Social Science Spectrum ISSN 2454-2806
Vol. 6, No. 2, June 2023, pp. 53-68

Left Behind and Unhealthy? A Case Study of Health and Treatment-Seeking Practices of Migrant Sons' Older Parents in Indian Sundarban

Shinjini Ray*

Abstract

This study assesses the impact of adult out-migration on the health and treatment-seeking practices of left-behind older parents. Further, it identifies the preferred sources of treatment and challenges the left behind older parents face regarding healthcare access. A cross-sectional field survey was conducted from October 2020 to December 2020 among 400 left-behind and 200 non-left-behind older parents aged 60 years and above residing in the Sundarban Delta region of India. Both quantitative and qualitative interviews were conducted. Data were analysed using descriptive statistics, multivariate OLS and logistic regression models. We considered five physical health markers- self-rated health (SRH), non-communicable diseases (NCDs), activities of daily living (ADLs), instrumental activities of daily living (IADL), Body Mass Index (BMI), and two psychological health indicators- happiness and depression. Prevalence of NCDs and depressive symptoms significantly increased with adult sons' out-migration. A positive association was found between adult sons' migration and older parents' mobility, functional ability and BMI. Migration has a negative impact on NCDs-related treatment-seeking behaviour among left-behind older parents. Further initiatives are required to mitigate depressive symptoms and enhance healthcare utilization among older adults who have been left behind.

Keywords: inter-state migration, elderly health, treatment-seeking behaviour, Sundarban.

I. Introduction

In recent decades, India has undergone a significant demographic shift characterized by accelerated population ageing. This transformation is primarily attributed to pronounced changes in demographic trends, including decreased fertility and reduced mortality rates. As a result of these changes, there has been a notable increase in the proportion of older individuals within the population. This demographic shift is often quantified by the growing old-age dependency ratio, which signifies a heightened demand for healthcare services, improved infrastructure, and the establishment of a robust social security system to ensure the well-being of older adults (Rajan et al., 2003).

In the traditional Indian society strong familial bonds and kinship networks have traditionally provided essential social support and caregiving for older adults. Usually, older individuals receive care and financial assistance from their adult children, mainly their sons and daughters-in-law (Agrawal, 2012). Over the past few decades, the Indian society has transformed from a joint family to a nuclear family. Factors such as urbanization and migration related to employment opportunities have led adult sons and their families to relocate from their parental homes to larger Indian cities and international destinations (Bailey et al., 2018). This trend, closely associated with the decline of the joint family structures and emergence of nuclear households has reduced co-residence between older parents and their adult sons (Samanta et al., 2014). Consequently, older adults are increasingly at risk of being left behind as their sons migrate. Elderly parents who have one or more adult sons living away from their original or habitual residence, regardless of whether other family members are present in the household are classified as "left-behind" older adults (Adhikari et al., 2011; AO et al., 2016; Thapa et al., 2018).

* Shinjini Ray, Research Scholar, International Institute for Population Sciences, Govandi Station Road, Deonar, Mumbai 400088, India. Email: shinjiniray@gmail.com.

Acknowledgment: The field survey for this present study was funded by UNFPA (India Office) under its Ageing Project. This article forms the part of the Ph.D. thesis of the author. The author wishes to thank Prof. R. Nagarajan (IIPS) for his guidance and the referees of the journal for their comments on the earlier version of the paper.

Sundarban (so-called owing to Sundri trees) is the largest single mangrove forest in the world. It stretches from India to Bangladesh. It is a remarkable ecological hotspot and a UNESCO World Heritage Site due to its significant biodiversity (Mandal & Naskar, 2008). Despite its natural beauty and ecological importance, it has faced challenges over the past two centuries. The human population in the Indian region has rapidly increased with about 95 per cent of the people directly or indirectly dependent on water bodies for their livelihoods such as agriculture, aquaculture and fishery (Chowdhury et al., 2017; Mistri & Das, 2020). As a result, human activities, including embankment construction and forest clearing, have degraded this once-virgin mangrove forest to meet the population's growing needs (Mandal et al., 2010).

This region has undergone several devastating cyclones in the past two decades, causing extensive flooding and salinization of fertile agricultural lands. Islands within it are exceptionally susceptible to frequent embankment failures, submergence, flooding, beach erosion, cyclones and storm surges (Mandal et al., 2010). Migration constitutes a prominent livelihood strategy for its residents with approximately three-fourths of the households having at least one adult member migrating in search of employment. Key drivers for the adult out-migration include environmental degradation, low agricultural productivity, limited job prospects and a low wage rate. Notably, inter-state migration is significantly favoured over inter-district and intra-district migration (Mistri, 2013). Cyclone Aila of 2009 greatly impacted livelihood opportunities in the Sundarban, compelling a substantial number of distressed individuals to relocate, mainly engaging in inter-state migration facilitated by intermediaries (Mistri & Das, 2020). This phenomenon resulted in a considerable proportion of migrants opting to leave their home state, West Bengal. Migrant individuals prefer Tamil Nadu, followed by Karnataka, Kerala, Gujarat and Maharashtra as their destination. The primary pull factors for inter-state migration include wage rate differences and better job opportunities at the chosen destinations (Mistri & Das, 2017). As a result, older adults are increasingly vulnerable to being left behind in the deltaic region.

The health status of older adults in this region is influenced by several factors, including geographic location, socio-economic conditions, healthcare access and environmental challenges. The health status of the older population refers to the overall physical and psychological well-being and healthcare access among older individuals. The region is prone to cyclones and natural disasters, which can significantly impact older adults' health. The deltaic region faces issues related to high salinity levels in water sources, which can affect the availability of safe drinking water (Mistri, 2013). Contaminated water sources can lead to waterborne diseases and adversely impact older adults' health. Like other parts of India, this region also witnesses increased non-communicable diseases such as diabetes, hypertension and cardiovascular diseases among older individuals. These chronic conditions require ongoing management and access to appropriate healthcare services.

Older individuals may experience psychological distress due to socio-economic challenges, natural disasters and limited social support systems. This stress can impact their mental well-being and overall health. Some older individuals may face stigma or social isolation, which can negatively affect their mental health. Lack of social connections and engagement can contribute to loneliness and depression. The region has a scarcity of healthcare facilities including hospitals, clinics and qualified healthcare professionals. This limited access to healthcare services can impede the timely diagnosis and treatment of health conditions among older adults. The region's remote and inaccessible areas make it difficult for older adults to access healthcare facilities outside their immediate vicinity. Lack of proper transportation infrastructure can further exacerbate the issue.

Considering the growing ageing population and outmigration of adult sons in India, it becomes crucial to comprehend whether the absence of adult sons in the household affects the health and treatment-seeking behaviour of older parents who are left behind. While some studies from developing countries have explored the overall physical and psychological health of left-behind older adults (Abas et al., 2009; Adhikari et al., 2011; Kanaiaupuni, 2000; Knodel & Saengtienchai, 2007; Kuhn, 2006; Yi et al., 2019), research explicitly focusing on the health and well-being outcomes of older Indians in the absence of their adult sons in the household is relatively limited. There is also a notable research gap regarding the effects of adult out-migration on the treatment-seeking behaviour of left behind older

parents as well as their preferred sources of treatment and the reasons behind not seeking treatment. The current study aims to address this research gap, offering valuable insights from a policy perspective that can contribute to a more comprehensive understanding of the healthcare dynamics in this population. The specific objective of the present study is to assess the linkages between the migration of adult sons and the health outcomes of their left-behind older parents. The study also tried to identify the preferred sources of treatment and challenges the left-behind older parent face regarding healthcare access.

II. Data and methods

Data

A cross-sectional community-based study was conducted in two different older population groups (aged 60 years and above) in the region during the survey period from October to December 2020. The study comprised 600 geriatric population, among which 400 were left behind and 200 non-left behind older parents. Apart from the survey, some left-behind older parents were selected for in-depth interviews to get more detailed information about their preferred source of treatment and the problems they faced regarding seeking treatment.

Site selection and sampling frame

To understand the physical and psychological health status of left behind older parents and the problems they face in accessing healthcare facilities, we conducted fieldwork in the Sundarban region. It is the largest delta in the world, located in the southern coastal area of West Bengal and neighbouring Bangladesh. The Indian portion of Sundarban comprises of 19 community development blocks, among which 13 come in the South and six in the North 24 Parganas district of West Bengal. The North 24 Parganas district, between 2001 and 2011, witnessed the highest number of adult inter-state migrations in West Bengal (Census, 2011). Therefore, the Indian Sundarban under North 24 Parganas district has been selected for the present study. Only the older parents of inter-state adult migrants were considered in the present study, assuming that the ties between older parents and their adult sons were weaker compared with those whose sons migrated within the same state. Thus, the impact of adult migration on left behind older parents could be more noticeable.

Hingalganj block under North 24 Parganas was selected for the present study as 91.4 per cent of this population resides in rural areas (Census, 2011). For calculating the proportion of left-behind older adults, 15 per cent of left-behind older adults are considered at the village level, based on the researcher's exposure to the study area. Using the Probability Proportion to the Population sampling scheme, seven villages from the Hingalganj block were selected. The older parents with all the migrated adult family members at least for two years and above were included as the left behind older parents, and the respondents with at least one living adult son staying with his older parents for a minimum for two years and above were considered non-left behind older parents.

Sample size estimation

For sample size estimation, 15 percent was considered the minimum significant proportion. Thus, the sample size was calculated considering the minimum proportion to be estimated as 15 percent with an allowable absolute error of 3 percent, a non-response rate of 10 percent and a design effect of 1.5 percent. By using the formula: (n)= Z21-α/2 *p*q/d2 where, n= required sample size, p= minimum proportion to be estimated, i.e., 15%=0.15, q= (1-p) = (1-0.15) = 0.85, Zα/2= 1.96 for 95% confidence absolute, d= allowable error 3%, R= non-response rate, i.e., 10%, Design effect= 1.5, the sample size (n)= 394. Considering a round figure, 400 left behind older adults were drawn. At the same time, 200 non-left-behind older adults were also interviewed randomly as the reference group to compare left-behind and non-left-behind older adults. Apart from this quantitative survey, ten Key Informant Interviews with Gram Panchayat Pradhan, local doctors, forest officers, social workers and NGO representatives were conducted to understand the changing socio-economic scenario in these villages

and communities. Twenty in-depth interviews among left-behind older parents were also undertaken to get a detailed scenario of their health and treatment-seeking behaviour. The pre-tested and pre-designed questionnaire was used to collect the data.

Variable description

The main explanatory variable of the present study is migration of adult children. The survey collected information on the place of residence of adult sons not residing with their older parents (the respondents) during at least two years preceding the survey.

Independent variables

In the present analysis, older parents' various demographic and socio-economic factors were considered as control variables. The individual's age and educational attainment were measured in single years and used as continuous variables. Information concerning the older parent's adult sons, including the total number of living adult sons, their mean age (in years), and the mean years of their school attainment was also included as continuous variables. Dummy variables were introduced for the individual's sex and marital status. Moreover, the health and well-being of ageing parents are believed to be influenced by their income, particularly in low- and middle-income nations where social security benefits are inadequate (Chokkanathan & Mohanty, 2017; Guo et al., 2019). Accordingly, the present analysis is controlled for the income effect at the individual level by adding the economic independence of the older parents. Additionally, a set of categorical variables was included to account for the influence of religion, caste, lifestyle-related behaviour (i.e., smoking and drinking habit) and social network ties on older parents. Household economic status was measured using estimates of the wealth index computed through principal component analysis (PCA) (Filmer & Pritchett, 2001). Socio-demographic characteristics of the studied sample is provided in Appendix (Table A1).

Measures of health indicators

Several physical and mental health measurements for older adults were investigated, acknowledging the multidimensional nature of health. Self-rated health (SRH), the presence of non-communicable diseases (NCDs), activity restrictions in daily living (ADLs), instrumental activity limitations in daily living (IADLs) and BMI were used to measure the older individual's physical health status. The level of happiness and depressive symptoms were used to assess the psychological health of older parents. The following is a description of each indicator:

Physical health indicators

Self-Rated Health (SRH): SRH has been widely used in geriatric research to evaluate an older individual's general health status. (Razzaque et al., 2010; Singh et al., 2013). We have collected the respondents' SRH information by asking how they rate their general health condition. The responses were recorded on a five-point Likert scale: "excellent" (1 point), "very good" (2 points), "good" (3 points), "fair" (4 points) and "poor" (5 points). However, we have reversed the value of the SRH indicator—that is, "excellent" (5 points), "very good," "good," "fair," and "poor" (1 point)—such that higher values equal better health and thus assumed SRH indicator as a continuous variable in the analyses.

Non-Communicable Diseases (NCDs): Information regarding NCDs were based on self-reporting. Respondents were asked: Were they sick during the last 30 days? We considered six major NCDs, namely, stroke, diabetes, COPD, hypertension, arthritis and cancer, for the present study. Respondents had two response options as ‘yes’ or ‘no’. Negative responses were coded as 0, while positive responses as 1.

Activity Limitations in Daily Living (ADLs): We measured ADLs based on how difficult it is for older individuals to complete six basic self-care activities: walking, toileting, bathing, dressing, eating,

and continence. Respondents were asked if they faced any trouble while performing the tasks and each task had three response options: do not require assistance, require partial assistance and require complete assistance. We assigned these responses 2, 1, and 0 score and then computed an aggregated ADL score by adding individual responses across the six questions. The final score varied from 0 to 12, with a higher number indicating less need for assistance with daily self-care activities.

Instrumental Activity Limitations in Daily Living (IADLs): Eight fundamental instrumental activities that are essential to independent living were the focus of the IADL questions: dialling and receiving telephone calls, preparing food, regular shopping, participating in housekeeping tasks, travelling, doing laundry, taking medicines and managing personal finance independently. For each activity, there were three to five response options that included codes of 0 and 1 based on the difficulty level of the respective activity. These points were added together for each of the eight activities to create an overall IADL score that ranged from 0 to 16. A higher score denoted a better performance in the instrumental activities.

Body Mass Index (BMI): We measured the height and weight of the older parents. Further, we divided the weight of older individuals by their height to get their BMI.

Psychological health indicators

Happiness score: We adopted a 9-point Subjective Well-being Inventory (SUBI-9) to measure happiness score of the older parents (Diener, 1994). Respondents provide responses to each item on a scale of 1 to 3, with higher scores indicating higher levels of happiness. These item scores are then summed to derive a total score ranging from 9 to 27. A higher total score indicates a more favourable psychological health.

Depressive symptoms: The Geriatric Depression Scale (GDS-15), a 15-item instrument, was used to evaluate the psychological health of older parents. GDS-15 is a popular and trustworthy self-reported screening tool for determining the non-specific and minor mental illnesses that affect the older population. This instrument comprises two response categories for each item: yes and no, denoted by the codes 1 and 0 respectively. By summing up these values, an overall score was calculated that we called the GDS-score, a continuous variable with a range of 0 to 15. A higher score indicated greater depressive symptoms.

Healthcare seeking variable: Older individuals were asked whether they received any medical treatment while they suffered from chronic morbidity in the last 12 months. Their responses were coded separately, generating two dichotomous variables where 0 = no treatment received and 1 = any treatment received.

Main explanatory variable

The main explanatory variable of the present study is the status of being 'left-behind' older adults. We collected information on the migration status and current place of residence of older parents' adult sons. Thus, older parents were considered left-behind if they were residing in the absence of their adult sons (due to migration to other states) and other adult household members for at least two years preceding the survey. We only considered inter-state migration of adult sons assuming that their ties with the older parents were weaker compared with those who migrated within the state. Thus, the impact of adult migration on left-behind older parents could be more noticeable.

Statistical analysis

Descriptive statistics and tests of difference were adopted to demonstrate differences in physical and psychological health indicators and treatment-seeking behaviour between two groups of older parents: those who were left behind and those who were not. Further, using the ordinary least square

(OLS) regression model, we examined the relationship between adult sons' migration and selected health indicators of older parents.

III. Results

Descriptive results for the physical and psychological health of older adults

Table 1 presents the summary statistics for physical and psychological health indicators included in the present study. With regard to physical and psychological health indicators, a significant variation is present between the two groups. The left-behind older adults had a better score on subjective health (SRH) and IADL than the non-left older adults (SRH = 2.35 vs. 2.22; IADL = 5.15 vs. 3.92, respectively). The depression score had a mean of 6.65, and there was a difference of 0.58 between the two groups. Detailed descriptive results for the physical and psychological health of older adults by socio-demographic characteristics are presented in Appendix (Tables A2 and A3).

Table 1: Descriptive statistics of older parents according to physical health measures by migration status

Health measures	Full sample	Left-behind elderly	Non-left- behind elderly	Difference
	Mean (SD)	Mean (SD)	Mean (SD)	
SRH	2.31 (0.94)	2.35 (0.94)	2.22 (0.93)	0.13*
NCDs	1.04 (1.03)	1.04 (1.01)	1.03 (1.06)	0.01
ADL Score	13.48 (1.85)	13.69 (1.18)	13.02 (2.72)	0.67*
IADL Score	4.76 (1.97)	5.15 (1.79)	3.92 (2.09)	1.23*
BMI	22.79 (4.06)	22.93 (4.24)	22.49 (3.64)	0.44*
Depression score	6.65 (1.90)	6.84 (1.93)	6.26 (1.77)	0.58*
Happiness score	6.32 (2.21)	6.16 (2.17)	6.68 (2.25)	0.52*

Note**:** SRH: Self-rated health; NCDs: Non-communicable diseases; ADL: Activities of daily living; IADL: Instrumental activities of daily living; BMI: Body mass index; SD: Standard deviation. *Differences at the 5 percent significance level ($p<0.05$) using two-sided t-test.

Effect of adult sons' migration on the physical health of older adults

Table 2 presents the coefficient from OLS regression estimation for five physical health variables of our interest. The result shows that the migration of adult sons has a statistically significant positive (coeff = 0.26, $p<0.01$) association with the subjective health (SRH) of older individuals. The result also shows a strong positive association between IADL and migration of adult sons, indicating that older parents with migrant sons are likely to perform instrumental activities more independently than older individuals without them (coeff = 1.16, $p= 0.001$). At the same time, ADL of older parents was also positively associated with adult migrant sons (coeff = 0.56, $p< 0.001$).

Effect of adult sons' migration on the psychological health of older adults

Table 3 presents the results from OLS estimates for two psychological health indicators of older parents: depression and happiness. Results indicate that being left behind was positively related with depressive outcomes (coeff = 0.48, $p<0.001$). The result also suggests that having a migrant son was negatively related to the happiness of older parents.

Effect of migration on the healthcare seeking behaviour of older adults

Table 4 presents the impact of adult migration on older parents' treatment-seeking behaviour in the last 12 months while suffering from non-communicable diseases. In the study, around 65 percent of left-behind older parents reported that they sought treatment while suffering from any ailment. Most respondents preferred to visit unqualified medical practitioners, followed by government and private hospitals or clinics. The result shows that the absence of adult sons impacted the treatment-seeking

Table 2: Effect of adult children's migration on indicators of physical health of older parents: OLS regression

	SRH	NCDs	ADL	IADL	BMI
Coefficient	0.26	0.04	0.56	1.16	0.37
(95% CI)	(0.09, 0.42)	(-0.13, 0.21)	(0.27, 0.85)	(0.88, 1.44)	(-0.34, 1.08)
P value	0.002	0.650	0.000	0.000	0.307
Constant	2.09	0.69	13.00	3.60	21.89
(95% CI)	(1.43, 2.76)	(0.46, 0.93)	(12.5, 13.5)	(3.11, 4.09)	(20.93, 22.87)
Adjusted R^2	0.15	0.11	0.23	0.37	0.03

Note**:** SRH: Self-rated health; NCDs: Non-communicable diseases; ADL: Activities of daily living; IADL: Instrumental activities of daily living; BMI: Body mass index.
All the estimations include the following control variables: total number of living adult sons, mean age of living adult sons, mean years of schooling of the adult sons, older parents' age, sex, religion, caste, marital status, years of schooling, economic dependence, lifestyle-related behaviour (i.e., smoking and drinking habit); and household wealth status.
Coefficients in bold fonts are statistically significant ($p<0.05$).
The co-efficient values for the control variables are not shown for brevity; the full results are provided in Appendix (Table A4).

Table 3: Effect of adult children's migration on indicators of psychological health of older parents: OLS regression

Parameters	Depression	Happiness
Coefficient	0.48	-0.26
(95% CI)	(0.19, 0.77)	(-0.57, 0.05)
P value	0.001	0.096
Constant	8.64	4.62
(95% CI)	(7.38, 9.91)	(3.25, 5.99)
Adjusted R^2	0.34	0.42

Note: All the estimations include the following control variables: total number of living adult sons, mean age of living adult sons, mean years of schooling of the adult sons, older parents' age, sex, religion, caste, marital status, years of schooling, economic dependence, lifestyle-related behaviour (i.e., smoking and drinking habit); social network ties (i.e., relatives, neighbours and friends), and household wealth status. Coefficients in bold fonts are statistically significant ($p<0.05$). The co-efficient values for the control variables are not shown for brevity; the full results are provided in Appendix (Table A5).

behaviour of older parents. Around 27 percent of left-behind older parents reported that since there was no one to help take them to healthcare facilities, they could not seek treatment for their ailments. In contrast, only 9 percent of non-left-behind older parents reported the same. Overall, 8 percent of older adults could not seek treatment due to the COVID-19 pandemic as the outpatient department of the hospitals did not allow senior citizens as they were more prone to get affected by the virus. The inclination towards seeking medical assistance from local unqualified practitioners was vividly captured through in-depth interviews, as outlined below:

> *"Poor people like us are left with no other option but to go to the local unqualified practitioners, irrespective of our treatment. Neither medical practitioners nor medicines are available in the village's primary health centre. The government hospital is far away from our village. So what else can we do? People staying with their sons and having money can afford to go to the government or private hospitals. We can only go to local doctors (unqualified practitioners) and leave the rest to God".* (An 80-year-old man, Banstala village).

The adverse effect of seeking treatment from an unqualified medical practitioner was explained by 66-year-old MBBS doctor-

> *"There are a lot of unqualified practitioners. Patients usually go to them as they are available near the villages, so patients do not have to travel much to get the treatment. These unqualified practitioners generally prescribe medicines without appropriate clinical diagnosis and even without knowing the side-effects of those medicines. If you are taking treatment and don't get better, they will send you to a specialist doctor".*

Table 4: Percentage distribution of older parents according to treatment-seeking behaviour in the last 12 months by migration status

Treatment seeking behaviour	All (%)	Left-behind parents (%)	Non-left-behind parents (%)
Sought treatment for NCDs			
Yes	65.4	64.6	67.2
No	34.6	35.4	32.8
Preferred source of treatment			
Govt. hospital/clinic	23.9	24.4	23.1
Private hospital/clinic	14.1	10.9	20.5
Unqualified medical practitioner	54.9	60.4	43.6
Ritualistic healing	3.7	3.1	5.1
Others	3.3	1.2	7.7
Reason for not seeking treatment			
Ailment was cured	13.3	12.1	15.9
Long distance of medical facility	18.9	16.2	25.0
Financial reason	24.5	24.2	25.0
Long waiting time	1.4	2.0	-
Ailment was not serious	11.2	8.1	18.2
No body to help	21.7	27.3	9.1
Hospitals were not allowing due to Covid-19	8.4	9.1	6.8
Treatment may not help now	0.7	1.0	-
Total (N)	600	400	200

Note: NCDs: Non-communicable diseases.

IV. Discussion and conclusion

The present study aimed to understand the association between adult out-migration, physical and psychological health outcomes, and healthcare-seeking behaviours of older parents left behind in the Indian Sundarban delta region. It also tried to identify the preferred sources of treatment and challenges faced by this population group regarding healthcare access. Adopting a multidimensional approach to assess the health of older individuals, we examined the influence of adult sons' migration on various physical aspects, encompassing self-rated health, NCDs, activities of daily living, instrumental activities of daily living and body mass index. Psychological health outcomes, including happiness and depression were also considered. Our findings indicate that the impact of adult sons' migration on the health of left-behind parents manifests differently across distinct measures of older adults' health outcomes. Specifically, we observed migration's direct and beneficial impact on the subjective health of older individuals. This aligns with earlier studies that suggested the income generated through migration plays a positive role in enhancing life satisfaction and subjective well-being among left-behind parents (Böhme et al., 2015). Conversely, we noted that the migration of adult sons increases the likelihood of older adults left behind being diagnosed with chronic morbidity. Existing research from India indicates that post-migration, older adults may engage in unhealthy lifestyle behaviours, ignoring age-related restrictions on diet, physical activity, and the consumption of tobacco and alcohol (Bhandari & Paswan, 2021; Bhandari et al., 2021), potentially contributing to elevated levels of NCDs among left-behind older parents.

Furthermore, our results suggest migration directly and positively influences older individuals' functional ability to perform instrumental activities. One plausible explanation is that the migration of adult children may foster self-dependency among left-behind parents, prompting them to undertake routine tasks independently. This independence could reflect better instrumental health status in the left-behind elderly (Hacihasanoğlu et al., 2012).

The influence of adult migration on the psychological well-being of parents was substantial, indicating a heightened prevalence of general psychological disorders, particularly depression, among older parents who were left behind. The observed negative correlation between migration and adverse

mental health outcomes is frequently interpreted as a consequence of geographical isolation, affecting the regular personal interaction between older parents and their migrating children (Bhandari et al., 2021; Rossi & Rossi, 2018). Additionally, in the absence of adult children, older parents may experience feelings of loneliness and social isolation due to a diminished family role such as reduced involvement in the nurturing of grandchildren and a decline in psychosocial resources in the context of family separation (Cudjoe et al., 2018). Over time, this sense of loneliness and isolation may manifest in various symptoms indicative of poor mental health including persistent worrying, anxiety and depression (Miltiades, 2002; Vullnetari and King, 2008).

Older individuals preferred accessing government healthcare facilities due to the availability of free or low-cost treatment. Following the 'time allocation model', the correlation between the migration of adult children and healthcare utilization among older parents demonstrates a lower healthcare utilization rate among the elderly who are left behind. The limited healthcare utilization among left-behind older adults is attributed to the absence of available assistance to bring them to healthcare facilities. In the Indian context, adult sons have consistently served as a primary source of providing necessary care and support for their older parents, thus co-residing with adult sons and their families is anticipated to guarantee the healthcare needs of older individuals (Ugargol et al., 2016). However, as migration disrupts this co-residential arrangement with adult sons and other adult family members, the healthcare utilization of older parents may become restricted during periods of necessity.

V. Conclusion

This study presents empirical findings elucidating the intricate relationship between the migration of adult children and the health dynamics and the treatment-seeking behaviour of older parents who remain in their original setting. The results acknowledge a positive correlation between the migration of adult sons and improvements in body mass index, mobility and functional health among older parents. Nevertheless, a simultaneous increase in chronic morbidity, depressive symptoms and suboptimal healthcare utilization among left-behind parents underscores the adverse consequences of adult emigration on the geriatric health and well-being landscape. Given the mounting proportion of the aging population in India, coupled with a noticeable trend in rural-urban adult migration, our findings underscore the need for policymakers to prioritize monitoring the migration status of adult sons as a key determinant influencing the health and welfare of older adults in the country.

From an intervention perspective, there is an urgent need for the development of public health policies targeting the alleviation of depressive symptoms in left-behind parents to enhance psychological well-being within this vulnerable demographic group. Additionally, addressing the observed lower healthcare utilization among left-behind elderly demands the implementation of mobile healthcare facilities and geriatric welfare services in Primary Health Centres (PHCs) to mitigate the prevalent underutilization of healthcare services in this group. Furthermore, a robust longitudinal study utilizing clinically recognized instruments and specifically focusing on the health of left-behind parents would be more helpful in comprehending the multifaceted factors contributing to the negative impact on older individuals' physical and psychological health.

VI. Strengths and limitations

The outcomes of this study contribute valuable insights to the discourse surrounding the influence of adult sons' migration status on the physical and psychological health status, as well as treatment-seeking behaviour, of their older parents and the problems they face regarding seeking treatment. Nonetheless, certain limitations should be addressed in the future research. Firstly, our analysis considered self-rated health variables which may produce potentially biased estimations as no clinical diagnoses were made for further reliability and validity assessment. Secondly, the cross-sectional nature of the data restricted us from predicting older parents' health status before their adult sons' migration. Finally, due to the unavailability of longitudinal data, we could not examine the reverse-causation association between adult sons' migration and older parents' health outcomes. By investigating this

relationship, important insights could have been drawn regarding the relationship between adult sons' migration decisions and their parents' health and treatment-seeking behaviours.

Ethical consideration

Ethical clearance from the Students Research Ethics Committee (SREC) of the IIPS was taken before starting the field survey. Individual respondent's consent was taken, and the purpose of the study was explained to the respondents before the interview. Respondents were free to skip any question(s) or withdraw from the interview at any time. It was also explained to the respondents that their information would be kept confidential and only used for research purposes.

References

Abas, M. A., Punpuing, S., Jirapramukpitak, T., Guest, P., Tangchonlatip, K., Leese, M., & Prince, M. (2009). Rural–urban migration and depression in ageing family members left behind. *The British Journal of Psychiatry*, *195*(1), 54-60.

Adhikari, R., Jampaklay, A., & Chamratrithirong, A. (2011). Impact of children's migration on health and health care-seeking behavior of elderly left behind. *BMC Public Health*, *11*, 143.

Agrawal, S. (2012). Effect of living arrangement on the health status of elderly in India: Findings from a national cross-sectional survey. *Asian Population Studies*, *8*(1), 87–101.

Ao, X., Jiang, D., & Zhao, Z. (2016). The impact of rural-urban migration on the health of the left-behind parents. *China Economic Review*, *37*(1), 126–139.

Bailey, A., Hallad, J., & James, K. S. (2018). 'They had to Go': Indian older adults' experiences of rationalizing and compensating the absence of migrant children. *Sustainability*, *10*(6), 1946.

Bhandari, P., & Paswan, B. (2021). Lifestyle behaviours and mental health outcomes of elderly: Modification of socio-economic and physical health effects. *Ageing International*, *46*, 35-69.

Bhandari, P., Ray, S., & Nagarajan, R. (2022). Implication of adult out-migration on the health and healthcare seeking of the older parents in Indian households: An exploration. *Ageing International*, *47*(2), 180-205.

Böhme, M. H., Persian, R., & Stöhr, T. (2015). Alone but better off? Adult child migration and health of elderly parents in Moldova. *Journal of Health Economics*, *39*, 211-227.

Chokkanathan, S., & Mohanty, J. (2017). Health, family strains, dependency, and life satisfaction of older adults. *Archives of Gerontology and Geriatrics*, *71*, 129-135.

Chowdhury, A., Naz, A., & Maiti, S. K. (2017). Health risk assessment of 'tiger prawn seed' collectors exposed to heavy metal pollution in the conserved mangrove forest of Indian Sundarbans: A socio-environmental perspective. *Human and Ecological Risk Assessment: An International Journal*, *23*(2), 203-224.

Cudjoe, T. K., Roth, D. L., Szanton, S. L., Wolff, J. L., Boyd, C. M., & Thorpe Jr, R. J. (2020). The epidemiology of social isolation: National health and aging trends study. *The Journals of Gerontology: Series B*, *75*(1), 107-113.

Diener, E. (1994). Assessing subjective well-being: Progress and opportunities. *Social Indicators Research*, *31*, 103-157.

Filmer, D., & Pritchett, L. H. (2001). Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. *Demography*, *38*(1), 115-132.

Guo, W., Chen, L., & Perez, C. (2019). Economic status, family dependence, and health outcomes of older people in Western rural China. *Journal of Gerontological Social Work*, *62*(7), 762-775.

Hacihasanoğlu, R., Yildirim, A., & Karakurt, P. (2012). Loneliness in elderly individuals, level of dependence in activities of daily living (ADL) and influential factors. *Archives of Gerontology and Geriatrics*, *54*(1), 61-66.

Kanaiaupuni, S. M. (2000). *Leaving parents behind: Migration and elderly living arrangements in Mexico*. Center for Demography and Ecology, University of Wisconsin-Madison.

Knodel, J., & Saengtienchai, C. (2007). Rural parents with urban children: social and economic implications of migration for the rural elderly in Thailand. *Population, Space and Place*, *13*(3), 193-210.

Kuhn, R. S. (2006). A longitudinal analysis of health and mortality in a migrant-sending region of Bangladesh. In *Migration and health in Asia* (pp. 177-208). Routledge.

Mandal, R. N., & Naskar, K. R. (2008). Diversity and classification of Indian mangroves: a review. *Tropical Ecology*, *49*(2), 131.

Mandal, R. N., Das, C. S., & Naskar, K. R. (2010). Dwindling Indian Sundarban mangrove: the way out. *Science & Culture*, *76*(7-8), 275-282.

Miltiades, H. B. (2002). The social and psychological effect of an adult child's emigration on non-immigrant Asian Indian elderly parents. *Journal of Cross-Cultural Gerontology*, *17*, 33-55.

Mistri, A. (2013). Migration and sustainable livelihoods: a study from Sundarban biosphere reserve. *Asia Pacific Journal of Social Sciences*, *5*(2), 76-102.

Mistri, A., & Das, B. (2017). Migration in response to environmental change: A risk perception study from Sundarban biosphere reserve. In *Climate change, vulnerability and migration* (pp. 147-166). Routledge India.

Mistri, A., & Das, B. (2020). *Environmental change, livelihood issues and migration*. Springer Singapore.

Rajan, S. I., Mishra, U. S., & Sarma, P. S. (2013). *Demography of Indian aging,* 2001–2051. In An aging India (pp. 11-30). Routledge.

Razzaque, A., Nahar, L., Akter Khanam, M., & Kim Streatfield, P. (2010). Socio-demographic differentials of adult health indicators in Matlab, Bangladesh: self-rated health, health state, quality of life and disability level. *Global Health Action*, *3*(1), 1-8.

Registrar General of India (RGI). (2011). Census of India 2011. Provisional Population Totals. New Delhi: Government of India.

Rossi, A. S., & Rossi, P. H. (2018). *Of human bonding: Parent-child relations across the life course*. Routledge.

Samanta, T., Chen, F., & Vanneman, R. (2014). Living arrangements and health of older adults in India. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *70*(6), 937-947.

Singh, L., Arokiasamy, P., Singh, P. K., & Rai, R. K. (2013). Determinants of gender differences in self-rated health among older population: evidence from India. *Sage Open*, *3*(2), 1-12.

Thapa, D. K., Visentin, D., Kornhaber, R., & Cleary, M. (2018). Migration of adult children and mental health of older parents 'left behind': An integrative review. *PloS one*, *13*(10), e0205665.

Ugargol, A. P., Hutter, I., James, K. S., & Bailey, A. (2016). Care needs and caregivers: Associations and effects of living arrangements on caregiving to older adults in India. *Ageing International*, *41*(2), 193-213.

Vullnetari, J., & King, R. (2008). 'Does your granny eat grass?' On mass migration, care drain and the fate of older people in rural Albania. *Global Networks*, *8*(2), 139-171.

Yi, F., Liu, C., & Xu, Z. (2019). Identifying the effects of migration on parental health: Evidence from left-behind elders in China. *China Economic Review*, *54*, 218-236.

Appendices

Table A1: Socio-demographic characteristics of study population by migration status

Socio-demographic characteristics	Left behind parents (%)	Non-left behind parents (%)	Total
Age group (in years)			
60-69	59.8	62.3	60.6
70-79	28.1	18.6	25.0
80+	12.1	19.1	14.4
Sex			
Male	59.3	59.6	59.4
Female	40.7	40.4	40.6
Marital status			
Currently married	63.4	66.1	64.3
Widow/widower	36.6	33.9	35.7
Education			
No schooling	33.5	32.8	33.3
Primary	27.1	21.3	25.2
Secondary	32.2	35.0	33.1
Higher education	7.2	10.9	8.4
Economic dependence			
Fully dependent	15.7	17.5	16.3
Partially dependent	32.5	18.0	27.9
Independent	51.8	64.5	55.9
Religion			
Hindu	96.4	97.8	96.8
Muslim	3.6	2.2	3.2
Caste			
SC	88.7	91.8	89.7
ST	7.0	4.4	6.1
Other	4.4	3.8	4.2
Currently smoking			
No	74.8	80.9	76.8
Yes	25.2	19.1	23.2
Currently consuming alcohol			
No	81.4	95.1	85.8
Yes	18.6	4.9	14.2
Household wealth status			
Poor	30.4	24.6	28.5
Middle	32.0	19.1	27.9
Rich	37.6	56.3	43.6
Social network ties			
Low	68.0	55.7	64.1
High	32.0	44.3	35.9
Total	400	200	600

Table A2: Descriptive statistics of physical health indicators by socio-demographic characteristics and migration status

Socio-demographic characteristics	SRH		NCDs		ADL		IADL		BMI	
	LBE	NLBE	LBE	NLBE	LBE	NLBE	LBE	NLBE	LBE	NLBE
Age group (in years)										
60-69	2.5	2.4	0.9	0.7	13.9	13.9	5.6	4.9	23.1	22.4
70-79	2.1	2.0	1.2	1.3	13.6	13.2	4.9	3.5	22.8	23.1
80+	2.1	1.8	1.6	1.9	12.8	9.8	3.6	1.2	22.3	22.1
Sex										
Male	2.5	2.3	0.9	0.8	13.5	13.3	4.8	4.1	22.1	22.4
Female	2.1	2.0	1.2	1.3	14.0	12.5	5.7	3.6	22.7	22.7
Marital status										
Currently married	2.5	2.3	1.0	0.8	13.5	13.4	4.8	4.2	22.5	22.4
Widow/widower	2.1	2.1	1.2	1.4	14.0	12.3	5.8	3.5	23.6	22.7
Education										
No schooling	2.1	2.1	1.2	1.2	13.7	12.6	5.0	3.5	23.3	22.6
Primary	2.4	2.1	1.0	0.8	13.9	13.2	5.1	3.8	23.3	22.9
Secondary and above	2.5	2.4	1.0	1.0	13.6	13.2	5.3	4.3	22.4	22.2
Economic dependence										
Fully dependent	2.2	2.2	1.2	1.3	13.7	12.2	5.3	3.2	23.6	23.7
Partially dependent	2.3	1.9	1.2	1.6	13.7	11.8	5.4	3.1	22.5	22.3
Independent	2.4	2.3	1.0	0.8	13.7	13.6	5.0	4.4	23.0	22.2
Religion										
Hindu	2.4	2.2	1.0	1.0	13.7	13.0	5.2	3.9	22.8	22.5
Muslim	1.9	1.7	1.1	1.0	14.0	13.0	4.8	3.2	25.4	22.4
Caste										
SC	2.4	2.2	1.1	1.0	13.7	13.0	5.1	3.9	22.7	22.5
ST	2.5	2.1	0.8	1.0	13.9	13.5	5.4	4.7	24.4	22.4
Others	2.1	2.1	0.9	1.3	14.0	13.0	5.3	3.4	25.2	22.8
Currently smoking										
No	2.3	2.2	1.1	1.1	13.7	12.8	5.2	3.8	23.2	22.4
Yes	2.7	2.4	0.8	0.6	13.6	13.9	4.9	4.5	22.1	23.0
Currently consuming alcohol										
No	2.3	2.2	1.4	1.1	13.7	12.9	5.1	3.8	23.1	22.5
Yes	2.7	3.2	0.6	0.4	13.9	14.0	5.3	5.9	22.2	21.7
Household wealth status										
Poor	2.1	1.9	1.1	1.3	13.8	12.6	5.2	3.2	22.9	22.2
Middle	2.4	2.9	1.1	1.2	13.6	12.2	4.9	3.4	23.5	22.3
Rich	2.5	2.3	0.9	0.8	13.7	13.5	5.4	4.4	22.6	22.7
Social network ties										
Low	2.2	1.9	1.2	1.4	13.6	12.2	5.0	3.2	22.9	22.3
High	2.8	2.6	0.6	0.6	13.9	14.0	5.5	4.9	22.9	22.7
Total	2.4	2.2	1.1	1.0	13.7	13.0	5.2	3.9	22.9	22.5

Table A3: Descriptive statistics of psychological health indicators by socio-demographic characteristics and migration status

Socio-demographic characteristics	Depression		Happiness	
	LBE	NLBE	LBE	NLBE
Age group (in years)				
60-69	6.5	5.9	21.6	20.3
70-79	7.2	6.3	22.9	22.1
80+	7.8	7.2	24.1	23.8
Sex				
Male	6.2	5.6	20.5	19.3
Female	7.7	7.2	24.8	24.3
Marital status				
Currently married	6.3	5.8	20.8	19.9
Widow/widower	7.8	7.2	24.7	24.1
Education				
No schooling	7.6	7.1	24.6	23.6
Primary	6.8	5.9	22.2	21.8
Secondary and above	6.2	5.9	20.3	19.4
Economic dependence				
Fully dependent	7.0	7.0	22.8	23.4
Partially dependent	6.8	7.3	22.1	23.5
Independent	6.8	5.8	22.2	20.1
Religion				
Hindu	6.8	6.2	22.2	21.3
Muslim	6.9	7.0	23.7	20.2
Caste				
SC	6.9	6.3	22.2	21.4
ST	6.7	5.1	22.8	19.9
Others	6.3	6.4	21.7	21.7
Currently smoking				
No	7.1	6.5	22.8	21.8
Yes	6.1	5.3	20.6	19.3
Currently consuming alcohol				
No	7.0	4.8	22.6	21.5
Yes	5.9	6.3	20.7	18.4
Household wealth status				
Poor	7.0	6.8	23.7	23.7
Middle	7.1	6.4	22.3	22.1
Rich	6.5	5.9	21.1	20.0
Social network				
Low	7.5	7.2	24.3	23.6
High	5.5	5.1	17.9	17.6
Total	6.8	6.3	22.3	21.3

Table A4: Effect of migration on various indicators of physical health

Background characteristics	Coefficient (95% CI)				
	SRH	NCD	ADL	IADL	BMI
Status					
Non-left behind (ref.)					
Left behind	0.26 (0.09, 0.42)	0.04 (-0.13, 0.21)	0.56 (0.27, 0.85)	1.16 (0.88, 1.44)	0.37 (-0.34, 1.08)
Age group					
60-69 (ref.)					
70-79	-0.3 (-0.5, -0.1)	0.28 (0.06, 0.5)	-0.31 (-0.68, 0.05)	-0.83 (-1.19, -0.48)	-0.15 (-1.06, 0.75)
80+	-0.28 (-0.56, 0)	0.69 (0.38, 0.99)	-2.24 (-2.76, -1.73)	-2.59 (-3.09, -2.09)	-0.88 (-2.14, 0.39)
Sex					
Male (ref.)					
Female	-0.09 (-0.33, 0.14)	0.15 (-0.11, 0.41)	0.14 (-0.3, 0.57)	0.2 (-0.22, 0.61)	1.7 (0.63, 2.76)
Marital status					
Currently married (ref.)					
Widow	-0.12 (-0.33, 0.09)	-0.01 (-0.25, 0.22)	0.32 (-0.07, 0.71)	1 (0.63, 1.38)	-0.23 (-1.19, 0.73)
Education					
No schooling (ref.)					
Primary	-0.04 (-0.24, 0.17)	-0.14 (-0.37, 0.09)	0.26 (-0.12, 0.64)	0.35 (-0.02, 0.72)	0.67 (-0.27, 1.61)
Secondary and above	0.03 (-0.18, 0.23)	0.01 (-0.22, 0.23)	-0.02 (-0.4, 0.35)	0.54 (0.18, 0.91)	0.1 (-0.82, 1.03)
Economic dependence					
Independent (ref.)					
Fully dependent	0 (-0.21, 0.22)	0.14 (-0.1, 0.37)	-0.41 (-0.81, -0.02)	-0.12 (-0.5, 0.26)	0.69 (-0.28, 1.66)
Partially dependent	-0.17 (-0.34, 0.01)	0.19 (0, 0.38)	-0.43 (-0.75, -0.11)	0.03 (-0.28, 0.35)	-0.45 (-1.24, 0.35)
Religion					
Hindu (ref.)					
Muslim	-0.27 (-0.93, 0.39)	-0.21 (-0.93, 0.52)	0.89 (-0.32, 2.1)	0.13 (-1.04, 1.3)	1.28 (-1.71, 4.27)
Caste					
SC (ref.)					
ST	-0.02 (-0.33, 0.29)	-0.05 (-0.39, 0.3)	0.04 (-0.54, 0.61)	0.26 (-0.29, 0.82)	1.51 (0.1, 2.92)
Others	0.11 (-0.45, 0.68)	-0.01 (-0.63, 0.61)	-0.03 (-1.07, 1)	0.32 (-0.68, 1.32)	1.07 (-1.48, 3.63)
Currently smoking					
No (ref.)					
Yes	0 (-0.24, 0.24)	-0.07 (-0.33, 0.2)	0.15 (-0.29, 0.59)	-0.19 (-0.62, 0.23)	0.34 (-0.75, 1.43)
Currently consuming alcohol					
No (ref.)					
Yes	0.25 (-0.03, 0.54)	-0.15 (-0.46, 0.16)	-0.17 (-0.69, 0.35)	0.34 (-0.16, 0.85)	-0.52 (-1.8, 0.77)
Household wealth status					
Poor (ref.)					
Middle	0.3 (0.1, 0.51)	0.04 (-0.18, 0.26)	-0.3 (-0.67, 0.07)	-0.27 (-0.63, 0.09)	0.83 (-0.07, 1.74)
Rich	0.34 (0.14, 0.54)	-0.19 (-0.4, 0.02)	0.12 (-0.24, 0.48)	0.26 (-0.09, 0.61)	0.42 (-0.47, 1.3)
Mean no. of living sons	-0.02 (-0.1, 0.06)	-0.05 (-0.14, 0.03)	-0.02 (-0.16, 0.12)	-0.07 (-0.2, 0.07)	0 (-0.35, 0.34)
Mean age of sons	-0.01 (-0.02, 0.01)	0.02 (0, 0.03)	-0.02 (-0.04, 0)	-0.01 (-0.03, 0.01)	0.01 (-0.05, 0.06)
Mean years of schooling of sons	0.02 (0, 0.04)	0 (-0.02, 0.02)	0.03 (-0.01, 0.06)	0.05 (0.01, 0.08)	0.04 (-0.06, 0.13)
Constant	2.09 (1.43, 2.76)	0.69 (0.46, 0.93)	13.00 (12.50, 13.50)	3.60 (3.11, 4.09)	21.89 (20.9, 22.9)
Adjusted R^2	0.15	0.11	0.23	0.37	0.03

Note: ref: reference category.

Table A5: Effect of migration on various indicators of psychological health

Background characteristics	Coefficient (95% CI)	
	GDS	Happiness
Status		
Non-left behind (ref.)		
Left behind	0.48 (0.19, 0.77)	-0.26 (-0.57, 0.05)
Age group		
60-69 (ref.)		
70-79	0.25 (-0.09, 0.6)	0.74 (0.03, 1.44)
80+	0.63 (0.14, 1.13)	1.05 (0.05, 2.06)
Sex		
Male (ref.)		
Female	0.2 (-0.22, 0.62)	1.21 (0.35, 2.08)
Marital status		
Currently married (ref.)		
Widow	0.49 (0.12, 0.86)	0.83 (0.08, 1.58)
Education		
No schooling (ref.)		
Primary	-0.27 (-0.64, 0.09)	-0.06 (-0.8, 0.68)
Secondary and above	-0.45 (-0.81, -0.09)	-1.19 (-1.92, -0.45)
Economic dependence		
Independent (ref.)		
Fully dependent	-0.07 (-0.44, 0.31)	-0.34 (-1.1, 0.42)
Partially dependent	0.23 (-0.07, 0.54)	0.48 (-0.14, 1.11)
Religion		
Hindu (ref.)		
Muslim	0.28 (-0.87, 1.44)	0.98 (-1.37, 3.33)
Caste		
SC (ref.)		
ST	-0.2 (-0.75, 0.34)	0.5 (-0.61, 1.61)
Others	-0.75 (-1.73, 0.23)	-1.11 (-3.12, 0.89)
Currently smoking		
No (ref.)		
Yes	-0.14 (-0.55, 0.28)	0.33 (-0.52, 1.18)
Currently consuming alcohol		
No (ref.)		
Yes	-0.17 (-0.67, 0.32)	0.44 (-0.57, 1.45)
Household wealth status		
Poor (ref.)		
Middle	0.28 (-0.07, 0.63)	-0.55 (-1.27, 0.16)
Rich	0.09 (-0.25, 0.43)	-0.79 (-1.48, -0.09)
Social network ties		
Low (ref.)		
High	-1.42 (-1.75, -1.09)	-4.82 (-5.48, -4.15)
Mean no. of living sons	-0.02 (-0.16, 0.11)	-0.13 (-0.4, 0.15)
Mean age of sons	0.01 (-0.01, 0.03)	0.02 (-0.02, 0.07)
Mean years of schooling of sons	-0.03 (-0.07, 0.01)	-0.1 (-0.18, -0.03)
Constant	8.64 (7.38, 9.91)	4.62 (3.25, 5.99)
Adjusted R^2	0.34	0.42

Note: ref.: reference category.