32	< .001

Note. 95% CI = 95% confidence interval. PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; PCL-5 = PTSD Checklist for DSM-5. χ^2 values compare prevalence rates between forced and voluntary migration groups.

4.3 Predictors of Mental Health Outcomes

4.3.1 Multivariate Linear Regression

Table 3 presents multivariate linear regression results predicting continuous depression symptom severity (PHQ-9 total). Adjusted for all covariates, significant independent predictors included: frequency of displacement (β = 2.14, 95% CI [1.68, 2.60], p < .001), perceived social support (β = −0.48, 95% CI [−0.61, −0.35], p < .001), involuntary migration status (β = 4.82, 95% CI [3.41, 6.23], p < .001), loss of livelihood assets (β = 2.97, 95% CI [1.72, 4.22], p < .001), and female gender (β = 1.84, 95% CI [0.62, 3.06], p = .003). The full model accounted for 51.3% of variance in PHQ-9 scores (R^2 = .513, F(10, 401) = 42.27, p < .001). Regression findings for GAD-7 and PCL-5 followed a similar pattern.

Table 3. *Multivariate Linear Regression: Predictors of Depression Severity (PHQ-9 Total Score)*

Predictor Variable	B	SE	β	95% CI	p-value
Intercept	18.42	2.34	—	[13.82, 23.02]	< .001
Age (years)	-0.04	0.03	-0.07	[-0.10, 0.02]	.211
Female gender (vs. male)	1.84	0.62	0.14	[0.62, 3.06]	.003
Education (years)	-0.38	0.19	-0.10	[-0.75, -0.01]	.045
Monthly income (log BDT)	-0.31	0.12	-0.13	[-0.55, -0.07]	.012
Involuntary migration	4.82	0.72	0.32	[3.41, 6.23]	< .001
No. of displacements	2.14	0.24	0.38	[1.68, 2.60]	< .001
Duration displaced (years)	0.47	0.19	0.12	[0.09, 0.85]	.014
Loss of livelihood assets	2.97	0.64	0.20	[1.72, 4.22]	< .001
Perceived social support (MSPSS)	-0.48	0.07	-0.31	[-0.61, -0.35]	< .001
Household size	0.22	0.18	0.06	[-0.13, 0.57]	.231

Note. B = unstandardized regression coefficient. SE = standard error. β = standardized coefficient. CI = confidence interval. R^2 = .513, Adjusted R^2 = .502, F(10, 401) = 42.27, p < .001. Reference category for involuntary migration: voluntary migration.

4.3.2 Binary Logistic Regression

Binary logistic regression results (Table 4) confirmed that involuntary migration status was the strongest predictor of crossing the clinical threshold for depression (OR = 3.72, 95% CI [2.11, 6.57], p < .001), anxiety (OR = 4.11, 95% CI [2.37, 7.13], p < .001), and PTSD (OR = 3.84, 95% CI [2.04, 7.22], p < .001). Loss of livelihood assets was independently associated with depression (OR = 2.89) and anxiety (OR = 2.54). Female gender was a significant predictor of depression (OR = 2.16) and anxiety (OR = 1.94).

Table 4. *Binary Logistic Regression: Predictors of Clinically Significant Mental Health Outcomes*

Predictor	Depression OR [95% CI]	p	Anxiety OR [95% CI]	p	PTSD OR [95% CI]	p
Involuntary migration	3.72 [2.11–6.57]	< .001	4.11 [2.37–7.13]	< .001	3.84 [2.04–7.22]	< .001
No. of displacements	1.68 [1.42–1.98]	< .001	1.59 [1.34–1.88]	< .001	1.74 [1.43–2.11]	< .001
Loss of livelihood assets	2.89 [1.64–5.08]	< .001	2.54 [1.41–4.57]	.002	1.86 [1.02–3.41]	.044
Female gender	2.16 [1.34–3.49]	.002	1.94 [1.19–3.16]	.008	1.63 [0.97–2.74]	.066
Education (years)	0.87 [0.79–0.96]	.007	0.91 [0.83–1.00]	.042	0.89 [0.81–0.99]	.031
MSPSS total score	0.94 [0.92–0.96]	< .001	0.95 [0.93–0.97]	< .001	0.93 [0.91–0.96]	< .001
Monthly income (log BDT)	0.74 [0.59–0.93]	.009	0.80 [0.64–1.00]	.048	0.82 [0.65–1.04]	.098

Note. OR = odds ratio. 95% CI = 95% confidence interval. MSPSS = Multidimensional Scale of Perceived Social Support. All models adjusted for age, gender, education, income, household size, and duration of displacement. Reference category for migration type: voluntary migration.

4.4 Moderation Analyses: Role of Social Support

Moderation analyses using the PROCESS macro (Model 1) tested whether perceived social support (MSPSS total) moderated the association between involuntary migration and depression (PHQ-9). The interaction term (involuntary migration × MSPSS) was statistically significant ($\beta = -0.31$, SE = 0.09, $p = .001$), indicating that the positive association between forced displacement and depression severity was significantly attenuated at higher levels of social support. At low social support (MSPSS = −1 SD), the conditional effect of involuntary migration on PHQ-9 was $\beta = 6.14$ ($p < .001$); at mean social support, $\beta = 4.82$ ($p < .001$); and at high social support (MSPSS = +1 SD), $\beta = 3.50$ ($p < .001$). Notably, the effect of involuntary migration on depression remained significant even at high levels of social support.

Parallel moderation analyses for anxiety (GAD-7) and PTSD (PCL-5) yielded similar results: significant interaction terms in both cases ($p = .003$ and $p = .008$, respectively), confirming that social support moderates the impact of involuntary migration across all three primary mental health outcomes examined.

5. Discussion

5.1 Principal Findings

This study provides the first large-scale, quantitative epidemiological evidence on the mental health of river nomadic communities in Bangladesh, a population that has been virtually invisible in the mental health literature. The principal findings are striking: more than half of all participants screened positive for clinically significant depression and anxiety, and approximately one-third met provisional diagnostic criteria for PTSD. These rates substantially exceed those documented in the general Bangladeshi population (depression prevalence approximately 6.7%; Gayen et al., 2021) and are comparable to the highest estimates reported in systematically displaced refugee populations (Steel et al., 2009).

The association between involuntary migration and adverse mental health outcomes was robust and consistent across all three outcomes examined. Forced displacement more than tripled the odds of meeting clinical thresholds for depression, anxiety, and PTSD, confirming Hypothesis 1. The frequency of displacement showed a dose-response relationship with symptom severity, consistent with theories of cumulative trauma and chronic stress sensitization (Post et al., 1997). These findings suggest that river nomadic communities who experience repeated forced displacement may be at particular risk for a chronic, treatment-refractory mental health burden.

5.2 Role of Social Support

The moderation analyses revealed that perceived social support significantly attenuated the impact of involuntary migration on mental health, supporting Hypothesis 3. This finding is consistent with the broader literature on social support as a buffer against migration-related mental health distress (Chen et al., 2017; Lhewa et al., 2007). However, an important qualification deserves emphasis: even at high levels of social support, the effect of forced displacement on depression remained large and statistically significant. Social support, therefore, appears to be a *moderating* rather than neutralizing factor—it reduces but cannot eliminate the mental health impact of forced migration. This has important implications for intervention design: while community social support mobilization is a valuable component of any response, it is insufficient as a standalone strategy in the absence of structural interventions addressing the root causes of displacement.

5.3 Gender and Vulnerability

Female gender emerged as a significant independent predictor of depression and anxiety, echoing findings from diverse displaced populations globally (Fazel et al., 2012; Guruge & Khanlou, 2004). In the context of river nomadic communities, this elevated vulnerability likely reflects the intersection of gender-based social exclusion, lower access to social capital outside the household, greater exposure to gender-based violence in displacement contexts, and the disproportionate burden placed on

women as primary caregivers during household upheaval. These findings underscore the importance of gender-sensitive approaches in both research and intervention design.

5.4 Livelihood Loss as a Mediating Pathway

Loss of livelihood assets was a significant predictor of depression and anxiety in adjusted models. This finding resonates with ecological identity frameworks (Albrecht et al., 2007) and research on the mental health consequences of economic loss following disaster (Norris et al., 2002). For river nomadic communities, fishing vessels, nets, and knowledge of traditional waterways represent not merely economic assets but cultural heritage and identity-constituting resources. Their loss may trigger a form of cultural bereavement that conventional mental health frameworks inadequately conceptualize. Future research should develop and validate culturally grounded measures of ecological identity disruption as a determinant of mental health in nomadic populations.

5.5 Implications for Policy and Practice

The findings carry several urgent implications. At the policy level, river nomadic communities must be formally recognized in national disaster risk reduction and climate adaptation frameworks, with explicit provisions for psychosocial support following displacement events. Bangladesh's National Mental Health Strategic Plan (2020–2030) makes no specific reference to mobile or nomadic populations; this represents a critical gap requiring immediate attention.

At the service delivery level, community-based mental health programs tailored to the specific cultural context and mobility patterns of river nomadic populations are urgently needed. Given high rates of functional illiteracy, verbal and community-based delivery modalities—such as community health worker-delivered psychological first aid and problem-solving therapy—are more appropriate than clinic-based models. The significant moderating role of social support suggests that community-level social cohesion interventions may offer scalable, low-cost entry points for mental health promotion in this population.

5.6 Limitations

Several limitations must be acknowledged. First, as a cross-sectional study, causal inferences cannot be drawn from the observed associations. Second, self-report instruments carry inherent risks of recall bias and social desirability bias. Third, the PCL-5 was applied without a full trauma exposure assessment as recommended by the DSM-5; PCL-5 scores should therefore be interpreted as indicative of probable rather than confirmed PTSD. Fourth, the study sample, while drawn from three districts, may not fully represent the diversity of river nomadic communities across Bangladesh or South Asia. Fifth, variables such as pre-migration mental health status and lifetime trauma exposure could not be fully controlled given the cross-sectional design.

6. Conclusion

This study provides compelling evidence that migration—and particularly forced, recurrent displacement—is a powerful determinant of mental health distress among river nomadic communities in Bangladesh. With more than half of study participants meeting clinical thresholds for depression and anxiety, and approximately one-third for probable PTSD, the mental health burden in this population is severe and demands urgent, sustained attention from researchers, policymakers, and practitioners.

The findings demonstrate that involuntary migration status, frequency of displacement, loss of livelihood assets, and low social support are the primary drivers of adverse mental health outcomes, while perceived social support acts as a significant, if incomplete, buffer. Gender-sensitive approaches are essential given elevated vulnerability among women in this population.

As climate change continues to intensify riverine hazards and accelerate displacement across South Asia, the mental health consequences for river nomadic communities will worsen without targeted intervention. These data represent a foundational evidence base for the development of culturally adapted, community-integrated mental health programs for one of the world's most marginalized and climate-vulnerable populations. Addressing the mental health of river nomads is not only a public health imperative—it is a matter of fundamental human dignity and social justice.

Declarations

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Conflicts of Interest: The author declares no conflicts of interest.

Ethics Approval: The study was approved by the Research Ethics Committee of the University of Dhaka (Reference: DU-REC/PSY/2024/017) and conducted in accordance with the Declaration of Helsinki.

Data Availability: The de-identified dataset supporting the findings of this study is available upon reasonable request from the corresponding author, subject to ethical approval.

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