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Health disparities between native and foreign-born older population in India: Does migration status matter in later life?

Vasim Ahamad[1*] and Ram B. Bhagat[2]

Abstract

Background Ageing and migration are both contemporary phenomena and challenging for modern society in the 21st century. Persons ageing with migration status might have a double risk of vulnerability to poor health outcomes. This study examines the health disparities between foreign-born and native populations in India.

Methods The data drawn for the study from the Longitudinal Ageing Study in India (LASI) Wave-I (2017-18). The study used univariate and bivariate analysis to examine health disparities between native and foreign-born groups, and logistic regression analysis was used to examine the association between migration status and health outcomes of older persons.

Results Over fifty percent (56.5%) of the older persons (age 60+ years) were migrants; of these migrants of older persons, 55% were internally migrated, and 1.5% were foreign-born migrants in India. The foreign-born migrants persons showed a higher prevalence of poor SRH, chronic conditions, depression symptoms, and physical limitations than internal migrants and non-migrant groups. Further, the logistic regression result shows that foreign-born migrants were more likely to have poor SRH [AOR:1.72; CI: 1.45-2.04], chronic conditions [AOR=1.56; CI: 1.26-1.81], depression symptoms [AOR 1.14; CI: 1.07-1.21], and physical limitations [AOR 1.29; CI: 1.21-1.38], than non-migrants. Moreover, the study shows that the migrants' health disparities also vary with their length of stay and country of origin.

Conclusions This cross-sectional study suggests that persons with internal and foreign-born migrant status were more vulnerable to poor health outcomes than non-migrants in their later life. This study predicts that migrants need separate health policies as they are in poorer health conditions than non-migrants. Policymakers should initiate equal access to healthcare services for older internal and foreign-born migrants in India.

Keywords Health disparities, Foreign-born, Immigrants, Ageing, Migration, India

Introduction

Ageing and migration are both contemporary phenomena and challenging for modern society in the twenty-first century. The world is experiencing continuous ageing. It reached 703 million people aged 65 and above and is projected to double to 1.5 billion by 2050 [1]. Being aged and having migrant status in another country might cause a double risk of vulnerability for poor health outcomes. Understanding the health and its determinants among foreign-born migrants is crucial for researchers

*Correspondence:
Vasim Ahamad
vaseem3006@gmail.com
[1] Department of Migration and Urban Studies, International Institute for Population Sciences, Govandi Station Road Deonar, Mumbai 400088, India
[2] Formerly at Department of Migration and Urban Studies, International Institute for Population Sciences, Govandi Station Road Deonar, 400088 Mumbai, India

and policymakers, as they constitute a significant and growing share of the population. 280 million people were notified in the international migration stock by 2020, and countries such as the United States (51 million), Germany (16 million), Saudi Arabia (13 million), Russia (12 million), and the United Kingdom (9 million) were the top destinations for international migrants [2]. Among all international migrants, 34 million (12.2%) were aged 65 and above [2].

Growing older in another country is challenging in terms of social and economic security and healthcare utilization. Migration is found to be a social determinant of health [3]. The social condition (the circumstances that affect a person's life, welfare, and relationships) primarily determines the person's health and the social condition is affected mainly by foreign and ethnic status, both during and after the migration [4]. The health paradox between foreign-born and native-born populations found mixed results worldwide; some studies show that foreign-born have better health than the nation-born population [5–8], which generally refers to the healthy migrant's effect (HME). In the HME, the foreign-born migrants were found to be in a better condition regarding health outcomes. The theory behind the healthy migrant effect is that migration is a selective process and healthy persons choose to migrate [9]. Another growing literature shows that foreign-born migrants' health deteriorates with the length of residence in the country [10–13]. This phenomenon is sometimes called healthy assimilation. Primarily, healthy persons migrate to another country, but after spending some duration at the destination country, the migrant's health declines and is poor compared to the native population in later life despite their relatively healthy status at a young age [14, 15]. There are numerous explanations for why migration and the attribute of being migrants have become disadvantageous to health conditions. The factors include stress developed by new environment adaptation or loss of relatives and family members [8, 16], limited access to health care utilization due to language barrier [17, 18], discrimination in the labor market, being engaged in hard manual work, and discrimination at the workplace as an outer or foreigner [19]. The evidence of the foreign-born migrants' health paradox comes from both developed and developing countries such as America [20–22], European countries [23–25], Australia [10, 19], Indonesia [26], Chile [27], and China [28, 29]. The results conclude that foreign-born migrants were initially healthier than non-migrants due to HME, but health declined among migrant groups over time. Many factors determine the foreign-born migrants' health, such as duration, origin country, working status, adaptation, and acculturation at the destination place. Studying foreign-born populations is less common among developing countries due to their low proportion, so the foreign-born health paradox has not been much explored in developing countries like India.

India is the largest populous country in the world. It has a large share of internal migrants (450 million) in terms of population [30]. However, India has also become the top 14th destination country globally for foreign-born people—with 4.9 million foreign-born population living in India by 2020 [2]. According to the 2011 census, 103 million people were aged 60 and above, and in this, 53 million people were migrants, which is 51% of the total older population, which means half of the elderly population of India are migrants [31, 32]. A recent study based on national survey data shows 57% of the older population were migrants in India; among the total older persons, 1.5% have foreign-born status [32]. While the proportion of older foreign-born migrants was low in India, it is important to explore how health differences exist among foreign-born and native populations. The previous studies on migration and health focused on young migrants, basically on labor migrants' health[33–38]. Migrants were found to be more vulnerable to poor health compared to non-migrants, particularly in communicable diseases such as HIV/AIDS [38] and malaria [35], as well as non-communicable diseases like obesity, diabetes [36], and hypertension [39]. Furthermore, prolonged migration duration was associated with a decline in migrants' health outcomes [40]. Focusing on migration and health at a later age, not many attempts have been made by the researcher; some studies examined the health of older migrants and found that elderly migrants are more likely to have poor health outcomes than non-migrants [41, 42] another study found that the foreign-born migrants were to be richer and had less social support than non-migrants in India [32].

The difference in health outcomes between foreign-born and native populations is not yet understood in India. Despite research on health disparities, limited studies have explored how migration status affects health later in life in India. The studies primarily focus on working-age migrants, overlooking long-term health impacts. Additionally, migrants are often treated as a homogeneous group, ignoring variations in migration history and integration. This study addresses these gaps by examining health disparities among native and foreign-born older adults in India, regarding the multiple health outcomes focused on physical and mental health conditions. It suggests that foreign-born migrants have poorer health conditions than internal migrants and non-migrants, and the foreign-born status affects their health conditions in later life. Further, the study explores how the length of stay and the country of origin of the foreign-born are associated with their health

conditions in older age. The findings of the study must be valuable for the making of policy for the foreign-born older migrants, as in India, targeted policies are absent, which may exacerbate health disparities, leaving older foreign-born adults vulnerable due to financial constraints and restricted healthcare access. Addressing these gaps could help mitigate health inequalities in this group. In the present study, individuals aged 60 years and above are defined as older persons.

Methods and Materials

Data source

The present study used data from the first wave of the Longitudinal Ageing Study in India (LASI), conducted in 2017–18. The LASI is a cross-sectional, national-level dataset that covers a diverse sample of 73,396 individuals, 31,135 male and 42,261 aged 45 and older, and their spouses (regardless of age) across all states and union territories of India. The survey's main objective was to study the health status and socioeconomic well-being of older adults in India. The LASI adopted a multistage stratified area probability cluster sampling design to arrive at the eventual observation units: older adults age 45 and above and their spouses, irrespective of age [43]. The present study was conducted on respondents aged 60 years and above. The 30,628 respondents selected for the current study and its exclusion and inclusion of the sample are shown in Fig. 1 as follows.

Study variables

Dependent variable

The study's primary outcome is the health status, and we used multiple health outcomes such as self-rated health, chronic conditions, depression symptoms, and physical limitations to examine the health outcomes of the study population.

The self-rated health (SRH) measures the overall health of the person. It is also referred to as the subjective health of the person. The question "Overall, how is your health in general?" was asked in the LASI to measure participants' overall health and had responses of "excellence, very good, good, fair, and poor." For the present study, we used poor SRH as the overall health outcome, and the responses were categorized into two groups. They were recorded as "1" for poor SRH, including fair and poor responses, and "0" for no poor SRH, including excellent, very good, and good.

Chronic condition information was collected on nine self-reported diagnosed chronic diseases in LASI to assess the prevalence of chronic health conditions. The prevalence of chronic health diseases was assessed based on ever-diagnosed conditions/diseases and diagnosed by health professionals such as MBBS (Bachelor of Medicine and Bachelor of Surgery), MD (Doctor of Medicine), BDS (Bachelor of Dental Surgery), and AYUSH (Ayurveda, Yoga, and Naturopathy, Unani, Siddha, and Homeopathy) only. To measure chronic conditions, we included a total of nine of the diseases, which are high cholesterol, chronic lung disease, chronic heart

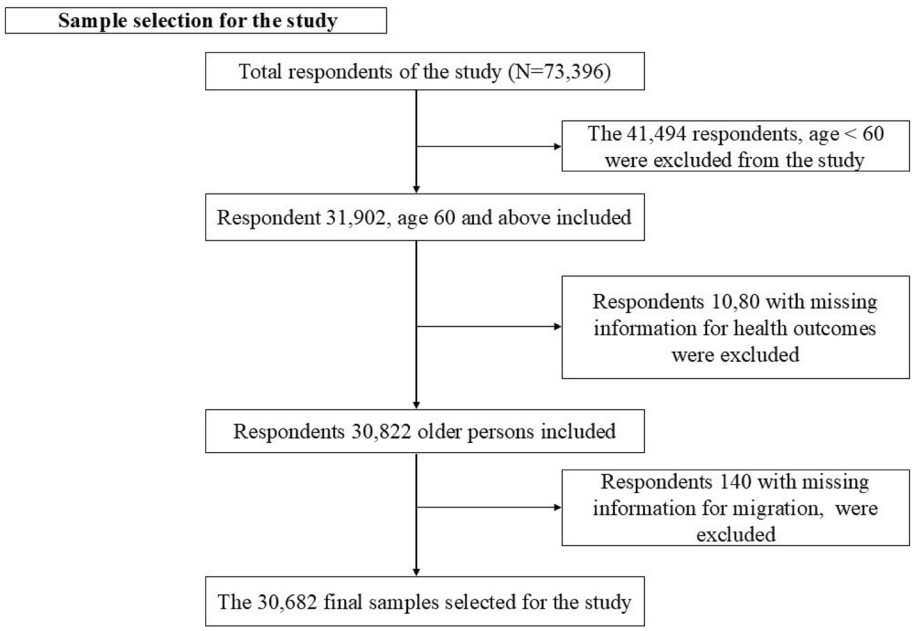

Fig. 1 Selection of sample size for the study

disease, stroke, hypertension (HT) or high blood pressure, diabetes or high blood sugar, cancer or a malignant tumour, bone and joint disease, and neurological/psychiatric. Chronic condition recorded as No (0 = not diagnosed with any chronic diseases) and Yes (1 = Ever diagnosed with any of the nine chronic diseases).

The depressive symptom was considered for mental health status. In this study, we adopted the shortened version of the Centre for Epidemiological Studies-Depression (CES-D) score developed by Anderson et al. (1994)[44] to measure depressive symptoms. The CES-D by Anderson (1994) comprised seven negative symptoms, i.e., fear of something, low energy, trouble concentrating, feeling alone, feeling depressed, bothered by things, and everything is an effort, while three positive symptoms included feeling happy, hopeful, and satisfied. For all these ten symptoms, individuals had responded rarely or never, i.e., < 1 day; sometimes, i.e., 1 or 2 days; often, i.e., 3 or 4 days; and most or all of the time, i.e., 5–7 days in a week before the interview in the LASI. For the negative symptoms, rarely or never were sometimes scored zero, while often and most or all of the time categories were scored one. At the same time, the scoring was reversed for three positive symptoms. The overall score varies from 0 to 10, and a score of four or more was considered to calculate the prevalence of depressive symptoms.

Physical Limitations in the present study are measured as difficulty in activities of daily living (ADL). To examine ADL limitations, persons were asked if they were having any of the following limitations and they anticipated any of the following limitations to continue longer than three months: difficulty with dressing, including putting on chappal and shoes, walking across the room, bathing, eating, getting in or out of bed, or using the toilet, including getting up and down. The persons without difficulty performing ADLs were categorized as no and otherwise as yes.

All the measured health conditions are based on self-reported, which may be influenced by cultural perception [45]. The older adults may downplay health issues due to cultural norms emphasizing resilience or acceptance of ageing. Similarly, stigma surrounding mental health may lead to underreporting of depressive symptoms, particularly among older migrants who may prioritize physical health concerns over psychological well-being [45]. These cultural influences could impact the accuracy of self-reported measures, potentially leading to underestimation of health disparities.

Independent variables

The individual migration status (internal and foreign-born migrants) is the primary exposure variable in this study. The persons are classified as migrants based on the "Place of birth (POB)." According to the definition, if a person's place of birth differs from the current place of enumeration (POE), then the person is considered a migrant; otherwise, they are considered as non-migrants [46]. In migration status, we are categorized as non-migrants, internal and foreign-born migrants. If a person's POB is outside of India, then persons classified as foreign-born migrants in the study, and persons POB is within India and POE not POB, are considered as internal migrants. Foreign-born older adults were identified based on self-reported migration history, specifically country of birth. The dataset includes individuals who migrated to India at different life stages, but it does not distinguish between voluntary and forced migration. Additionally, due to sample size constraints, certain subgroups of foreign-born migrants may be underrepresented, limiting the generalizability of findings.

Other independent variables

The other independent variables and their categorization used in the study are as follows: Age (60–69, 70–79, and 80 + years), Sex (male and female), Residence (rural and urban), Marital status (currently married, widowhood, and others), Religion status (Hindu, Muslim, and others), Education (No education, primary, secondary and higher, and graduate and above), Wealth status (poor, middle, and rich), Currently working (working, not working and never worked), Smoking (no, yes), Alcohol (no, yes), and Physical activity (no, yes). The wealth status was recorded based on the MPCE (monthly per capita expenditure) in the study.

Statistical analysis

The study participants' general characteristics and distribution were determined using descriptive analysis. The preliminary study used descriptive statistics and bivariate analysis to examine the prevalence of migration levels and health prevalence based on migration status and socioeconomic characteristics of the persons. The Chi-square test was used to measure the significance level of the bivariate relation. Aside from that, the findings of the association of health outcomes with migration characteristics and other independent variables were carved out using logistic regression analysis. The dependent variables, poor self-rated health, chronic condition, depression symptoms, and physical limitations, were categorized as no and yes, and in all models the non-migrants were the reference category in the migration status variable.

A logistic regression model can be written as follows:

$$\log(odds) = logit(p) = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k$$

where β_0 is the intercept, $\beta_1, \beta_2, \ldots\ldots\ldots, \beta_k$, are the regression coefficients indicating the relative effect of a particular explanatory variable on the outcome, $x_1, x_2, \ldots\ldots\ldots, x_k$, are the control variables [47]. In all models, we have taken different dependent variables (poor SRH, chronic condition, depression symptoms, and physical limitation) that we have mentioned in the results.

For the robustness of the model, we have checked the model linearity, multicollinearity, and goodness of model fit. We found that the model linearly fit as an insignificant p-value, and we also found the goodness of the model fit as the p-value insignificance in all models except the chronic condition model 2 (0.045). Furthermore, variance inflation factors (VIFs) were used to check for multicollinearity with each model's exposure migration variables and other independent variables separately. We found an average VIF (1.28) for each type of model, which suggests that models have no collinearity among the study variables. A key limitation of using logistic regression in this study is that it only identifies associations between the selected health outcomes and independent variables. Since the dataset is cross-sectional, the analysis does not establish causality or capture changes over time. The statistical package STATA for Windows version 16 was used for all statistical analyses. The proper individual-level sampling weights were used to make the results representative.

Results

Older migrants and their characteristics in India

Figure 2 shows the migration level among older persons in India. Among the older persons, more than fifty percent were migrants, the figure showing that 55% of the total older persons were internal migrants, and 1.5% of the total older population were migrants from another country, which is called foreign-born migrants. 28.4% were internal migrants, and 1.4% were foreign-born migrants among older male persons, while among females, 78.7% migrated within the country, and 1.6% migrated from abroad. The female proportion of migration was higher than the male migration in India.

Table 1 depicts the demographic and socioeconomic characteristics of older persons stratified by migration status in India. The age group 60–69 was higher among internal migrants, while among foreign-born migrants, the age group 80+proportion was higher than non-migrants. The sex proportion was reversing among migrants and non-migrant status among non-migrants; the proportion of males was higher than that of non-migrants and low among migrant groups. The proportion of rural and urban residents varies with migration status; among non-migrants, the rural residence proportion was high, but it was reduced with internal and foreign-born migrants' status. The proportion of currently married people was higher among non-migrants than migrant groups. The education attainment shows that the proportion of people with no education was high among internal migrants compared to non-migrants. At the same time, the proportion of secondary and higher education was also found to be higher among non-migrants and foreign-born migrants groups compared to internal migrants. The Hindu religion had a higher proportion among all groups. The proportion of those currently working was higher among non-migrants and lower among the migrant group. The proportion of middle and rich wealth quintiles was higher among foreign-born migrants groups than among internal migrants and non-migrants. The smoking and alcohol consumption proportion is higher among non-migrants than among persons with migration status.

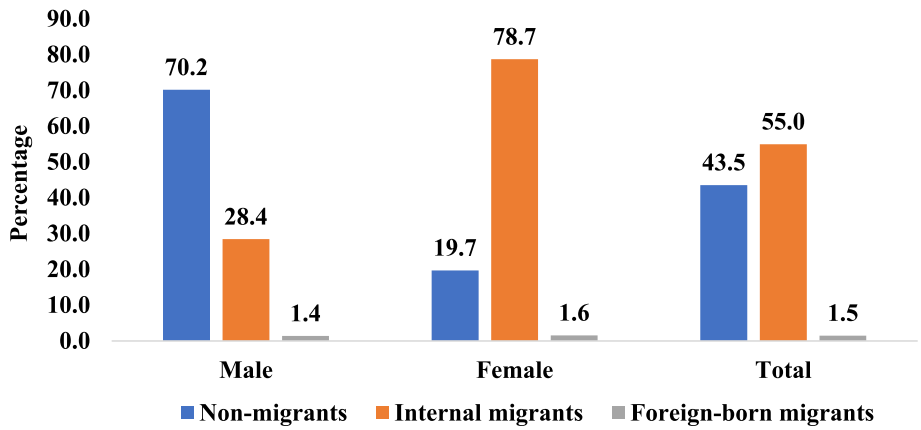

Fig. 2 Migration status and level among older persons in India, LASI-1 (2017–18), weighted%

Table 1 Socioeconomic characteristics of respondents with their migration status in India, LASI-1 (2017–18)

Socioeconomic Characteristics	Non-migrants		Internal migrants		Foreign-born migrants		Total number
	Number	%	Number	%	Number	%	
Age* **							
60–69	7,757	58.1	10,341	61.3	172	37.8	18,271
70–79	4,038	30.2	4,894	29.0	200	43.8	9,131
80 +	1,563	11.7	1,633	9.7	84	18.5	3,280
Sex* **							
Male	10,163	76.1	4,116	24.4	202	44.2	14,481
Female	3,194	23.9	12,752	75.6	255	55.8	16,201
Residence* **							
Rural	10,415	78.0	11,137	66.0	251	55.0	21,804
Urban	2,942	22.0	5,731	34.0	205	45.0	8,878
Marital status* **							
Currently married	9,390	70.3	9,336	55.4	246	54.0	18,973
Widowed	3,609	27.0	7,264	43.1	195	42.6	11,068
Others	358	2.7	268	1.6	16	3.4	641
Education* **							
No education	6,554	49.1	10,513	62.3	235	51.6	17,303
Primary	3,503	26.2	3,422	20.3	86	18.8	7,011
Secondary and Higher	2,693	20.2	2,300	13.6	118	25.8	5,111
Graduate and above	606	4.5	633	3.8	18	3.8	1,257
Religion* **							
Hindu	11,022	82.5	13,930	82.6	428	93.7	25,380
Muslim	1,573	11.8	1,697	10.1	8	1.8	3,279
Others	762	5.7	1,241	7.4	21	4.5	2,024
Working status* **							
Currently working	5,461	40.9	4,083	24.2	111	24.3	9,654
Not working	6,119	45.8	6,588	39.1	183	40.0	12,889
Never worked	1,778	13.3	6,197	36.7	163	35.7	8,138
Wealth status* **							
Poor	6,006	45.0	7,201	42.7	172	37.7	13,379
Middle	2,710	20.3	3,536	21.0	124	27.1	6,369
Rich	4,642	34.8	6,131	36.4	161	35.2	10,934
Smoking* **							
No	6,262	46.9	11,857	70.3	241	52.8	18,360
Yes	7,095	53.1	5,011	29.7	216	47.2	12,322
Alcohol* **							
No	10,334	77.4	15,418	91.4	419	91.7	26,171
Yes	3,024	22.6	1,450	8.6	38	8.3	4,511
Physical activity* **							
No	8,972	67.2	13,188	78.2	376	82.3	22,535
Yes	4,386	32.8	3,680	21.8	81	17.7	8,147
Length of residence **							
less than ten years			865	5.2	13	2.9	878
Ten and more years			15,843	94.8	439	97.1	16,282
Origin Country							
Bangladesh					313	68.4	419
Pakistan					90	19.6	120
Nepal					11	2.4	15
Others					43	9.5	58
Total sample	**13,357**	**100**	**16,868**	**100**	**457**	**100**	**30,682**

**** p = < 0.001, **p = < 0.05, & * p = < 0.1; LASI Individual sample weights were applied*

The length of duration shows that most of the migrants migrated for ten or more years. Among internal migrants, only 5.2% of the total migrated in less than ten years, and among foreign-born migrants, only 3% was migrated in last ten years. The origin of the country was shown for the foreign-born migrants in India. It shows that 68.6% of foreign-born migrants originate from Bangladesh, 19.6% migrated from Pakistan, 2.4% from Nepal, and 9.5% from another country of the globe.

Prevalence of health outcomes among older persons with their migration and socioeconomic characteristics in India

Figure 3 shows the prevalence of poor SRH, chronic conditions, depression symptoms, and physical limitations among older persons with their migration status in India. The prevalence of all health outcomes shows a difference among older persons with their migration status. The prevalence of poor SRH shows that foreign-born migrants had a higher prevalence (62.6%) than internal migrants (50.3%) and non-migrants (46.3%). The chronic condition prevalence also shows higher among foreign-born migrants (62.7%) than among internal migrants (55%) and non-migrants (50%) groups, respectively. Furthermore, the prevalence of depression symptoms was higher in foreign-born migrants (40.2%) than in internal migrants (32.5%) and non-migrant persons (27.5%). The prevalence of physical limitations was also shown to be higher among foreign-born migrants (26.6%) and internal migrants (25.5%) than non-migrants (24%).

Table 2 depicts the prevalence of health outcomes among older persons with demographic and socioeconomic characteristics. Increasing in age and having female sex shows a higher prevalence of all selected health outcomes. The prevalence of poor SRH, depression, and physical limitation was higher in rural than in urban residents; only chronic conditions found a higher prevalence (67.5%) among urban residents compared to rural ones (47.1%). The persons with widowed status had a higher prevalence of health outcomes than their other groups. The education level of persons shows a decline in the prevalence of poor SRH, depression, and physical limitation with an increase in education level. However, the prevalence of chronic conditions was higher among persons with higher education levels. The Muslim religious status was found to be more prevalent with all health outcomes compared to Hindu and other religious statuses, respectively. The working status of older persons shows that the persons currently working had a low prevalence of all selected health outcomes about not working and never working persons. the persons with affluent wealth status show a low prevalence of all given health outcomes except the prevalence of chronic conditions; it shows the persons with poor wealth had a low prevalence (47.1%) and a higher prevalence (60.8%) among persons with rich wealth status. The persons who smoked had a higher prevalence, while the persons with alcohol showed less prevalence among all given health outcomes. The persons with physical activity showed less prevalence of health outcomes than those without physical activity.

Further, the table depicts the prevalence of health outcomes with migrants' duration of residence and foreign-born migrants with the country's origin. The chronic and physical limitation prevalence is higher among internal migrants with less than ten years of duration than migrants with more than ten years of migration duration, while the prevalence of depression symptoms is higher among migrants with more than ten years of migration duration. Among foreign-born migrants, the prevalence of poor SRH (63.2%) and chronic condition (63.2%) was higher with more than ten years of migration duration. In comparison, the prevalence of depression (73.8%) and physical limitation (51.7%) was higher among foreign-born migrants with less than ten years of

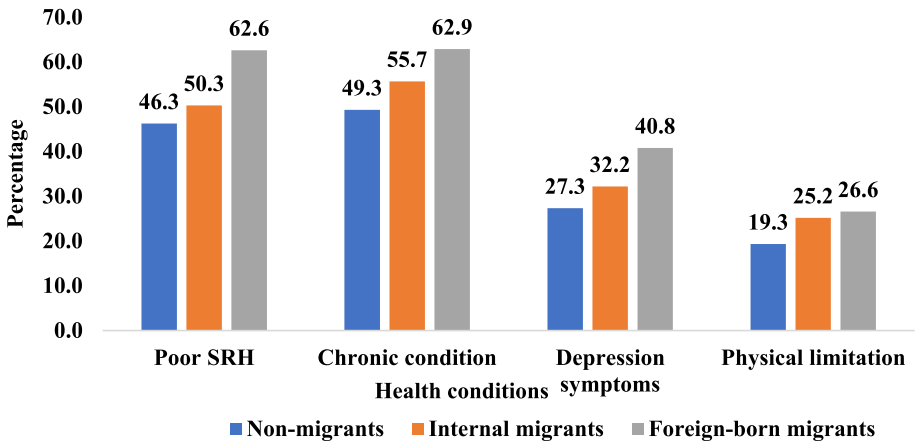

Fig. 3 Prevalence of health outcomes with migration status among older persons in India, LASI-1 (2017–18), weighted%

Table 2 Prevalence of health outcomes among older persons with demographic and socioeconomic characteristics in India, LASI-1 (2017–18)

Characteristics	Poor SRH	Chronic condition	Depression symptoms	Physical limitation
Age				
60–69	45.0	50.8	28.9	17.3
70–79	52.0	56.5	31.3	26.7
80 +	60.2	55.7	34.6	41.0
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Sex				
Male	46.9	50.3	27.5	19.9
Female	50.3	55.4	32.6	25.1
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Residence				
Rural	51.0	47.1	31.4	23.5
Urban	43.2	67.5	27.4	20.5
p-value	< 0.001	< 0.001	< 0.001	0.238
Marital status				
Currently married	46.2	51.7	27.3	19.9
Widowed	53.0	55.7	34.9	27.4
Others	50.3	44.9	37.2	22.9
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Education				
No education	51.3	46.6	34.1	24.6
Primary	49.9	58.8	27.6	24.0
Secondary	42.6	63.0	22.9	15.6
Graduate and Higher	31.3	67.7	20.6	16.3
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Religion				
Hindu	47.6	52.0	30.5	22.5
Muslim	54.9	57.4	31.3	23.6
Others	52.5	58.1	25.0	22.9
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Working status				
Currently working	40.4	40.0	27.0	13.6
Not working	54.1	58.2	32.4	28.5
Never worked	50.2	60.2	30.5	24.1
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Wealth status				
Poor	50.0	47.1	31.6	23.5
Middle	47.1	52.1	29.4	22.8
Rich	48.1	60.8	29.0	21.5
p-value	0.028	< 0.001	< 0.001	0.841
Smoking				
No	46.8	56.8	30.3	22.4
Yes	51.6	47.4	30.0	23.0
p-value	< 0.001	< 0.001	0.196	0.016
Alcohol				
No	48.8	54.1	30.7	23.3
Yes	48.3	46.9	27.7	18.7
p-value	0.571	< 0.001	< 0.001	< 0.001

Table 2 (continued)

Characteristics	Poor SRH	Chronic condition	Depression symptoms	Physical limitation
Physical activity				
No	52.7	56.1	30.8	25.1
Yes	37.7	44.5	28.5	15.8
p-value	< 0.001	< 0.001	< 0.001	< 0.001
Duration of internal migrants				
Less than ten years	50.8	60.2	31.5	27.5
Ten and more years	50.3	55.4	68.5	25.0
p-value	0.699	0.009	0.253	0.976
Duration of Foreign-born migrants				
Less than ten years	44.9	53.0	73.8	51.7
Ten and more years	63.2	63.2	26.2	25.8
p-value	0.482	0.412	0.190	0.706
Origin country of foreign-born migrants				
Bangladesh	72.5	67.8	51.3	31.6
Pakistan	45.9	53.7	24.3	22.6
Nepal	49.3	52.9	0.7	3.5
Others	29.1	49.2	8.9	4.5
p-value	< 0.001	0.242	< 0.001	0.146
Total	**48.7**	**53.0**	**30.2**	**22.6**

LASI Individual sample weights were applied

migration duration. The prevalence of health outcomes among foreign-born migrants in their origin country shows that the poor SRH prevalence was higher among foreign-born migrants from Bangladesh (72.5%) than Nepal (49.3%), Pakistan (45.9%), and others (29.1%). The prevalence of chronic conditions, depression symptoms, and physical limitations was also higher among Bangladesh and Pakistan origin foreign-born migrants than among Nepal and others, respectively.

Association of health outcomes with migration status among older persons in India

Table 3 depicts unadjusted logistic regression results for the association of multiple health outcomes with migration status among older persons in India. The regression results were presented in four models for outcome variables such as poor SRH, chronic condition, depression symptoms, and physical limitation with migration status. The unadjusted results for poor SRH, chronic condition, depression symptoms, and physical limitation with migration status were the significant factors and foreign-born migrants were more likely to have poor SRH [AOR:1.91; CI: 1.62–2.26], chronic condition [AOR:2.00; CI: 1.68–2.37], depression symptoms [AOR:1.55; CI: 1.31–1.84], and physical limitation [AOR:1.81; CI: 1.50–2.17] than non-migrants, respectively. Further, the table showed that internal migrants also were significantly more likely to have poor SRH, chronic conditions, depression symptoms, and physical limitations than non-migrants.

Table 3 Unadjusted logistic regression results for the association of health outcomes with migration status among older persons in India, LASI-1 (2017–18)

Health Outcomes	Poor SRH		Chronic condition		Depression symptoms		Physical limitation	
	UOR	95% CI	UOR	95% CI	UOR	95% CI	UOR	95% CI
Migration status								
Non-migrants®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Internal migrants	1.21***	[1.16,1.27]	1.42***	[1.36,1.49]	1.19***	[1.13,1.25]	1.45***	[1.37,1.53]
Foreign-born migrants	1.91***	[1.62,2.26]	2.00***	[1.68,2.37]	1.55***	[1.31,1.84]	1.81***	[1.50,2.17]

® = *Reference, *** p = < 0.001, ** p = < 0.05, & * p = < 0.1, UOR* Unadjusted odds ratio, *CI Confidence Interval*

Table 4 depicts adjusted logistic regression results for the association of multiple health outcomes with migration status among older persons in India. The regression results were presented in four models for poor SRH, chronic condition, depression symptoms, and physical limitation with main explanatory and other independent variables. The adjusted regression results for poor SRH with migration status showed significant factors, and the result showed that the foreign-born migrants [AOR:1.72; CI: 1.45–2.04] and Internal migrants [AOR = 1.18; CI: 1.12–1.25] were more likely to have poor SRH compared to non-migrants. The poor SRH was also significantly associated with higher age, female sex, marital status, education, health behaviour, and physical activity. The association of chronic conditions with migration status shows a significant factor and more likely to have chronic conditions with foreign-born migrants [AOR = 1.56; CI: 1.26–1.81] and internal migrants [AOR = 1.16; CI: 1.10–1.23], concerning non-migrants. The chronic condition was also significantly associated with higher age, female sex, marital status, education, health behaviour, and physical activity. The adjusted regression results for depression symptoms with migration status showed significant factors, and the result showed that the foreign-born migrants [AOR 1.14; CI: 1.07–1.21] and internal migrants [AOR: 1.49; CI: 1.25–1.77] were more likely to have depression symptoms compared to non-migrants. The adjusted regression results for physical limitation with migration status showed significant factors, and the result showed that the foreign-born migrants [AOR 1.29; CI: 1.21–1.38] and internal migrants [AOR: 1.37; CI: 1.13–1.65] were more likely to have physical limitation compared to non-migrants. The other independent variables, such as age, female sex, marital status, education, working status, health behaviour, and physical activity, were also significantly associated with depression symptoms and physical limitations among older persons in India.

Table 5 depicts unadjusted logistic regression results for the association of multiple health outcomes with migration duration among older persons in India. The unadjusted results for poor SRH, chronic condition, depression symptoms, and physical limitation with migration duration were the significant factors and ten and more years migration duration were more likely to have poor SRH [AOR:1.23; CI: 1.18–1.29], chronic condition [AOR:1.42; CI: 1.31–1.49], depression symptoms [AOR:1.21; CI: 1.15–1.27], and physical limitation [AOR:1.46; CI: 1.38–1.55] than non-migrants, respectively. Further, the table showed that those with a duration of less than ten years were significantly more likely to have poor SRH, chronic conditions, and physical limitation than non-migrants.

Table 6 depicts the adjusted association of health outcomes with migration duration of older migrants among older persons. The table shows the migrant's duration significant factors with health outcomes and more likely to have poor SRH, depression, and physical limitation with durations less than ten years and ten or more years of duration concerning non-migrants (since birth), respectively. The association of chronic condition with migration status showed significant factors only with a duration of ten or more years of migration, and was more likely to have [AOR: 1.37; CI: 1.13–1.65] chronic condition concerning non-migrants. The migration duration shows that the higher duration of migration influences the chronic condition of older persons in India. The other health conditions, such as poor SRH, depression, and physical limitation, did not vary much with the duration of the migrants' residence in India.

Discussion

The present study focused on the health disparities among older persons with their internal and foreign-born migration status in India. We measure the physical and mental health conditions to examine the health disparities. For physical health, we have analyzed the overall health status (poor SRH), chronic condition, and physical limitation, and for mental health, we have measured depression symptoms. The prevalence of health outcomes measured with socioeconomic characteristics and the association of health outcomes with foreign-born status and length of duration were carved out by logistic regression analysis. Migration plays a vital role in economic enhancement for migrants, families, and communities, but it adversely affects health outcomes at all phases of the migration process. We need to understand their migration history, which means their origin and destination place, and length of duration at the residence to sketch how health disparities exist among older persons with their migration status to achieve the goal of active and healthy ageing and overcome the challenge of migration health.

The present study shows that 55% of the total population was internally migrated, and 1.5% migrated from another country. More than half of the older persons migrated, and the proportion of migration was higher among females than males. In India, females change their usual place primarily due to marriage [48, 49], and males mainly migrate due to work and employment reasons [30, 50]. Among the migrants, both internal and foreign-born showed that most of the migrants (95%) had ten or more years of duration, which means the migrants migrated at an early age to their destination and are currently growing older. It showed that the migration of older persons in later life was not as much as working-age migration [32].

Table 4 Adjusted logistic regression result for the association of health outcomes with migration status among older persons in India, LASI-1 (2017–18)

Health Outcomes	Poor SRH		Chronic condition		Depression symptoms		Physical limitation	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Migration status								
Non-migrants®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Internal migrants	1.18***	[1.12,1.25]	1.16***	[1.10,1.23]	1.14***	[1.07,1.21]	1.29***	[1.21,1.38]
Foreign-born migrants	1.72***	[1.45,2.04]	1.51***	[1.26,1.81]	1.49***	[1.25,1.77]	1.37**	[1.13,1.65]
Age group								
60–69®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
70–79	1.27***	[1.21,1.34]	1.18***	[1.11,1.24]	1.07*	[1.01,1.13]	1.55***	[1.45,1.65]
80 +	1.60***	[1.47,1.74]	0.98	[0.90,1.07]	1.16**	[1.06,1.26]	2.43***	[2.22,2.66]
Sex								
Male®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Female	1.18***	[1.11,1.27]	1.10**	[1.03,1.18]	0.94	[0.88,1.02]	1.15**	[1.06,1.25]
Residence								
Rural®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Urban	0.77***	[0.73,0.81]	1.70***	[1.61,1.80]	0.90***	[0.85,0.96]	0.99	[0.93,1.06]
Marital status								
Currently married®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Widowed	1.06*	[1.00,1.12]	1.04	[0.98,1.10]	1.28***	[1.21,1.36]	1.13***	[1.06,1.21]
Others	1.12	[0.97,1.30]	0.81**	[0.70,0.94]	1.44***	[1.23,1.68]	1.21*	[1.01,1.45]
Education								
No education®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Primary	1.09**	[1.03,1.16]	1.47***	[1.38,1.56]	0.82***	[0.77,0.88]	1.04	[0.96,1.12]
Secondary and Higher	0.94	[0.87,1.01]	1.55***	[1.44,1.66]	0.74***	[0.68,0.80]	0.80***	[0.73,0.88]
Graduate and above	0.68***	[0.60,0.77]	1.65***	[1.45,1.88]	0.49***	[0.42,0.57]	0.62***	[0.52,0.74]
Religion								
Hindu®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Muslim	1.21***	[1.12,1.30]	1.35***	[1.25,1.46]	0.97	[0.89,1.05]	1.05	[0.96,1.14]
Others	0.78***	[0.73,0.83]	0.89***	[0.83,0.95]	0.65***	[0.60,0.70]	0.70***	[0.64,0.76]
Working status								
Currently working®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Not working	1.43***	[1.34,1.52]	1.76***	[1.65,1.87]	1.24***	[1.16,1.33]	1.95***	[1.79,2.12]
Never worked	1.20***	[1.11,1.29]	1.68***	[1.56,1.81]	1.16***	[1.06,1.25]	1.64***	[1.49,1.81]
Wealth status								
Poor®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Middle	0.94	[0.88,1.00]	1.30***	[1.22,1.38]	0.87***	[0.82,0.94]	1.04	[0.96,1.12]
Rich	1.05*	[1.00,1.11]	1.75***	[1.66,1.85]	0.92**	[0.87,0.98]	1.05	[0.98,1.12]
Smoking								
No®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Yes	1.30***	[1.24,1.38]	0.87***	[0.83,0.92]	0.97	[0.91,1.03]	1.05	[0.98,1.12]
Alcohol								
No®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Yes	1.10**	[1.03,1.18]	1.04	[0.97,1.12]	0.96	[0.89,1.04]	1.05	[0.96,1.14]
Physical activity								
No®	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Yes	0.64***	[0.60,0.68]	0.81***	[0.76,0.85]	0.95	[0.89,1.02]	0.76***	[0.70,0.82]

® = *Reference, *** p = < 0.001, **p = < 0.05, & * p = < 0.1, AOR* Adjusted odds ratio, *CI* Confidence Interval

Table 5 Unadjusted logistic regression results for the association of health outcomes with migration duration among older persons in India, LASI-1 (2017-18)

Health outcomes	Poor SRH		Chronic condition		Depression symptoms		Physical limitation	
	UOR	95% CI	UOR	95% CI	UOR	95% CI	UOR	95% CI
Migration duration								
Non-migrants®	1	[1.00,1.00]	1.0	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Less than ten years	1.25***	[1.10,1.41]	1.68***	[1.48,1.91]	1.13	[0.98,1.29]	1.46***	[1.26,1.69]
Ten and more years	1.23***	[1.18,1.29]	1.42***	[1.36,1.49]	1.21***	[1.15,1.27]	1.46***	[1.38,1.55]

® = *Reference, *** p = < 0.001, **p = < 0.05, & * p = < 0.1, UOR* Unadjusted odds ratio, *CI* Confidence Interval

Table 6 Adjusted logistic regression results for the association of health outcomes with migration duration among older persons in India, LASI-1 (2017–18)

Health outcomes	Poor SRH		Chronic condition		Depression symptoms		Physical limitation	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Migration duration								
Non-migrants®	1.0	[1.00,1.00]	1.0	[1.00,1.00]	1	[1.00,1.00]	1	[1.00,1.00]
Less than ten years	1.27***	[1.11,1.44]	1.1	[0.96,1.25]	1.16*	[1.00,1.33]	1.31***	[1.12,1.53]
Ten and more years	1.20***	[1.14,1.26]	1.18***	[1.12,1.25]	1.15***	[1.09,1.22]	1.30***	[1.21,1.38]

® = *Reference, *** p = < 0.001, **p = < 0.05, & * p = < 0.1, AOR* Adjusted odds ratio, *CI Confidence Interval $ = result adjusted with age, sex, residence, marital status, education, religion, working status, wealth quintile, smoking, alcohol, and physical activity*

The origin country of foreign-born migrants showed that more than 90% of the migrants came from neighbouring countries of India. Internal migration was more predominant among older migrants than internationally in India. The Indian migration pattern indicates that intra-state and interstate migration holds a higher share of total migration among all age groups [30, 51–53].

The study found that the prevalence of poor SRH was higher among foreign-born migrants than among internal migrants and non-migrant persons. The foreign-born migrants with more than ten years of duration had a higher prevalence of poor SRH (63%) compared to foreign-born migrants with less than ten years of duration (44%). Moreover, the logistic results show that foreign-born migrants were likelier to have poor SRH than non-migrants. The other studies also show that migrants had poor SRH compared to non-migrants [23, 54]. People who change their origin country and grow older in another country have poor subjective well-being due to losing connection to a support system, health loss during the movement process, and adaptation to a new environment[55].

Migrants' self-rated health is influenced by multifaceted social determinants, including socioeconomic inequalities, restricted healthcare access, language barriers, discrimination, and migration-related stressors [56]. We found that foreign-born migrants are likely to have a higher poor SRH than internal migrants and non-migrants, supported by other studies [23, 57]. Migrants also face cultural barriers in new places, especially communication and language barriers, which impede accessing healthcare services and add to the deterioration of health over time [25]. More than fifty percent of older persons in India have at least one chronic condition. Some previous community-based studies in India suggest a higher prevalence of chronic diseases [58–60]. The older age itself is a cause of increased chronic diseases and comorbidities [61]. Furthermore, the study found that foreign-born migrants had a higher prevalence of chronic conditions than internal migrants and non-migrants, respectively. The study also reveals that foreign-born migrants with less than ten years of migration duration had a low prevalence of chronic disease compared to foreign-born migrants with more than ten years of duration [62]. Few studies on the health of migrants worldwide portray a complicated picture; migrants have also been found to have higher rates of chronic diseases, including hypertension, diabetes, and stroke [39, 63, 64]. After controlling all demographic, socioeconomic, and risk behaviour factors, we found that the risk of chronic conditions was higher among foreign-born and internal migrants than non-migrants. The result also shows that chronic conditions were significantly associated with more than ten years of migration duration compared to non-migrants. Studies support the view that migrants who have long-distance have more chronic illnesses than native persons [5, 65]. Many possible reasons could diminish chronic health in long-distance migration, such

as adaptation to an unfamiliar society, exposure to stressful and harmful conditions, lack of healthcare knowledge, and language barriers to achieving healthcare services at the destination place [5].

Assessing migration status and depression symptoms, the study highlights that the prevalence of depressive symptoms was higher among migrants' older persons who had foreign-born status and native migration status. The regression analysis indicates that the likelihood of depression among older persons is likely to increase among foreign-born migrants and internal migrants compared to non-migrants, even after controlling for demographic and socioeconomic characteristics. These results demonstrate that migration to a region with social and cultural differences significantly affects deteriorating health conditions due to assimilating to new surroundings. Moreover, cultural practices can lead to considerable levels of acculturative stress [66], which in turn has been linked with psychiatric disorders [26, 67]. Studies related to migration literature suggest that foreign-born migrants have lots of factors in new places that are associated with depression, such as discrimination, lack of social support, stressful work, and lack of access to healthcare [68–70]. Internal migrants in India were also found to be more susceptible to depression [71], possibly due to the sociocultural disparities associated with migration from one state to another, resulting in acculturation stress and discrimination behaviour among migrants [72, 73].

The study examined how migration-associated physical limitations in later life, with migration status, measured by measuring ADL, and its association with migration status. The study found that foreign-born migrants had a higher prevalence of physical limitations than internal migrants and non-migrants. Furthermore, the adjusted results show that foreign-born migrants were more likely to have physical limitations than non-migrants, which was also associated with migration duration. The studies support that older people with migrant status had more physical limitations than non-migrants in India [42]. The increased number of immigrants with ADL can also be the result of cultural barriers such as language barriers, lack of knowledge of the new system, low education, and low health literacy [74].

Overall, the findings of the study suggest that disparities in health outcomes such as poor SRH, chronic conditions, depression symptoms, and physical limitations exist between migrants and non-migrant older persons in India. Foreign-born and internal migrants' status is a significant factor in determining health conditions and also varies with migrants' duration of residence. The health of foreign-born migrants declines in the destination country due to many factors, including exposure to adverse events at migration due to acculturation-related challenges, such as homesickness**,** discrimination, stigmatization, poor living conditions, exposure to unfamiliar environmental conditions, and limited knowledge of and access to health and care and lack of a social support system [20, 75–77]. The perceived discrimination at the destination, which is a common risk to migrant health, is consistently found to be closely associated with adverse health outcomes, from both physical and mental health, as well as subjective health status [78, 79]. The previous studies illustrated that foreign-born migrant had low social support [32, 80], and the absence of social support negatively affects the health of foreign-born migrants [80]. The study also observed variations in health outcomes of migrants with their length of stay at the destination place. The foreign-born migrants' health declined in terms of their overall health status and chronic condition, but depression symptoms were found to be higher among new foreign-born migrants. However, the depression symptoms reduced with more years of stay. This result presented the previous studies' finding that the Cultural differences between the foreign-born migrants and the native-born population also affect the psychosocial health of the foreign-born migrants in the short run [81, 82], but migrants adapt to the new cultural setting, which would not affect their health outcomes in the long run. However, continuous discrimination might cause an increase in chronic levels and reduced overall health during the long stay of foreign-born migrants [83, 84]. In this study, we also found that the internal migrants were more vulnerable to health conditions than the non-migrants, but the prevalence of poor health outcomes was less than the foreign-born migrants. Previous studies explored factors such as lower education, doing a job in the "3D" (dirty, dangerous, and demeaning) category, social isolation, and limited healthcare access were determinants of poor health outcomes among internal migrants in India [36, 37, 53, 85, 86]. A recent study by Mondal et al. in 2024 explains the plausible mechanism for existing health disparities between migrants and non-migrants in India and study explains the lower education level among migrants, food insecurity, absence of social support, acculturation in new places, and unhealthy lifestyle of migrants contributes the lower health status among migrants [41]. As the study shows, the foreign-born migrants were more affluent in economic condition than natives, but they are more prone to poor health outcomes, which indicates that migration influences the health beyond the socio-economic condition. Despite the migration status, our findings show that health disparities are also associated with demographic, socioeconomic, and health behaviour factors. This was supported by many previous studies in India [42, 56, 58, 59, 87]. The

study concludes that their demographic, socioeconomic, and healthy behaviour influenced older persons' health conditions. However, migration status and length of stay were also associated with health outcomes among older persons in India, and health disparities exist between native and foreign-born populations; among native people, health disparities also exist between migrants and non-migrants Finally, the study concludes that migrant status plays a role in later life health disparities and it differs with native and foreign-born migrant status.

The study results significantly strengthen the interpretation of health disparities with migration status at the national level. This study is based on the nationally representative data set and is newly surveyed data in India. This study fills the gap in health outcomes with persons' migration status in later life, which could benefit academics and researchers' understanding of the migration effect among older persons. The subject of health outcomes presented in the study includes both physical and mental dimensions of health status, which provides comprehensive knowledge about the relationship between older persons' health and migration status. Further study needs to be done among particular migrant groups, such as return migrants and left-behind older persons, and the study also needs to explore the gender role in the analysis of migration effect in late life.

Limitations & strengths

Moreover, the study also has some limitations. In the present study, migrants are classified based on the place of birth question; the POB has a limitation in capturing the multiple migration history of the persons. It is also not able to answer about the return migration. The study did not answer the reasons for migration, which were unavailable in the dataset. Because of this, we could not answer why people migrated and how the particular reason for migration affects their health. Another limitation of the study was that the health outcomes measured in this study, based on self-reported results, might be biased in the sense of reported health. Older migrants may underreport or overreport health conditions based on stigma, personal coping mechanisms, or differences in health awareness. These biases could affect the observed associations between migration status and health outcomes. Future research should incorporate objective health measures, such as biomarker data or clinical assessments, to complement self-reported information and provide a more comprehensive understanding of health disparities among older adults. This study does not explicitly analyze gender disparities in health outcomes, despite their recognized importance in later life. The primary focus was on migration status and health disparities, and gendered analyses were beyond the study's scope. However, future research should explore gender differences in health outcomes among older migrants, as men and women may experience migration and ageing-related health challenges differently. Despite the limitation, the study also has some strength as this is the latest data set in India on ageing and migration study and the findings of the study can be generalized as a national level. With all the strengths and limitations of the study, the study fills the research gap in the field of migration and health relations in India, and it can be generalized at the national level.

Conclusions

The study examined the health disparities among older persons with their migration status. This is a comprehensive study, and the findings reveal that persons with foreign-born and internal migrant status were more vulnerable to poor health outcomes than non-migrants in their later life. However, this study reveals that migrants, especially, need separate health policies as they are in poorer health conditions than non-migrants. Policymakers should initiate equal access to healthcare services for older migrants in India, regardless of their migration status or socioeconomic background. Foreign-born older migrants must be included under Ayushman Bharat healthcare schemes with particular concern and provision, such as migrants who have overseas citizenship of India status must be included in the government healthcare scheme. The migrants also need to be included in the national policy for senior citizens, regardless of their origin place, whether foreign-born or native migrants, for their particular needs in later life such as access to pensions and social security benefits. Older migrants must focus on the study of development perspectives to achieve active and healthy ageing and the goal of leaving no one behind in health-related issues. Finally, researchers and academicians must concentrate on migration and its intersection from an ageing perspective on their socioeconomic and health trajectory to overcome all migrant issues in later life in India.

Abbreviations

LASI	Longitudinal Ageing Study in India
UN DESA	United Nations Department of Economic and Social Affairs
HME	Healthy Migrants Effect
SRH	Self-reported Health
MBBS	Bachelor of Medicine and Bachelor of Surgery
MD	Doctor of Medicine
BDS	Bachelor of Dental Surgery
AYUSH	Ayurveda, Yoga, and Naturopathy, Unani, Siddha, and Homeopathy
HT	Hypertension
CES_D	Centre for Epidemiological Studies- Depression
ADL	Activities of Daily Living
POB	Place of Birth
POE	Place of Enumeration
MPCE	Monthly Per Capita Expenditure
VIF	Variance Inflation Factors
AOR	Adjusted Odds Ratio
CI	Confidence Interval

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Authors' contributions
V.A.: Conceived and designed the research paper and data curation, analyzed the data, and prepared the original manuscript and R.B.B.: Supervised, validated, writing & edited the original draft.

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Data availability
The study utilizes a secondary source of data that is freely available in the public domain through a request form (LASI Wave 1 Data Request form (www.iipsindia.ac.in).

Declarations

Ethics approval and consent to participate
The Given study is a secondary data analysis based on LASI wave-I (2017–18). The Indian Council of Medical Research (ICMR) extended the necessary guidance and ethical approval for conducting the LASI. Therefore, information from respondents is not collected as part of the study, so consent to participate is not required.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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