

Women's labour migration and vulnerability: the case of Arunachal Pradesh

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Vilakshan -
XIMB Journal of
Management

253

Received 14 July 2025
Revised 24 February 2026
Accepted 2 April 2026

Abstract

Purpose – The purpose of this study is to examine the vulnerability of migrant workers in Arunachal Pradesh, India, focusing on disparities in employment, economic, social and workplace security across gender, religion, education and district contexts.

Design/methodology/approach – Using primary survey data from 400 migrants and 50 non-migrants across four urban centres, a composite vulnerability index is constructed. Beta regression models assess the influence of socio-demographic and regional factors on employment, economic, social and workplace insecurity.

Findings – Female migrants face higher vulnerability because of concentration in low-wage informal work and limited protections. Muslim and Buddhist migrants experience elevated insecurity linked to discrimination. Education significantly reduces vulnerability, while illiteracy reinforces precarious employment. District-level differences highlight the role of local labour markets, though economic insecurity persists even in relatively better-performing sectors.

Originality/value – This study offers an intersectional analysis of migrant vulnerability in a relatively under-researched region of India. By integrating composite indices with regression analysis, it identifies key structural determinants of insecurity and provides policy insights for gender-sensitive interventions, improved education access, strengthened social protection and reduced institutional barriers.

Keywords Women, Migrant worker, Vulnerability index, Arunachal Pradesh, Factors, Informal employment, Social protection, Gendered migration, Labour vulnerability

Paper type Research paper

1. Introduction

India is widely regarded as one of the fastest-growing economies in the world, yet its development trajectory remains marked by sharp regional and social imbalances. States with stronger infrastructure and sustained investment have progressed rapidly, while geographically

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Funding: This article is an outcome of the project titled “Women Migrant Workers in Arunachal Pradesh: Emerging Issues and Challenges” funded by the National Commission for Women, New Delhi.

Conflict of interest: The authors declared no potential conflict of interest with respect to research, authorship and/or publication of this article.



Vilakshan - XIMB Journal of
Management
Vol. 23 No. 2, 2026
pp. 253-270
Emerald Publishing Limited
e-ISSN: 2633-9439
p-ISSN: 0973-1954
DOI 10.1108/XJM-07-2025-0069

remote and socio-economically marginalised regions continue to lag (Bhattacharyya, Abraham and D'Costa, 2013; Majumder *et al.*, 2022). These disparities have deepened in the post-liberalisation period, reinforcing inequalities in employment, access to basic services and social mobility across gender, class and region. One visible outcome has been the growing reliance on internal migration as a livelihood strategy. However, the gains from economic growth and labour mobility have been unevenly distributed. Women remain among the most disadvantaged, with persistently low and precarious workforce participation. The Global Gender Gap Report (2022) ranks India 143rd out of 146 countries in economic participation and opportunity, highlighting systemic barriers to secure employment (Kumar *et al.*, 2020; World Economic Forum, 2022). Although women constitute nearly half of global migration flows (Boyd, 2021), migration in India continues to be perceived as male-dominated, leading to the marginalisation of women's experiences in research and policy (Godbole, 2018). Consequently, the specific vulnerabilities of migrant women remain largely invisible.

These inequalities take distinct forms in India's northeastern region, particularly in Arunachal Pradesh. Despite its natural resource base and strategic significance, the state remains economically underdeveloped, marked by poor connectivity, a limited industrial base and heavy dependence on public employment (Bhattacharyya *et al.*, 2013; Jaiswal, 2019; Kumar *et al.*, 2020). Paradoxically, it records an in-migration rate (45%) higher than the national average (37.6%) (Khataniar and Sarma, 2014; Lusive and Bhagat, 2020; John and Kuruvilla, 2021). Migrants, largely from Bihar, West Bengal, Odisha and Jharkhand, are absorbed into informal and precarious sectors, with an increasing participation of women. Although women in Arunachal's tribal societies are often perceived to enjoy relatively higher social status, this does not necessarily translate into economic security. Gendered divisions of labour confine many to subsistence agriculture, domestic work and informal services, lacking legal protection (Paul and Devi, 2026; Ramya, 2016). Migration further exposes women to insecure employment, exploitative contracts, unsafe conditions and social isolation, reinforcing gendered precarity.

The concept of vulnerability provides a useful analytical lens to understand these layered disadvantages. Vulnerability is both a structural condition and an outcome, intensified by insecure mobility, limited legal safeguards and gender-based exclusion (Gilodi *et al.*, 2022; Gunaratne *et al.*, 2023; Acharya and Porwal, 2020b). For migrant women, these risks intersect with socio-cultural constraints, restricting access to welfare, healthcare and legal redress (Osseiran, 2024). As Brown *et al.* (2017b) argue, migrants often experience overlapping forms of deprivation. Despite the growing feminisation of migration, empirical evidence on women's vulnerabilities remains limited, particularly in frontier regions such as Arunachal Pradesh (Gilodi *et al.*, 2022). This gap carries significant policy implications in the context of India's Sustainable Development Goals, especially SDG 1, SDG 5, SDG 8 and SDG 10. While migration can offer income and mobility, the absence of institutional safeguards may deepen insecurity.

Against this backdrop, the present study examines the gendered dimensions of labour migration and vulnerability in Arunachal Pradesh, focusing on socio-economic, occupational and institutional determinants shaping female migrants' lived experiences. By centring on a peripheral and politically sensitive region, the study contributes to the literature on gender, labour and migration and provides evidence to inform more inclusive and context-sensitive policy frameworks.

2. Literature review

2.1 Migration and development in Arunachal Pradesh

Arunachal Pradesh, though rich in forests, biodiversity and hydroelectric potential, remains developmentally constrained because of weak infrastructure, limited connectivity, a narrow

industrial base and dependence on public employment (Ramya, 2014; Rasul and Sharma, 2014; Nandy, 2019). Political neglect and insurgency have further hindered economic integration.

Migration has become a defining feature of this uneven development. Census 2011 reports that 45.59% of the state's population were migrants, higher than the national average (37.6%) and the highest in the Northeast (Lusome and Bhagat, 2020; Ramya and Chaudhuri, 2024). Most migrants are intra-state (76.68%), while inter-state flows primarily originate from Assam, Bihar, Uttar Pradesh and West Bengal (Ramya and Chaudhuri, 2024; Upadhyay, 2013). The feminisation of migration is particularly significant. Women constituted 52.31% of migrants in 2011, with rising inter-state and international work-related mobility (Lusome and Bhagat, 2020). These trends position Arunachal Pradesh as an emerging yet underexplored site to examine gendered labour mobility and vulnerability.

The feminisation of migration in the state is especially noteworthy. Female migrants constituted 52.31% of all migrants in 2011, rising from 47.70% in 2001. Moreover, nearly half of all women in Arunachal Pradesh (49.27%) were migrants in 2011, compared to 42.14% of men. While marriage and family-related movement remain the dominant reasons for female migration, a growing proportion of women are migrating independently for employment, with 12.36% of inter-state and 9.52% of international female migrants reporting work-related motives (Lusome and Bhagat, 2020).

These patterns highlight that Arunachal Pradesh is not only a resource-rich yet developmentally constrained state but also a rapidly transforming migration destination where gendered labour mobility is becoming increasingly central. This makes the state a particularly important and underexplored site for examining the intersections of migration, informality and women's vulnerability in India's northeastern frontier.

2.2 Gendered occupational patterns and vulnerabilities

Informal labour in India is structurally embedded within caste, gender and regional hierarchies rather than being transitional (Bremar, 2013; Gooptu, 2013; Devi and Paul, 2026). Migrants are concentrated in precarious sectors, such as construction, agriculture, brick kilns, domestic work and petty services, with women occupying the most insecure and undervalued roles.

In Arunachal Pradesh, migrant women are largely engaged in unorganised and self-employed activities, agriculture, domestic work, construction, vending and daily wage labour. Much of this work is unpaid or lacks contracts and social protection, reinforcing chronic insecurity (Bremar, 2013). Domestic work remains particularly exploitative, with limited regulatory oversight and exposure to harassment and health risks. Weak unionisation and absence of gender-sensitive policies further deepen vulnerability (Upadhyay, 2013; Arora and Kumawat, 2024). Globally, similar patterns show migrant women clustered in low-status, low-income jobs with disproportionate care burdens (Masood and QaiserJahan, 2015).

2.3 Gender, migration and labour: conceptual perspectives

Migration is not gender-neutral but shaped by household power relations and labour market structures. Mazumdar, Neetha and Agnihotri (2013) highlight the invisibility of women's labour in official statistics. Women's migration decisions are mediated by education, bargaining power and economic constraints (Mohan et al., 2022). However, outcomes remain uneven: some studies note declining employment post-migration (Singh, Keshri and Bhagat, 2015), while others observe feminisation of low-end services (Deori, 2016).

2.4 *Migration, informality and labour market outcomes*

Labour migration in India is driven by regional disparities and survival strategies (Keshri and Bhagat, 2013). Migrant networks ease labour market entry but reproduce segmentation (Sharma and Das, 2018). Migrants face unsafe work and limited health-care access (Moyce and Schenker, 2018), and crises such as COVID-19 exposed the fragility of informal livelihoods (Sahu, Maity and Agarwala, 2024). Informality thus remains a persistent structural condition.

2.5 *Global perspectives on gendered migration*

International scholarship shows migration reshaping gender norms and identities. Studies further highlight intersections of race, care labour and urban exclusion (Kundu and Saraswati, 2012), with ethnographic work documenting everyday precarity among migrant women (Thakkar, 2023; Grover *et al.*, 2018b).

2.6 *Gaps in literature and research relevance*

Despite extensive scholarship on gender and migration, focused studies on Arunachal Pradesh remain limited (Lusome and Bhagat, 2020; Anastasiadou *et al.*, 2024). The region's unique socio-political context is often generalised within broader Northeast narratives (Larsen, 2022; Anastasiadou *et al.*, 2024) and gender-specific vulnerabilities in frontier informal economies remain insufficiently examined (Krishna, 2012). This gap underscores the need for localised, gender-sensitive empirical research.

3. **Data and methodology**

3.1 *Theoretical framework and rationale*

This study is grounded in the multidimensional vulnerability framework, which views vulnerability as the intersection of economic insecurity, labour precarity, weak social protection and unsafe working conditions (Naik and Unni, 2013; Agarwala, 2013; World Social Protection Report 2020–22: Social protection at the crossroads – in pursuit of a better future, 2024). Feminist political economy further highlights how gendered power relations shape access to employment, assets, mobility and welfare, producing differentiated vulnerabilities among migrant workers.

Given the layered nature of informal employment in frontier regions such as Arunachal Pradesh, a composite index approach is appropriate. It captures structural and institutional deprivation beyond income-based measures. Accordingly, a Vulnerability Index (VI) is constructed to quantify overall insecurity and assess how socio-demographic and spatial factors influence vulnerability.

3.2 *Study area*

The study covers four districts of Arunachal Pradesh: West Kameng (Bomdila), Papum Pare (Itanagar), East Siang (Pasighat) and Lohit (Tezu). These urban centres, selected for their high migrant concentration and economic activity, serve as administrative and commercial hubs with diverse labour markets, making them suitable for analysing gendered vulnerability in informal employment.

3.3 *Data source and sampling*

Both secondary and primary data are used. Secondary sources include the Census of India, National Sample Survey reports and state statistical publications. Primary data were collected through a structured survey in the four selected towns.

A two-stage sampling design was adopted: towns were purposively selected, and migrant workers were identified through workplace listing and snowball techniques across construction sites, domestic work clusters, markets, brick kilns and informal services. Respondents were then randomly chosen.

The final sample includes 400 migrant workers (350 women, 50 men) and 50 non-migrant workers for comparison. The survey collected data on demographics, migration history, employment, wages, assets, banking access, workplace conditions and occupational risks.

3.4 Analytical tools

A composite Vulnerability Index (VI), adapted from [Naik and Unni \(2013\)](#), is constructed with four dimensions:

Economic Security Index (ESI): Based on normalised monthly income, asset ownership and bank account possession. ESI is computed as the geometric mean of the income index and the economic empowerment index.

Job Security Index (JSI): Based on duration of employment with the current employer.

Working Conditions Index (WCI): Includes health insurance, housing provision, drinking water availability and absence of workplace threats/accidents.

Social Security Index (SSI): Captures access to provident fund, medical benefits, bonus, insurance, paid leave, overtime allowance, advance payments, clothing facility and other benefits.

All indices are normalised between 0 and 1. Correlation analysis shows moderate associations (0.38–0.64) without multicollinearity ($VIF < 5$), supporting aggregation.

These four components form a composite index that quantifies the overall vulnerability faced by migrant informal workers in the study area ([Table 1](#)).

The total vulnerability index ranges from 0 to 1, where higher values indicate greater vulnerability. It is computed as one minus the geometric mean of the four component indices (employment security, social security, working condition-related security and economic security). The detailed methodology for constructing each component and calculating the composite index is outlined below.

3.4.1 Economic security index (ESI). To construct the ESI, as mentioned earlier, three dimensions, i.e. Monthly Income, Possession of Asset and Possession of Bank account are incorporated. First of all, we have constructed the income index from the Monthly Income using the following method. The value of which lies between 0 and 1:

$$II_i = \frac{\text{Actual Income}_i - \text{Minimum Income}}{\text{Maximum Income} - \text{Minimum Income}}$$

In the next step, two closed-ended questions ([Table 2](#)) were asked to find the Economic Empowerment of the person.

Now, the economic empowerment index (EEI) has been constructed as:

$$EEI_i = \frac{\text{Actual Score}_i - \text{Minimum Score}}{\text{Maximum Score} - \text{Minimum Score}}$$

Finally, the ESI has been calculated as the geometric mean of II and EEI as:

$$ESI_i = \sqrt{(II_i \times EEI_i)}$$

Table 1. Components of vulnerability

Sl. No.	Components	Type and description		Value	Index
1	Monthly wage	Categorical	Continuous	—	Economic security index (ESI)
2	The household is well-equipped with assets		Yes	1	
3	Possession of bank account	Categorical	No	0	Job security index (JSI)
4	Period of job contract		Yes	1	
5	Possession of health insurance	Categorical	No	0	Working condition index (WCI)
6	Water condition at workplace		Continuous	—	
7	Housing facility provided	Categorical	Yes	1	Social security index (SSI)
8	Faced any threats or accidents		No	0	
9	Provision of provident fund	Categorical	Regular	1	
10	Provision of bonus facility		Irregular	0	
11	Provision of cloth facility	Categorical	Yes	1	
12	Provision of an advance payment		No	0	
13	Provision of medical benefits	Categorical	Yes	1	
14	Provision of insurance facility		No	0	
15	Provision of overtime allowance	Categorical	Yes	1	
16	Provision of paid leave		No	0	
17	Any other facility	Categorical	Yes	1	
			No	0	

Source(s): Constructed by the author, based on Naik and Unni's (2013) framework

Table 2. Indicators and Scoring Scheme for Economic Empowerment Index (EEI)

Sl. No.	Questions	Responses
1	Do you have any assets?	Yes = 1, No = 0
2	Do you have a bank account?	Yes = 1, No = 0
Total score of the i^{th} individual		Maximum = 2, Minimum = 0

3.4.2 Job Security Index (JSI). To construct the JSI, the number of months a person is working under a particular employer has been considered. The value of JSI lies between 0 and 1. It is constructed as:

$$JSI_i = \frac{\text{Actual Period of Work}_i - \text{Minimum Period of Work}}{\text{Maximum Period of Work} - \text{Minimum Period of Work}}$$

3.4.3 Working Condition Index (WCI). To construct the WCI, four closed-ended questions (Table 3) were asked of the respondents.

Now, the WCI has been constructed using the following method:

$$WCI_i = \frac{\text{Actual Score}_i - \text{Minimum Score}}{\text{Maximum Score} - \text{Minimum Score}}$$

3.4.4 Social security index (SSI). To construct the SSI, nine closed-ended questions (Table 4) were asked of the respondents.

Now, the SSI has been constructed using the following method:

$$SSI_i = \frac{\text{Actual Score}_i - \text{Minimum Score}}{\text{Maximum Score} - \text{Minimum Score}}$$

3.4.5 Correlation among component indices. Before constructing the vulnerability index, the relationships among the four component indices were examined through a correlation matrix to assess their internal consistency and to ensure they are related yet not collinear. The Pearson correlation coefficients are presented below (Table 5).

The matrix reveals moderate positive correlations among the indices (ranging from 0.38 to 0.64), suggesting that the dimensions are related but not redundant. This supports the aggregation of the indices into a composite measure and confirms that each index contributes uniquely to the overall concept of vulnerability.

3.4.6 Construction of vulnerability index (VI). The values of all indices (ESI, WCI, JSI, SSI) lie between 0 and 1. Where values close to 0 indicate a bad situation and values close to 1 represent a better situation. The Vulnerability Index (VI) is calculated using the following formula:

Table 3. Indicators and Scoring Scheme for Working Condition Index (WCI)

Sl. No.	Questions	Responses
1	Possession of health insurance	Yes = 1, No = 0
2	Housing facility provided by the employer	Yes = 1, No = 0
3	Pure drinking water is available at the workplace	Yes = 1, No = 0
4	Faced any threats or accidents	Yes = 0, No = 1
Total score of the i^{th} individual		Maximum = 4, Minimum = 0

Table 4. Indicators and Scoring Scheme for Social Security Index (EEI)

Sl. No.	Components	Responses
1	Provision of provident fund	Yes = 1, No = 0
2	Provision of medical benefits	Yes = 1, No = 0
3	Provision of bonus facility	Yes = 1, No = 0
4	Provision of insurance facility	Yes = 1, No = 0
5	Provision of cloth facility	Yes = 1, No = 0
6	Provision of overtime allowance	Yes = 1, No = 0
7	Provision of an advance payment	Yes = 1, No = 0
8	Provision of paid leave	Yes = 1, No = 0
9	Any other facility	Yes = 1, No = 0
Total score of the i^{th} individual		Maximum = 9, Minimum = 0

Table 5. Correlation among the Component Indices

Components	SSI	JSI	WCI	ESI
Social security index (SSI)	1.00	0.58	0.41	0.64
Job security index (JSI)	0.58	1.00	0.52	0.47
Working condition index (WCI)	0.41	0.52	1.00	0.38
Economic security index (ESI)	0.64	0.47	0.38	1.00

Note (s): All indices are normalised on a 0–1 scale, with higher values indicating greater vulnerability

$$VI = 1 - \sqrt[4]{ESI \times WCI \times JSI \times SSI}$$

Higher VI values indicate greater vulnerability. The geometric mean ensures balanced weighting of dimensions.

3.5 Models and variables used

3.5.1 Empirical models. For the analysis, the following models have been estimated. The dependent variable in all the models ranges between 0 and 1. The justifications of the explanatory variables are given below:

$$SSI_i = \alpha + \beta_0 AGE_i + \beta_1 LOII_i + \beta_2 GEN_i + \beta_3 REL_i + \beta_4 EDU_i + \beta_5 MS_i + \beta_6 IN_i + \beta_7 DIST_i + u_i$$

Model 1

$$JSI_i = \alpha + \beta_0 AGE_i + \beta_1 LOII_i + \beta_2 GEN_i + \beta_3 REL_i + \beta_4 EDU_i + \beta_5 MS_i + \beta_6 IN_i + \beta_7 DIST_i + u_i$$

Model 2

$$ESI_i = \alpha + \beta_0 AGE_i + \beta_1 LOII_i + \beta_2 GEN_i + \beta_3 REL_i + \beta_4 EDU_i + \beta_5 MS_i + \beta_6 IN_i + \beta_7 DIST_i + u_i$$

Model 3

$$WCI_i = \alpha + \beta_0 AGE_i + \beta_1 LOII_i + \beta_2 GEN_i + \beta_3 REL_i + \beta_4 EDU_i + \beta_5 MS_i + \beta_6 IN_i + \beta_7 DIST_i + u_i$$

Model 4

$$VI_i = \alpha + \beta_0 AGE_i + \beta_1 LOII_i + \beta_2 GEN_i + \beta_3 REL_i + \beta_4 EU_i + \beta_5 MS_i + \beta_6 IN_i + \beta_7 DIST_i + u_i$$

As the dependent variable takes values between 0 and 1, beta regression is an appropriate method for estimating the models (Paul *et al.*, 2025).

Explanatory variables used in the model are as follows.

Age (AGE): With an increase in age, the skill and experience of the worker increase, which increases the probability of being employed in better jobs (Aityan, 2022). Here, age is a continuous variable.

Law and order insecurity index (LOII): To capture individual-level vulnerability related to safety and access to justice, a Law-and-Order Insecurity Index (LOII) was constructed using three binary variables:

- (1) whether the respondent felt able to report crime or abuse without fear;
- (2) whether they had received legal help or intervention when needed; and
- (3) whether they knew how to file a complaint or legal case.

Each variable was coded as 1 for responses indicating insecurity (i.e. “No”) and 0 for secure responses (i.e. “Yes”). The LOII was then calculated as the simple average of these three indicators, resulting in an index ranging from 0 to 1, where higher values represent greater insecurity related to law and order.

Gender (GEN): In India, females are generally engaged in low-paid jobs with poor working conditions and face greater exposure to occupational hazards. In the model, gender is included as a categorical variable, with males taken as the base category.

Marital status (MS): Generally, unmarried, widowed and separated people are more vulnerable compared to married people (Chandra, 2011; Otto, 2018; Hossain and James, 2022). Marital status is taken as married and unmarried, with unmarried as the base category.

Religious group (REL): Marginalised sections with lower social status, such as minorities and other backward classes, are found to be in a state of high poverty and illiteracy and are more vulnerable in the job market (Chandra, 2011). The base category is Muslim (Islam).

Education level (EDU): Education is the basic requirement for employment in the job market (Dakuah and Chandra, 2015). Higher education lowers the chances of being unemployed or being engaged in low-skilled and low-category jobs (Hossain and James, 2022). Here, education level comprises seven categories: none, up to primary, up to secondary, completed high school, incomplete college, complete college education and post-graduation, where illiterate or no education is the base category.

Industry (IN): Migration workers in Arunachal Pradesh are basically found in three sectors: construction, brick kiln and health. These three sectors are considered here.

District (DIST): This variable is used to have a comparative picture of the district-wise vulnerability of the respondent.

4. Results

Table 6 shows clear gendered and migration-based differences in vulnerability. Migrant women exhibit the highest overall vulnerability (VI: 0.2138) and relatively low social security (SSI: 0.3889), indicating limited access to protective benefits. They also face poor working conditions (WCI: 0.6545), only slightly better than non-migrant women (0.70), who experience the worst conditions overall. Although non-migrant women report the lowest job insecurity (JSI: 0.0861), this reflects relatively stable but low-quality employment.

Table 6. Average vulnerability indices by migration status and gender

Index	Migrant		Non-Migrant	
	Female	Male	Female	Male
Social security index (SSI)	0.3889	0.2298	0.3185	0.2016
Job security index (JSI)	0.2176	0.2352	0.0861	0.1596
Working condition index (WCI)	0.6545	0.5303	0.7000	0.5465
Economic security index (ESI)	0.1981	0.2265	0.2531	0.2070
Vulnerability index (VI)	0.2138	0.1959	0.1556	0.1378

Source(s): Authors’ calculation from field survey (2023) data

Migrant men also face notable vulnerabilities, particularly in job security (0.2352) and working conditions (0.5303), though less severe than those of migrant women. Non-migrant men consistently record the lowest vulnerability across indices, especially in social security (0.2016) and overall vulnerability (0.1378), suggesting comparatively better employment stability and protection.

District-level patterns (Table 7) reveal spatial variation. Female vulnerability is higher in East Siang (VI: 0.2400) and Papum Pare (0.2493), while West Kameng shows relatively lower vulnerability for women (0.1250). Lohit displays comparatively stronger job security, particularly for males (0.2428) and females (0.3348), indicating the role of local labour market structures in shaping outcomes.

The beta regression results (Table 8) confirm several significant determinants of vulnerability. Law and order insecurity (LOII) reduces social security ($-0.35, p < 0.01$) and economic security ($-0.22, p < 0.05$) and increases overall vulnerability ($0.43, p < 0.05$). The adverse effects are stronger for women, as reflected in significant interaction terms.

Gender is a critical axis of disadvantage. Female migrants exhibit significantly higher overall vulnerability ($0.35, p < 0.05$) and lower job ($-0.24, p < 0.05$) and social security ($-0.25, p < 0.10$), reinforcing evidence that women are concentrated in precarious and unprotected informal employment (Yadav and Shah, 2024; Deshpande, 2011).

Religious identity also matters. Muslim and Buddhist migrants show significantly higher vulnerability (VI: 0.58 and 0.31, respectively) and lower job and economic security, reflecting broader patterns of marginalisation in labour and housing markets (Thorat *et al.*, 2012). Christian migrants report better working conditions ($-0.50, p < 0.05$), possibly because of stronger community networks.

Education emerges as a strong protective factor. Primary and secondary education significantly reduce overall vulnerability, while graduate ($1.56, p < 0.01$) and post-graduate ($1.88, p < 0.01$) levels substantially improve economic security, supporting the role of human capital in enhancing labour market outcomes. District effects are pronounced. Lohit shows significantly lower overall vulnerability ($-0.34, p < 0.05$) and higher job security ($0.50, p < 0.01$) relative to East Siang. Papum Pare records lower job security but better working conditions, reflecting its urbanised, service-oriented employment structure. West Kameng shows lower social security ($-0.63, p < 0.01$), possibly due to project-based employment patterns. Sectoral differences indicate that brick kiln workers face lower job ($-0.49, p < 0.01$) and economic security ($-0.43, p < 0.05$) than construction workers, despite reporting better working conditions ($0.51, p < 0.05$), suggesting captive but facility-supported employment arrangements. Age has mixed effects: older workers report higher job security ($0.03, p < 0.01$) but lower economic security ($-0.02, p < 0.01$), indicating that prolonged informal employment does not ensure long-term financial resilience.

Table 7. Average vulnerability indices by district and gender

District	Gender	Social security index (SSI)	Job security index (JSI)	Working condition index (WCI)	Economic security index (ESI)	Vulnerability index (VI)
East Siang	Male	0.3187	0.2123	0.5566	0.2384	0.2026
	Female	0.3824	0.2320	0.5809	0.2369	0.2400
Lohit	Male	0.2202	0.2428	0.5370	0.2308	0.2369
	Female	0.2456	0.3348	0.5921	0.1726	0.2371
Papumpare	Male	0.2667	0.1392	0.6000	0.2190	0.2142
	Female	0.3708	0.1722	0.7255	0.2051	0.2493
West Kameng	Male	0.1837	0.2176	0.5186	0.2128	0.1519
	Female	0.0960	0.3624	0.5455	0.1557	0.1250

Source(s): Authors' calculation from field survey (2023) data

Table 8. Beta regression result

		Dependent variables				
Explanatory variables	Type	SSI	JSI	ESI	WCI	VI
		Coefficients				
Constant	—	−0.63***	−2.46***	−1.13***	0.47*	1.52***
AGE	Continuous	0.0028	0.03***	−0.02***	0.002	0.0052
LOII	Continuous	−0.35***	−0.31	−0.22**	−0.19	0.43**
GEN	Male	(Base)				
	Female	−0.25*	−0.24*	−0.06	−0.14	0.35**
Female × LOII	Interaction	−0.08**	−0.06	−0.06*	−0.10	0.12**
REL	Hindu	(Base)				
	Muslim	−0.43*	−0.29*	−0.62***	0.97	0.58***
	Buddhist	−0.067	−0.62***	0.02	−0.084	0.31*
	Christian	0.11	−0.0003	0.03	−0.50**	0.16
EDU	Illiterate	(Base)				
	Primary	0.011	0.22	0.46***	0.032	−0.35**
	Secondary	0.19	0.20	0.69***	0.063	−0.34**
	High school	0.45	−0.35	0.32	0.17	−0.30
	Intermediate	0.012	−0.66	1.35***	0.46	0.05
	Graduate	0.37	0.16	1.56***	0.36	−0.60*
	Post graduate	0.46	−0.50	1.88***	0.06	−0.82
MS	Single	(Base)				
	Married	0.12	−0.07	0.31*	−0.17	−0.17
	Divorced	0.88**	−0.03	0.78*	−0.38	−0.34
	Widow	−0.23	−0.57	1.31	0.06	−1.18
IN	Construction	(Base)				
	Bricks kiln	−0.28	−0.49***	−0.43*	0.51**	0.16
	Health sector	0.22	−0.12	−0.48	0.36	0.10
DIST	East Siang	(Base)				
	Lohit	−0.57***	0.50***	0.15	0.03	−0.34*
	Papum Pare	−0.041	−0.43**	0.22	0.89***	0.15
	West Kameng	−0.63***	0.23	0.34*	−0.11	0.23
Test for joint significance of the model						
Log-Likelihood ratio		434.79	462.53	453.23	188.81	1097.91
LR Chi-Square		272.95***	98.42***	31.07***	102.01***	53.98***
Pseudo R ²		0.30	0.32	0.29	0.36	0.35
Note(s): ***, **, *denote significant at 1, 5 and 10% level, respectively						
Source(s): Calculated by authors from on-field survey (2023) data						

5. Discussions

This study examined determinants of vulnerability among informal migrant workers in Arunachal Pradesh using a multidimensional index combining job security, social security, economic security and working conditions. Its key contribution lies in quantifying overlapping insecurities in a frontier region with weak labour regulation and limited institutional reach. Rather than treating vulnerability as a single outcome, the findings show how it operates unevenly across gender, religion, education, sector, district and life stage.

Drawing on feminist political economy (Kabeer, 2015), vulnerability is interpreted as structurally produced through unequal power relations and restricted access to resources. The significantly higher vulnerability of female migrants reflects the gendered organisation of informal labour, limited bargaining power and constrained access to entitlements. This

aligns with [Parreñas' \(2015\)](#) concept of gendered migration chains and notion of the feminisation [Chen's \(2012\)](#) of informal employment. The strong negative effects of law-and-order insecurity, particularly for women, further demonstrate how institutional fragility and violence restrict economic participation ([Chant, 2014; Kabeer, 2015](#)).

Religious identity also shapes outcomes. Muslim and Buddhist migrants experience higher job and economic insecurity, echoing broader evidence of labour market discrimination and social exclusion in India ([Thorat et al., 2012; Valencia, 2016; Schmidt-Sane et al., 2024](#)). In this context, religion functions as a structural barrier limiting access to assets, welfare and stable employment.

Education consistently reduces vulnerability and enhances economic security, supporting human capital and capability perspectives that link schooling with mobility, bargaining power and improved employment outcomes ([Mosquera, 2013; Aleshkina and Апокина, 2022; Kabeer, 2015](#)).

Spatial and sectoral disparities further underline the contextual nature of vulnerability. Lower vulnerability in Lohit suggests the protective role of local networks ([Parreñas, 2015](#)), while mixed outcomes in other districts reflect uneven development ([Aliprantis and Zenker, 2011a, 2011b; Qu, 2023](#)). Brick kiln workers, despite somewhat better working conditions, face lower job and economic security, highlighting multidimensional and non-linear precarity ([Ali, 2024a, 2024b](#)). Similarly, older migrants exhibit greater job stability but weaker economic security, underscoring the absence of life-course protections in informal labour markets ([World Social Protection Report 2020–22: Social protection at the crossroads – in pursuit of a better future, 2024](#)).

The study's main contribution is its context-sensitive, multidimensional framework for measuring migrant vulnerability in an under-researched and politically sensitive region. However, limitations include cross-sectional data, reliance on self-reported information, limited non-migrant comparison, exclusion of caste and ethnicity and inability to capture subjective dimensions of insecurity.

Despite these constraints, the findings offer a strong empirical and theoretical basis for understanding gendered migrant vulnerability and provide a replicable framework for future research and policy design.

6. Conclusion

Migration vulnerability in Arunachal Pradesh is shaped by structural inequalities rooted in gender and religion. The study finds that women face significantly higher vulnerability because of their concentration in low-paid, informal and insecure work, coupled with limited social protection. Muslim migrants also experience heightened insecurity linked to discrimination and marginalisation. Law-and-order insecurity further reduces social and economic security, with disproportionately severe effects on women, showing how safety concerns intensify existing disadvantages. Education emerges as a key protective factor. Migrants with secondary and higher education report greater job stability and financial resilience, while illiterate workers remain confined to precarious sectors. District-level variations highlight the importance of local governance and labour market conditions; for example, migrants in Lohit experience lower vulnerability than those in East Siang. Sectorally, brick kiln workers report relatively better working conditions, but this does not offset their weak job and economic security.

These findings call for multidimensional policy responses. Gender-sensitive social protection, stronger law-and-order enforcement and anti-discrimination measures are essential, particularly for women and religious minorities. Expanding education and skill development for low-skilled migrants can enhance long-term resilience. District-specific strategies, improved migrant record systems and a streamlined Inner Line Permit framework

would further strengthen institutional protection. Future research should adopt longitudinal and qualitative approaches to capture changes over time and deepen understanding of migrants' lived experiences, alongside comparative studies across northeastern states to distinguish local from structural drivers of vulnerability.

Ethics Statement

Participation in this study was voluntary, and informed consent was obtained from all respondents before data collection. Participants were informed about the purpose of the research and their right to withdraw at any time. Confidentiality and anonymity were strictly maintained, with no personally identifiable information recorded. Data were used solely for academic purposes and handled securely. Interviews were conducted respectfully and sensitively, particularly when discussing employment conditions and personal insecurity, to ensure no harm or discomfort to participants.

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