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REVERSE MIGRATION AND URBAN CHALLENGES IN BAREILLY AMID THE COVID-19 PANDEMIC

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Abstract

Throughout the world the COVID-19 pandemic disrupted society and economy with India experiencing a major wave of reverse migration back home. Lack of job security and unstable city life forced many migrant workers back to their hometowns which created major problems for cities of medium size like Bareilly. Our research studies how returning migrants affect the economy and society of Bareilly including both city and neighboring zone problems. The research used stratified sampling to survey 400 people about employment shifts plus health support quality and economic differences. Our statistical analysis showed clear rises in joblessness alongside weak healthcare systems between city and edge-of-city areas. Our results reveal that cities need specific policy solutions to build urban strength by developing the healthcare system and generating jobs at the local level. Our research provides proven data to help urban planners and policy designers solve problems from returning migrants.

Keywords: Reverse migration, COVID-19, urban challenges, Bareilly, socio-economic impacts, healthcare, unemployment

1. Introduction

The COVID-19 pandemic created unmatched worldwide problems that deeply affected societies and economies at all levels. The major issue India faced during the pandemic emerged from workers moving back to their hometown from cities. Millions of migrant workers went back home because they lost their jobs and could not sustain life in urban places. During the pandemic this research examines how Bareilly Uttar Pradesh served as a vital point for returning migrants. The research shows how returning migrants during the pandemic put pressure on the city's basic services including medical facilities and job opportunities.

Many returning migrants poured into the tier-two city of Bareely which made it hard to provide services and help people adjust back to life. Through this research we analyze how reverse migration changed Bareilly's urban layout and what economic and social steps must be taken to

handle these effects. The research uses statistical tests to confirm specific theories about how reversed migration affects cities and their operational difficulties.

The contributions of this paper include: The paper approaches three main goals: studying socio-economic results of reverse migration in Bareilly, comparing urban challenges across different regions and offering proven strategies for resilient city development. The paper is organized as follows: The study is divided into eight sections starting with research motivation in Section 2 then literature review in Section 3 and then explores the research method in Section 4. Section 5 delivers statistical findings before critical observations are summarized in Section 6 followed by discussions of findings in Section 7 and ending with policymaking suggestions in Section 8.

1.1 Motivation

During the COVID-19 pandemic urban migrant workers in informal jobs proved to be very vulnerable. Widespread job losses during lockdown pushed millions of workers back to their hometowns when they found no financial support. Bareilly became an important location because it sits strategically and serves as the home district for numerous migrant workers. Looking at the movement of returning workers back to Bareilly helps us understand what problems smaller urban areas face right now. This research examines current weaknesses in infrastructure and policies to create useful proposals that strengthen city resilience and promote sustainable growth. Research results will help government officials create strategies to reduce lasting effects from these emergencies.

2. Literature Review

Deshingkar, P. et al. (2020): Researchers examined how migrant workers endured vulnerabilities throughout the COVID-19 pandemic. It highlighted the precarious nature of urban livelihoods and the lack of social safety nets for informal workers, emphasizing the need for systemic reforms.Sengupta, A. & Jha, M. (2021): Focused on reverse migration's impact on rural economies, this paper analyzed resource distribution challenges and the strain on rural infrastructure, suggesting ways to improve rural employment opportunities. Srivastava, R. (2021): This paper examined policy responses to migration crises, critiquing the inadequacies in urban planning and proposing strategies for managing migration in future emergencies.Raju, S. et al. (2020): Investigated the psychological toll on migrant workers and their families during the pandemic, with a focus on mental health outcomes and community-level support mechanisms.Aggarwal, S. et al. (2021): This study addressed the challenges faced by urban local bodies in accommodating reverse migrants, with particular attention to housing, sanitation, and healthcare.Chandrasekhar, C. P. et al. (2020): Examined the disruptions in labor markets caused by the pandemic, highlighting the impact on informal sectors and urban employment trends. Mukherjee, D. et al. (2021): The study looked at healthcare system challenges in small cities to show how decentralized medical services remain crucial whenever large population movements happen. Das, P. et al. (2022): Through their research about reverse migration this study reveals socio-economic effects which affect both urban and peri-urban regions through evaluations of distribution inequalities along with variations in employment opportunities. Kumar, S. et al.

(2021): Researchers evaluated the informal community networks functioning to reduce migration challenges and showed their essential role in developing local intervention systems. Verma, A. & Sharma, N. (2022): The study analyzed tier-two city urban systems to propose improvements for both the infrastructure systems and governance structures.

2.1 Gaps

- Urban resource strain: Limited research on tier-two cities like Bareilly.
- Healthcare and employment: Insufficient studies linking reverse migration with healthcare and employment outcomes in small cities.
- Policy responses: Need for evidence-based policy recommendations tailored to non-metropolitan urban contexts.

3. Research Methodology

Sampling Method and Sample Size

A stratified random sampling method was used to select participants, ensuring representation from both urban and peri-urban areas of Bareilly. The formula for calculating the sample size was:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

Where:

- Z = Z-score (1.96 for a 95% confidence level)
- p = estimated proportion (0.5 for maximum variability)
- e = margin of error (0.05)

Using this formula, a sample size of 400 participants was determined.

Statistical Testing Techniques

Explanation of Statistical Tests with Equations:

1. T-Test
   The T-test is used to determine if there is a statistically significant difference between the means of two groups. In this context, it compares unemployment rates before and after reverse migration.
   - Equation for T-test:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

   Where:

- $\bar{X}_1, \bar{X}_2$: Mean unemployment rates before and after reverse migration.
- s_1^2, s_2^2: Variance in unemployment rates before and after reverse migration.
- n_1, n_2: Sample sizes before and after reverse migration.

- Hypotheses:
  - Null Hypothesis (H_0): There is no difference in unemployment rates before and after reverse migration ($\mu_1 = \mu_2$).
  - Alternative Hypothesis (H_a): There is a significant difference in unemployment rates ($\mu_1 \neq \mu_2$).

2. Chi-Square Test
The Chi-square test is used to evaluate if there is a significant association between two categorical variables. In this case, it assesses the adequacy of healthcare services provided to migrants or urban populations.

- Equation for Chi-square (χ^2):

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where:

- O_i: Observed frequency for each category.
- E_i: Expected frequency for each category, calculated as $E_i = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$.

- Hypotheses:
  - Null Hypothesis (H_0): There is no significant association between healthcare adequacy and population categories (e.g., urban vs peri-urban).
  - Alternative Hypothesis (H_a): There is a significant association.

3. MANOVA (Multivariate Analysis of Variance)
MANOVA is used to analyze the effect of independent variables on multiple dependent variables simultaneously. Here, it examines socio-economic variables (income, education, housing) across urban and peri-urban areas.

- Equation for MANOVA:

$$F = \frac{\textit{Effect Variance (Between-group)}}{\textit{Error Variance (Within-group)}}$$

MANOVA extends the ANOVA equation for multivariate data:

$$F = \frac{SSB\ (Sum\ of\ Squares\ Between\ Groups)}{SSW\ (Sum\ of\ Squares\ Within\ Groups)}$$

Multivariate data involves a set of dependent variables $Y_1, Y_2, \ldots, Y_p$.

- Hypotheses:
  - Null Hypothesis (H_0): Socio-economic variables (income, education, housing) do not differ significantly across urban and peri-urban areas.
  - Alternative Hypothesis (H_a): At least one socio-economic variable differs significantly.
- Key Outputs of MANOVA:
  - Wilks' Lambda (Λ): Measures how well each variable separates groups.
  - Pillai's Trace: Measures the proportion of explained variance.

4 Results

4.1 Descriptive Analysis

- Income Distribution: 45% of participants reported a significant reduction in income post-migration, as shown in the bar graph.
- Healthcare Access: A pie chart revealed that 70% of respondents deemed healthcare services inadequate.

4.2 Statistical Findings

T-test Results (Unemployment Rate)

Variable	Pre-Migration Mean	Post-Migration Mean	t-value	p-value
Unemployment Rate	6.2%	12.8%	5.67	0.000
Interpretation: A statistically significant increase in unemployment rates post-migration.				

The statistically significant increase in unemployment rates from 6.2% pre-migration to 12.8% post-migration, as indicated by a t-value of 5.67 and a p-value of 0.000, underscores a critical socio-economic challenge. This result demonstrates that the observed rise in unemployment is not due to random variation but reflects a substantial shift following reverse migration. The significance lies in its broader implications for economic stability, policy planning, and social well-being. A surge in unemployment places considerable strain on local economies, particularly in rural and peri-urban areas that may lack the infrastructure and industries to absorb returning workers. It highlights a mismatch between the labor supply and demand, often exacerbating poverty and dependency on limited local resources.

The findings call for immediate policy interventions, such as skill development programs, job creation initiatives, and incentives for businesses to invest in these regions. Moreover, the increased unemployment rate has social implications, potentially leading to reduced household incomes, heightened inequality, and mental health challenges. It also indicates the need for long-term strategies to integrate returning workers into the economy, such as fostering entrepreneurship, improving rural employment opportunities, and aligning workforce skills with local industry needs.

This data serves as a wake-up call for governments and stakeholders to address the economic dislocation caused by reverse migration, emphasizing the importance of sustainable planning and investment in underdeveloped regions to mitigate the adverse effects on unemployment and overall socio-economic stability.

Chi-square Test Results (Healthcare Adequacy)

Category	Adequate	Inadequate	Total
Survey Responses	120	280	400
Chi-square value	45.2		
Interpretation: A significant inadequacy in healthcare infrastructure.			

According to the Chi-square evaluation healthcare infrastructure shortcomings below acceptable standards became evident via a resulting score of 45.2 based on survey participant assessments. The survey showed participants at 120 out of 400 would approve existing healthcare services but the majority at 280 out of 400 found it lacking as numerical results revealed 30% positive satisfaction and 70% negative evaluation. Systemic malfunctions within health service structures become apparent through service availability gaps which demand prompt systemic corrections to this foundational challenge. Research demonstrates multiple deficiencies present in medical service systems about reachability and service quality which along with service provision shortfalls mainly affect areas of reverse migration and rapid population growth.

The conclusions of this research must serve as foundational elements for all future policy-making sessions which occur. Healthcare infrastructure deficits that result in delayed treatments create increased mortality which makes existing disparities between health access wider. Searching for high-cost alternate health options puts heavy fiscal pressure on household economic management. Insufficient healthcare infrastructure conditions produce diminished worker efficiency across selected regions and damage collective health which blocks sustainable economic advancement.

Based on statistical findings policymakers must direct their highest priority to investment in health infrastructure. Healthcare infrastructure development stands alongside workforce recruitment improvement as well as better medical technology access and essential medicine availability as intertwined goals. Our objectives must include addressing these essential deficiencies since fixing them creates stable health performance while relieving family financial strains and building both economic security and social wellness. The Chi-square data strongly indicates the necessity to fix healthcare system weaknesses so we can obtain exceptional health services together with enhanced societal well-being.

MANOVA Results (Socio-Economic Variables)

Variable	F-value	p-value
Income	4.32	0.01
Housing Conditions	6.78	0.003
Education	3.56	0.025
Interpretation: Significant disparities in socio-economic variables.		

Socioeconomic variable analysis through reported F-values and p-values uncovers significant differences between groups. The availability of statistically meaningful income differences emerges because researchers found both a 4.32 F-value and a 0.01 p-value demonstrating distinguishable income trends across different groups. An F-value of 6.78 coupled with a p-value of 0.003 demonstrates major living standard and housing differences between research groups. Educational disparities exist between groups according to the analysis because the F-value of 3.56 shows variation that moves beyond statistical chance with a p-value of 0.025. Educational

experiences demonstrate disparities while showing inconsistent scholarly achievement across different studies.

Data produced from research examinations allows scholars to analyze economic behavior alongside the frameworks of social interactions. When financial pressures burden community members those limitations lead to inadequate service availability which results in unequal living standards while degrading both health outcomes and overall well-being. Social structures show discrimination when uneven educational success leads to better career advancements and mobility chances.

Effective social strategies must be deployed to eliminate existing social inequalities once statistical analyses present significant results through p-values less than 0.05. Policy makers need to create equitable income distribution by supporting employment opportunities expansion providing social welfare system support and designing better payment standards. Public budgets enable accessible housing development when financial support shifts toward accessible homes as municipalities develop growth strategies to fight housing inequality while education needs include wider access to higher education programs and skill building programs. Systemic inequities expose the depth of these inequalities and indicate vital developmental paths toward sustainable economic progress which must include targeted resource distribution together with complete developmental planning to overcome these gaps.

4.3 Observations

Statistical test results identify essential information about socio-economic inequality as well as joblessness and deficient healthcare that reverse migration afflicts affected areas. A T-test analysis shows that expanding unemployment reached significant dimensions as pre-migration rates increased to 6.2% while post-migration levels spiked to 12.8% where t-value equaled 5.67 and p-value stood at 0.000. The rapid increase demonstrates an urgent social economic situation because rural areas along with their peri-urban counterparts cannot accept the returning workforce from cities. When organized workforces exceed available positions businesses need to fill the gap it creates long-lasting joblessness which damages regional economic strength and intensifies poverty. The research outcomes require urgent solutions because they demand newly created employment positions and specialized training programs alongside policy tools that motivate industries to invest in growth regions. Social well-being joins economic stability as priority areas because addressing inequality and treating mental health consequences of joblessness becomes essential.

The Chi-square test demonstrates healthcare infrastructure inadequacies through substantial respondent agreement that healthcare services fall short of expectations (70 percent). The Chi-square value of 45.2 confirms that the problems described in the study spring from established healthcare delivery system failures in service accessibility and quality and facility availability. The health care system shortages pose an essential problem especially for population growth areas that received reverse migration which lacks capacity to serve this added healthcare requirement. Public health outcomes and mortality levels stand to deteriorate while health-based differences between

groups will intensify specifically for those who need better healthcare services. Strategic funding must go toward healthcare infrastructure expansion along with doctor education and basic services availability improvement because these gaps exist.

The introduced assessment measures through MANOVA found extensive statistical variation across variables related to income as well as housing quality and education attainment. The F-values and corresponding p-values (e.g., income: The results show significant inter-group differences for income (F=4.32, p=0.01), housing conditions (F=6.78, p=0.003), and education (F=3.56, p=0.025). Income disparities expose fundamental structural inequalities which prevent people from accessing necessary resources while creating continuous economic hardship. Living conditions that differ greatly between groups produce massive disparities in housing environments that negatively affect the health and standard of life for all residents. The distribution of learning opportunities must be equalized because education functions fundamentally as a guardian of economic upward movement. The results demonstrate why efficient planning combined with resource management remains crucial to minimize inequities and support enduring development within target geographic areas. Research evidence reveals the necessity of comprehensive policy approaches that will effectively manage these complex problems.

5.Conclusion and Findings

The research identifies critical socio-economic consequences from reverse migration along with demonstrating the need for specific programmatic solutions. The T-test results reveal a statistically significant rise in unemployment rates, increasing from 6.2% pre-migration to 12.8% post-migration (t-value: 5.67, p-value: 0.000). Workers will not take jobs in depressed rural and peri-urban areas because of their challenging employment situation which consequently drives poverty levels up and pushes society apart. The economic dislocation of underdeveloped regions requires immediate policy measures that must include job creation along with skill development programs and industrial investments to improve employment opportunities. The Chi-square test further reveals systemic inadequacies in healthcare infrastructure, with 70% of respondents rating healthcare services as inadequate (Chi-square value: 45.2). Healthcare infrastructure along with professional staff and service equilibrium demand substantial funding throughout locations where population movement causes rising service needs. Solving current health service gaps leads to improved public health results and reduced health disparities while enhancing community-wide immune response.Statistical assessments reveal comprehensive differences concerning the three socio-economic variables income (F=4.32, p=0.01), housing conditions (F=6.78, p=0.003) and education (F=3.56, p=0.025) between research phases. The research indicates structural arrangements which prevent communities from obtaining valuable resources and create continued poverty and blocked social advancement paths. The differences between housing quality and educational resources create wider socio-economic gaps which reduce life standards and hamper ongoing development processes.The research data demonstrates that unemployment operates aspirationally with healthcare and socio-economic differences. Solution of these problems needs fundamental strategic plans connecting urgent support with sustained efforts to decrease inequality while promoting sustainable development. Through health, education and housing investments

together with job development initiatives the problems caused by reverse migration will be reduced and economic and social stability of affected regions will improve.

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