Urban to rural COVID-19 progression in India: The role of massive migration and the challenge to India's traditional labour force policies

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Abstract
The coronavirus disease-2019 (COVID-19) has emerged as a deadliest disease in the 21st century. Initially in India, this disease was concentrated in major urban cities like Mumbai, Delhi, Gujarat, and Chennai, which were the national hot-spots for the COVID-19 pandemic. However, in subsequent months, returning migrants (mainly day labour) brought the disease back to their home; this vector triggered significant spread to semi-urban and rural areas. This highlighted serious concerns in rural India, where access to sophisticated healthcare and mitigation strategies were lacking. There is little data on this new pattern of disease spread. This article provides a short review for tracking the spread of COVID-19 into major rural states in India based on understanding urban-rural workforce migration relative to the growing proportion of the nation's COVID-19 caseload between May-September 2020.

Keywords
COVID-19, India, migration, urban city

1 | TO THE EDITOR

The COVID-19 is the deadliest disease of the 21st century that has spread rapidly in many parts of the world.1 India was the second highest COVID-19 affected country, after the USA, as of 30 September 2020.1 The first confirmed case of COVID-19 in India, reported on 30 January 2020, was a Keralite woman who had travelled from Wuhan City to Kerala. On 4 March 2020, a COVID-19 patient from Delhi infected six members of his own family. On the same day,
14 out of 21 Italian tourists along with an Indian driver tested positive. On 12 March 2020, India recorded its first Covid-19 death, a 76-year-old man who arrived from Saudi Arabia. Several other cases were recorded in March 2020, mainly people coming from affected countries, that resulted in community spread. On 19 March 2020, the Central Government announced to observe a nationwide 14-hour Janata curfew on 22 March, followed by a 21 days long nationwide lockdown of industries, construction, transportation, and travel was announced on 24 March 2020 in an attempt to lessen human to human contact. The lockdown was extended phase-wise until 31 May 2020 (Phase 1: 25 March 2020 to 14 April 2020; Phase 2: 15 April 2020 to 3 May 2020; Phase 3: 4 May 2020 to 17 May 2020; and Phase 4: 18 May 2020 to 31 May 2020), after which the government started unlocking the country based on the local severity of the disease. The lockdown had a significant impact on the Indian economy as a result Indian economy witnessed a deep recession in the GDP figure for Q1(April-June) FY21 falling by –23.9%. This move impacted the livelihood of millions of migrants, mostly daily wage workers across India's major cities as jobs were cancelled, resulting in less food buying power and uncertainty as to when the lockdown would end. This sparked a mass exodus of millions of migrant labourers, who left cities like Mumbai, Delhi, Surat, Chennai, etc., to return to their rural villages in the states of origin. Many of them travelled hundreds of kilometres to reach their villages, either walking/cycling or packed into trucks, buses, and trains. Many were left stranded mid-way at railway stations or at state or district borders, with no public transport. The Railway Ministry has estimated that since Prime Minister Narendra Modi declared a Nationwide lockdown (1 May 2020), at least 4.5 million labourers returned to their homes during the 2 months after lockdown with the help of special trains – Shramik Special – or by other means. These migrants represent a vulnerable segment to potential infection and ultimately brought the disease into their villages. This leads to a significant COVID-19 increase in semi-rural, towns and villages throughout India; these areas were already stretched and lacking health resources, including medical equipment, physicians and testing infrastructure, etc. In an attempt to control rural infection, the Government of India issued a mandatory home quarantine for 14 days for any traveller if asymptomatic and institutional quarantine if symptomatic. However, despite of these efforts, daily cases were continued to rise rapidly in rural areas which were previously untouched. These rural settings are home to 70% of the country’s senior citizens, who are most susceptible and living without required health resources to combat the disease. There is a paucity of data on the impact of COVID-19 in rural areas. This article compiled data from news reports to provide a short review for tracking the rising burden of COVID-19 in rural India with emphasis on viral spread as a function of urban-rural workforce migration between May and September, 2020. This synthesis has clearly shown that migration dynamics is linked to COVID-19 spread. This knowledge will help in reformulating the policy related to rural migration travel and disease tracking, which can protect India’s rural population from the future pandemic spread and will also provide information on non-pandemic disease spread. The results of this work will also be applicable to other parts of the World where rural-urban migration is a significant factor in economic development and livelihood.

2 | COVID-19 IN INDIA: THE URBAN TO RURAL SPREAD TIMELINE

India is a vast country where each year a substantial number of people migrate to urban cities for employment opportunities. As reported by the World Bank, the rural population significantly decreased from 82% in 1960 to 65% in 2019, with a concomitant urban population increased from 17.9% in 1960 to 34.47%. Migrants are mainly concentrated in 53+ million urban clusters that comprise 140 million of the 377 million urban population of the country, which is around 43% of the total urban population as per the 2011 Census. Out of these 53+ million cities, eight are mega-cities, each with 5+ million inhabitants. Around 48% of the migrants travel from the states of Bihar, Uttar Pradesh, Jharkhand, Rajasthan, Punjab, West Bengal, Assam, and Odisha to find work in Maharashtra, Delhi, Gujarat and Karnataka. Specific significant migration routes (Figure 1A) from ‘native’ to ‘professional places’ (i.e., place of origin to place of work/employment) include: Uttar Pradesh and Bihar to Delhi; Uttar Pradesh to Maharashtra; and Karnataka to Maharashtra. After the declaration of COVID-19 lockdown, the widespread panic among migrants in these major avenues and their desperate attempts to return home are directly related to disease spread. Figure 1B
**FIGURE 1** (A) Map shows migration between different states – the direction of arrow and the width of arrow indicate migration from native to professional place and the number of migration population, respectively. (B) Map shows migration from professional to native places wherein arrow represents the estimated COVID-19 infected cases per million populations (as per 10 April 2020). (C) List of states with maximum incoming cases during mobility from professional to native places (reproduced with permission from Kumar13) [Colour figure can be viewed at wileyonlinelibrary.com]
(based on April 2020 data) shows that the total number of cases per million population and highlights how migration from Delhi towards native places increased risk to Uttar Pradesh and Bihar (Figure 1C; for more details, refer to the study by Kumar13). According to the World Bank, more than 40 million migrant labours have been affected by the COVID-19 lockdown, and around 50,000 to 60,000 migrated from urban centres to their native places in rural areas in a period of a few days,8 which led to large-scale exposure of COVID-19 in rural settings. Initially (until April 2020 end), the pandemic was concentrated in cities like Mumbai, Delhi, Ahmedabad, Pune and Chennai, which got their first infections from foreign tourists or Indians coming from pandemic hit countries like Spain, Italy, China, Iran, etc. As of 17 May 2020, 79% of cases occurred in 30 cities.14 Subsequently, there has been a major shift in disease numbers towards the rural areas of India where 65% of the population live. The number of rural districts with more than 10,000 positive cases increased from 0 to 3 in just 1 month and the share of cases in rural and semi-urban areas rose from 21.1% on 13 July 2020 to 36.6% by 17 September 2020.15 On 5 September 2020, the Hindu16 reported that the increase of confirmed cases in mainly rural districts rose from 25% in phase 1 to 43% in phase 3 and in wholly rural districts the cases rose from 15% in phase 1 to 24% in phase 3. Consequently, the share of cases in urban or mostly urban districts decreased from 32% to 11% and 28% to 22%, respectively. The Hindustan Times17 also reported that more than 50% of all COVID-19 cases recorded in August 2020 were from 584 districts that are categorized as entirely or mostly rural. These districts were classified into five major categories based on their share (%) of rural population (2011 census): <20% rural population are considered entirely urban; 20%–40% rural is mostly urban; 40%–60% rural is mixed; 60-80% is mostly rural; >80% is rural.17 The 55% of new COVID-19 cases reported in August 2020 (see above) were mostly reported from the last two categories, which comprise the 584 districts from which they originated; this was not the case previously. This trend rapidly increased from 28% in May 2020 to 41% in July 2020 (Figure 2A). This may suggest that low population density in rural areas inhibits the spread, identification, isolation and treatment of infected persons, which is further exacerbated by lack of proper health facilities and containment in rural pockets. Down to Earth,18 which segregated 719 districts into urban and rural-based categories from 2011 Census data, reported that by 26 July 2020 rural cases exceeded urban cases, and suggested this trend will continue to increase (Figure 2B). This study also found that in August 2020 alone, rural districts recorded nearly 1.1 million COVID-19 cases, that is, 56% of all new cases. By September 2020, this statistic rose to 1.2 million new cases in rural districts, which again accounted for 53% of the national total (Figure 2B). At least nine states with significant migrations have registered more cases in their rural districts (Figure 2C). Similarly, when metro and non-metro cities are compared,17 the trend is significantly decreased in the former (Figure 2D). For instance, in June 2020 about 40% of the country’s new Covid-19 cases were being reported from only three major metro cities – Delhi, Mumbai and Chennai, and this figure reduced to only 6% in August 2020.

3 | URBAN TO RURAL STATE-WISE COVID-19 PROGRESSION

The major States like Uttar Pradesh, Bihar, Jharkhand, Odisha, West Bengal and Rajasthan witnessed sudden surge in COVID-19 cases after 1 May 2020 as large numbers of migrant workers returned to their home with the help of Sharmik Special Train.16 In UP the occurrence of rural cases went from 4057 to 5515 in just 1 week in May 2020. Subsequently, the percentage of rural cases rose from 40% in April 2020 to 65% in September 2020.19 In Madhya Pradesh cases went from 20% in April 2020 to 65% in September 2020,18 mainly due to influxes of migrants from Delhi, Maharashtra, and Gujarat. In Bihar, cases started increasing after 1 May 2020; between 4 May 2020 and 10 May 2020 the number of cases rose from 528 to 707, of which 150 of the 179 cases were attributed to migrant workers: 41 from Delhi, 36 from Maharashtra, and 35 from Gujarat, accounting for 75% of Bihar’s cases in the first week of May 2020.20 By 17 May 2020, Bihar had tested 835 Delhi returnees, 265 West Bengal returnees, and 1283 Maharastra returnees, out of which 26%, 12%, and 11%, respectively, tested positive.21 Positive cases linked to migrants stood at 3187 of 4422 by the first week of June: 758 from Delhi, 756 from Maharashtra, 505 from Gujarat, 276 from Haryana, 184 from UP, 127 from Rajasthan, 110 from West Bengal, and the rest from other states.22 On 19 May 2020, Bihar
FIGURE 2  (A) Percent distribution of new COVID-19 cases from April to August by five categories based on share of rural population, (B) monthly distribution of COVID-19 cases in urban versus rural areas, (C) COVID-19 cases in rural versus urban area in eight important States that hold majority of rural cases and (D) percentage of new COVID-19 cases in metros (Delhi, Mumbai and Chennai) and in rest of India. Source: References [Colour figure can be viewed at wileyonlinelibrary.com]
reported that one in four returning migrants from Delhi tested positive. Karnataka witnessed a substantial rise to 848 infections as of 10 May 2020, with almost doubled to 1710 cases in the following 10 days. This surge was due mainly to migration from Maharashtra. On 5 June 2020, Karnataka witnessed its largest single-day jump of 515 new cases, of which 473 were from Maharashtra. The coastal Karnataka district of Udupi, which is home to many returnees who work in Mumbai hotels, reported the largest number of active cases, followed by Kalburgi and Yadgir districts. In Jharkhand, numbers suddenly jumped from 157 to 303 in less than 2 weeks in May 2020, mainly from returnees on 70 Sharmik Special Trains. Jharkhand cases then rose to 610 cases in the last 8 days of May 2020 and to 1290 cases in the first week of June 2020. Over 90% of cases in Jharkhand are attributed to migrant workers post 2 May 2020. By the end of September 2020 rural cases in Assam jumped from 41% to 70% in just 1 month and in Odisha 60% of the cases were reported from rural areas. As per the Odisha State Health Department, almost 90% of their 1189 cases are attributed to migrants returning on Shramik Special Trains and buses; cases rose from 162 on 3 May 2020 to 611 cases in just 11 days. According to the Financial Express, 71 of 73 new cases reported on 15 May 2020 in Odisha included 50 from Surat (Gujarat), 20 from West Bengal and 1 from Karnataka. A steady increase in migration into 26 districts of Odisha came from Gujarat, Maharashtra, West Bengal, Telangana and Andhra Pradesh, resulting in cases rising from 1269, to 2994 by 31 May 2020. The return of close to 6,750,000 migrant workers to Rajasthan, 60% from near the Gujarat border, is blamed for a spike in cases to 1476 in the second week of May 2020. According to the West Bengal Health Department, a 3-day period saw a significant rise in cases: 76 cases in Howrah district, 67 cases in Malda, 46 in Hooghly and 30 in Uttar Dinajpur. Several cases have also been reported from the rural areas of Birbhum, Murshidabad and North 24-Parganas district, West Bengal. Most of these cases were migrant workers who returned from other states, especially Maharashtra. Overall, this scenario clearly indicates that returning migrant workers have been significant for transmitting COVID-19 from urban to rural areas within India.

4 | CONCLUSIONS

Media and government reports are clear: at the outset, the COVID-19 was concentrated in major urban cities like Mumbai, Delhi, and Chennai, which were the national hotspots for the pandemic. However, in subsequent months, the reactive policy decisions that led to mass exodus of migrants (mainly day labour) packed into different forms of transportation, which brought the disease back to their homes. This has certainly made a significant contribution in spreading the disease to several semi-urban and rural areas. States like Uttar Pradesh, Andhra Pradesh, Odisha, Bihar, Madhya Pradesh, Assam, West Bengal and Chhattisgarh have been the most affected States during this scenario. Also, given conditions in these States, a lack of testing, tracing, and control of the disease certainly make the situation worse. The decision to promote exodus from cities and the methods used, however, are not in the hand of the migrant workers. Their role in disease transmission was completely passive; they were/are simply providing for their families under some of the hardest conditions known on the Planet. Thus, the question remains: can India, or specific States, improve the precarious working conditions of the migrant workers, access to mitigation strategies, and health facilities in time to stem the tide? The lessons learned so far highlight that migrant workers should be important stakeholders when developing strategies for Urban and rural development that can result in a sustainable management of cities and their far reaching influences on rural India. So, the local administration and policymakers must develop economic and industrial centre policies that can alleviate this need for massive migrations and unintended consequences like the spread of disease in future. Some effective solutions to the present migrant crisis requires accurate data on internal migrants and implement schemes like one nation, one ration card for individual labour, urban social-welfare programs that can provide some basic service and social protection for daily workers, rental housing facility, relaxing migration regulations, and creating new incentives in essential services for migrant workers in cities. This will be a formidable challenge for all concerned. Also, rural public health systems should be revived and provide better healthcare infrastructure by the government. This is crucial to winning the war against this pandemic, and the next ones to come, in future.
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CONFLICT OF INTEREST
The authors declare no potential conflict of interest.

ETHICS STATEMENT
Prafulla Kumar Sahoo declared that the manuscript has not been published anywhere, there has been no known conflict of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. All the sources related to this work are acknowledged in the manuscript. The study reflects the authors' own research and analysis in a truthful manner.

AUTHOR CONTRIBUTIONS
All authors contributed equally to the literature review, data collection and writing of the manuscript.

DATA AVAILABILITY STATEMENT
All data presented in this study can be found from the respective citations included in the text.

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