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Impact of adult son migration on the health wellbeing of older parents and shifts in caregiving patterns: a study in India

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Abstract

Background Population ageing is a growing demographic concern in the twenty-first century, with health declining as individuals age. In India, migration, particularly among single males, disrupts traditional caregiving systems, affecting older parents' health. This study aims to examine the impact of adult son migration on the health and wellbeing of older parents, as well as shifts in caregiving patterns among left-behind parents.

Methods For this present study, a cross-sectional survey was conducted in Koch Bihar of West Bengal. Descriptive statistics and regression analyses were employed to assess physical and subjective health status as well as caregiving patterns, emphasizing the impact of adult sons' migration on the wellbeing of their parents.

Results The study shows that parents with migrant sons face significant health and caregiving challenges compared to those with non-migrant sons. Around 18% of parents with migrant sons rated their health as poor, with a higher likelihood of chronic ailments, psychological distress, and loneliness. The log β coefficients were 0.29 for psychological distress scores and 0.82 for loneliness among older parents of migrant sons. Nearly 7 out of 10 of the parents of migrants were reported suffering from any chronic ailment, whereas the prevalence of any chronic ailment was 57% among the parents of non-migrants. Caregiving support, particularly during acute illnesses and hospitalizations, was lower for these parents, with non-familial members often stepping in. There was also a reduction in family support for Activities of Daily Living (ADL). Generation-wise living arrangements and gender influence these effects.

Conclusion Parents of migrants often experience poorer health, chronic morbidity, psychological distress, and loneliness compared to parents of non-migrants. Despite family members being primary caregivers, parents of migrants were more likely to rely on non-family caregivers and take on financial responsibility for their care. The study highlights the need for eldercare strategies to address the caregiving gaps in areas with high adult out-migration, particularly considering generational and gender influences.

Keywords Ageing, Adult Migration, Left-behind, Wellbeing, Caregiving

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Background

The term 'health' has a wide range of meanings and definitions. The concept of health is not just a theoretical concern; it significantly affects how healthcare is provided, policies are made, and how people are treated. The concept of socially represented health significantly impacts several elements of health, including the need for healthcare services, health policy requirements, and the healthcare system's functioning [1]. In the nineteenth and twentieth centuries, health was defined by the medical model as "*the absence of disease or disability*" [2]. Later on, the World Health Organization (WHO) defined health as "*a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity*" [3]. As individuals get older, their overall health tends to decline. Health is crucial for the quality of an individual's life. The health of older adults impacts not just their wellbeing but also that of their families, communities, and the broader aspect of the healthcare system.

In the twenty-first century, population ageing has become a major demographic issue. It is often seen as an unavoidable result of the demographic transition that many countries are going through. Decreasing levels of fertility and rising life expectancy are causes of the growing absolute number and percentage of older people worldwide [4, 5]. India is no exception to this inevitable outcome of demographic transition. According to the Census of India, the proportion of older adults aged 60 and above rose from 5.5% in 1950 to 8.6% in 2011 and is projected to reach 19.5% by 2050. In absolute terms, the 60 and above population accounted for 103 million in 2011, which is expected to rise to 319 million by 2050 [6]. Contrarily, India has witnessed a rising migration trend, with most migrants being single males [7]. The Confucian norm of filial piety [8] is like the norm of seva in Indian culture [9]. Like many other Asian countries, India's parent–child relationship is based on filial piety or Seva. This is similar to the story of Shravan Kumar, who loved and cared for his parents very much [10]. Filial piety emphasises the importance of adult children showing respect, obedience, and care for their older adult parents. Traditionally, filial piety focuses on a son's duty to honour and support his parents. As per filial piety norms, the responsibility for caring for older parents lies with the son(s), not the daughter. A daughter may view her assistance or care for older parents as a kind gesture. However, if the daughter refuses to support her parents, parents should not call their daughter unfilial because she is a member of another family [11]. Like other developing countries, where social pensions and health insurance are still insufficient for older adults, familial and community-level support systems have become essential to uphold traditional Indian filial piety or seva [12]. Living with other family members is a valued living arrangement for older adults in India, with children and grandchildren expected to care for their ageing parents [13, 14]. In ancient times, older adults held significant authority and played an active role in family decision-making [15]; they also benefited from family as social security from younger members [14]. On the contrary, nowadays, the number of adult migrants has increased in India, especially males [16]. Since 1990, India's fertility rate has decreased [17], but internal migration has increased as the country's economic development phase has started. This trend has led to a decline in adult children living with their older parents. Adult children and other family members are the primary caregivers and emotional support for older Indian adults [18, 19]. However, migration disrupts this traditional caregiving system, affecting the health of older parents [20, 21]. Most previous studies have focused on the health of 'left-behind' parents [22–24], with few examining the well-being of older parents specifically in situations where sons, traditionally the primary caregivers, are absent. In particular, micro-level research from rural India on the health and caregiving patterns of elderly parents whose sons have migrated for work is very limited [18, 25]. This study aims to address and bridge these research gaps.

The theoretical perspective of children's migration and the wellbeing of their older parents

Several theoretical perspectives explain the health of left-behind parents. We broadly categorised them into the Classical Model of Time Allocation, the Family Disruption Model, and the New Economic Labour Migration Model (NELM). These models provide insights into how time allocation, family dynamics, and labour market participation impact the wellbeing of parents whose children have migrated. The classical time allocation model, developed by Becker [26], addresses how individuals distribute their time among different activities such as work, caregiving, and leisure. Despite being physically separated, migrant children can still retain family connections through phone conversations, video chats, or occasional visits. The time allocated to communication with parents is vital in providing emotional assistance, although it does not substitute for physical caregiving [27]. Sending remittances may compensate for the physical absence of migrant children, which can fill left-behind parents' financial needs and allow for the hiring or managing of caregivers for elderly parents, with the migrant's earnings indirectly contributing to their parents' care [28]. Like the Classical Model of Time Allocation, the Family Disruption Model considers emotional, social, economic, and caregiving dimensions in the context of children's migration and its impact on the health of left-behind parents. In this regard, family systems and attachment theories

are essential for explaining the relationship between children's migration and the health of left-behind parents. According to Bowen (1966), a family is an emotional unit; family members are interconnected, and each person's behaviour affects the whole family system. Family system theory highlights the importance of understanding relationships, patterns, and roles within the family system and the influence of family dynamics on individuals' behaviour and mental health [29]. The physical separation of children from their parents due to migration can lead to significant challenges. Children are often unable to provide direct caregiving or emotional support when their parents are ill. This separation may disrupt multigenerational households, leading to instability and an imbalance within the family structure. The children's migration causes these instabilities, frequently leading to emotional discomfort and poor subjective health among parents who remain behind [24]. Attachment theory also suggests that emotional bonding between parents and children is crucial for the psychological wellbeing of the parents. When children migrate, physical separation can strain the bonds between parents and their migrating children, which can leave them feeling left behind and lonely [30, 31]. The New Economic Labour Migration (NELM) theory differs from labour migration theories, where migration is considered a collective household decision to diversify income sources and risk reduction rather than an individual one [32]. Remittance sent by migrating children is crucial for overcoming the economic needs of the left-behind parents [24], which is also helpful for their healthcare-seeking [23, 33].

Although it is difficult to predict, children's outmigration directly impacts their parents' health. Previous studies suggest that the impact of migration on the health of left-behind older adults can be advantages or disadvantages, depending on the country's specific context [34–37]. In rural China, left-behind older adults experience material security when children migrate to other places, but often report low levels of happiness and a poor quality of life due to unmet psychological and emotional needs. [38]. The impact of migration on left-behind older parents' health has been debated. Contrarily, through financial transfers, labour migration can benefit families in their place of origin. Remittances can enhance left-behind households' long-term welfare by facilitating healthcare investments. However, some studies highlight the social costs of migration on left-behind family members. The physical absence of adult children can negatively impact older adults' health, labour participation, and social status. Thus, the effect of migration on the wellbeing of left-behind older adults remains an open empirical question, with evidence yielding mixed conclusions. Therefore, with this regard, this present study aims to investigate the impact of adult migration on older parents' health in the rural Indian context, and it also focuses on the shifts in caregiving patterns of left-behind older parents.

Methods

Data source and sampling design

For this study, we conducted a cross-sectional survey in the Koch Bihar district of West Bengal. Koch Bihar district was chosen on purpose because of migration and demographic factors, such as the fact that most of the adults living in rural areas are older, there is a high rate of people leaving the district, and this is West Bengal's fastest-growing trend of people leaving the district. We employed a three-stage sampling technique to reach the target population of parents with migrant adult sons; the first stage involved selecting subdivisions, the second stage focused on selecting villages, and the third stage identified individual participants. Older parents of migrants were included in this study if their adult sons had migrated to other places for employment purposes at least two years before the survey date. Koch Bihar district has five sub-division, namely *Cooch Behar Sadar, Dinhata, Mathabhanga, Mekhliganj, and Tufanganj*, and twelve blocks. A simple random sampling method was used to choose the Tufanganj subdivision as the study site because its economic and demographic characteristics are homogeneous in nature. The *Tufanganj* subdivision consists of two blocks. All the villages of the two blocks were classified into three strata based on population size, i.e., < 1000, 1000–5000, and > 5000. Next, Probability Proportional to Size (PPS) sampling was used to pick eight [8] villages from the Tufanganj-II block and ten [10] villages from the Tufanganj-I block from each stratum. Based on the available household information in the Voter List, we identified households with parents aged 60 years and above from the selected villages. After identifying the households, we conducted a house listing exercise using village panchayat information and our selected criteria to create the sampling frame. We used the Cochran formula for finite population sampling to determine the required sample size for the target population. The calculated sample size was 250 parents with migrant sons. For reference, an additional 250 parents of non-migrants were also considered. After the sampling frame exercise, we conducted interviews with the target population using a systematic random sampling technique.

Variables description

Outcome variables

The dependent variables in this study included health perception, physical and subjective health, and caregiving support for left-behind parents. We gathered health perceptions by collecting self-reported health statuses

and comparing them to previous periods and others. We assessed physical health using measures of functional ability and chronic ailments. The survey gathered data on chronic diseases, including hypertension, diabetes, cancer, chronic lung and heart diseases, stroke, arthritis, osteoporosis, neurological or psychiatric conditions, and high cholesterol. The survey asked the question, "*Has a doctor or nurse ever told you that you have any of the following ailments?*" based on self-reported responses. However, we did not verify these responses against prescriptions or other medical records. The Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) were evaluated to check the functional health of older parents using the ADL and IADL questionnaires from the Longitudinal Ageing Study in India (LASI) survey. The Activities of Daily Living (ADL) consists of six tasks (*bathing, dressing, toilet, mobility, continence, and feeding*), and the Instrumental Activities of Daily Living (IADL) consists of eight tasks (*ability to use telephone, shopping, food preparation, housekeeping, laundry, transportation, medication, and finances*). In 1980, the World Health Organisation developed the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) as a theoretical framework for assessing functional activities. The International Classification of Functioning Disability and Health (ICF) underwent subsequent modifications and renaming in 2001[39]. The World Health Organisation (WHO) incorporates the ideas of Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) into its comprehensive frameworks, specifically the International Classification of Functioning, Disability, and Health (ICF). This study used the General Health Questionnaire-12 recommended by the World Health Organization to assess the mental health of the parents of migrant's. The scale asked respondents if they had recently experienced any symptoms or behaviours related to psychological distress. Some questions were positive, while others were negative in nature. The items pertained to everyday life situations and the viewpoints of parents. We collected responses for each item using a four-point Likert scale. A simple counting method was used to calculate a total score, where higher psychological distress scores indicated poorer mental health and lower psychological distress scores indicated better mental health. In this study, this scale had very high reliability, with an alpha value of 0.91. To assess the emotional wellbeing of older parents, we measured loneliness and life satisfaction. For evaluating subjective feelings of loneliness and social isolation, we used a 20-item scale which was developed by the University of California, Los Angeles (UCLA) [40]. Participants rated each item on this scale using one of four options: O (*I often feel this way*), S (*I sometimes feel this way*), R (*I rarely feel this way*), or N (*I never feel this way*). We scored the scale using a simple counting method, with higher scores reflecting higher levels of loneliness. This study's loneliness scale was highly reliable, with an alpha value of 0.97. The Satisfaction with Life Scale (SWLS) was used to assess parents' life satisfaction which was used in the LASI survey. The SWLS is a 5-item tool measuring subjective life satisfaction. Items include statements about life being ideal, excellent, satisfying, fulfilling, and with minimal desire for change. Responses were collected using a seven-point Likert scale, ranging from strongly agree to strongly disagree. Higher scores on this scale indicate higher levels of life satisfaction. The Life Satisfaction scale in this study showed a high level of reliability, as noted in an alpha value of 0.92. Caregivers for older adults were assessed for their support in managing ADL limitations, staying during hospitalisation, covering expenses for chronic illnesses, and purchasing aids for locomotor disabilities.

Explanatory variable

The primary explanatory variables in the study were adult sons' migration and their migration characteristics.

Statistical approach

Descriptive statistics were used to assess older adult parents' health status and caregiving patterns of the parents of migrants. Normality checks were performed on all dependent variables before further analysis. We used proportion tests to analyze differences in functional and chronic morbidity and chi-square tests to assess significant differences in health perceptions. Since none of the dependent variables followed a normal distribution, we used the Mann–Whitney test to examine statistically significant differences in subjective health. Since the dependent variables were binary, binary regression analysis was also used to examine the association between adult sons'migration and their older parents' functional health and chronic morbidity. For ADL limitations, we coded '1^+ ADL limitations' as 1 and 'no ADL limitation' as 0. IADL limitations: '1^+ IADL limitations' coded as 1 and 'no IADL limitation' coded as 0. Chronic ailments: 'any chronic ailments' coded as 1, and 'no chronic ailments' coded as 0. Since the variables were collected in a continuous form, linear regression analysis was also used to look at the psychological stress, loneliness, and life satisfaction of older parents. All statistical analyses were performed through Stata 17.

Results

Background characteristics of the older parents

Table 1 illustrates the background characteristics of 495 older adult parents, comprising 248 mothers and 247 fathers; all of them have at least one living son. Among them, 250 parents have at least one son who migrated to

Table 1 Background characteristics of older adult parents of migrants and non-migrants in rural Koch Bihar, West Bengal

	Parents of migrants (*n* = 250)		Parents of non-migrants (*n* = 245)		Total (*n* = 495)	
Background	**Observation (N)/mean**	**Percentage (%)/95%CI**	**Observation (N)/mean**	**Percentage (%)/95%CI**	**Observation (N)/mean**	**Percentage (%)/95%CI**
Age	66.24	66.17- 67.44	67.39	66.37–68.41	66.81	66.17-67.44
Sex						
Male	135	54.00	112	45.71	247	49.90
Female	115	46.00	133	54.29	248	50.10
Year of schooling	2.52	2.15–2.89	2.11	1.75–2.46	2.32	2.06–2.58
Currently working status						
Currently working	136	54.40	95	38.78	231	46.67
Currently not working	114	45.60	150	61.22	264	53.33
Marital status						
Currently married	155	62.00	148	60.41	303	61.21
Currently not married	95	38.00	97	39.59	192	38.79
Living arrangement						
Alone or only with a spouse	92	36.80	54	22.04	146	29.49
With spouse and sons/relatives/sons/Daughters/others	158	63.20	191	77.96	349	70.51
Household Asset score	(-)0.12	(-)0.41–0.17	0.13	(-).13–0.39	(-)0.55	(-)0.19–0.19
Living children	3.35	3.18- 3.52	3.51	3.31- 3.70	3.43	3.30- 3.55
Living sons	2.07	1.96- 2.18	2.04	1.89- 2.19	2.05	1.96- 2.14

Source: Authors calculated from Surveyed data

another place for employment purposes, while 245 parents have non-migrant sons. The mean age of the older adult parents was 66.81 years (95% CI: 66.17–67.44). Specifically, the mean age for parents of migrants was 66.24 years (95% CI: 65.48–67.01), while for parents of non-migrants, it was 67.39 years (95% CI: 66.37–68.41). The mean years of schooling for older adult parents was 2.32 years (95% CI: 2.06–2.58); for parents of migrants, it was slightly higher at 2.52 years (95% CI: 2.15–2.89), compared to 2.12 years (95% CI: 1.74–2.50) for parents of non-migrants. About 61% of older adult parents were currently married. Notably, 54% of parents of migrant sons were currently working, compared to 39% of parents of non-migrants. Regarding living arrangements, 39% of older parents of migrants lived either alone or only with their spouse, compared to 22% among parents of non-migrants. Parents of migrants had a mean asset score of −0.12 (95% CI: −0.41 to 0.17), while parents of non-migrants scored an average of 0.13 (95% CI: −0.13 to 0.39). The mean number of living children was 3.35 for parents of migrants and 3.51 for parents of non-migrants, with the average number of living sons being 2.07 and 2.04, respectively. (Table 1).

Health perception of older adult parents

Health perception refers to how individuals perceive their self-health compared to others in the same socio-economic and demographic situation and in the past. Self-rated health differs from other health measures because it comes from an individual's subjective assessment and does not follow rigid criteria or definitions. It is like a personal assessment of an individual's health, consisting of subjective feelings and objective knowledge regarding their physical status. This assessment is influenced by the individual's subjective perspective and understanding of their overall health [41]. Table 2 depicts the health perception of older parents in rural Koch Bihar of West Bengal. About six out of the ten older parents of non-migrants rated their good health, whereas five out of ten parents of migrant sons were rated the same. Additionally, 18% of parents of migrant sons rated their poor health, whereas about 8% were parents of non-migrants.

Table 2 Health Perceptions of elderly parents in rural Koch Bihar, West Bengal

	Parents of migrants	Parents of non-migrants	χ^2 values
Self-Rated Health Status			
Good	52.80	62.45	12.06**
Fair	29.20	29.80	
Poor	18.00	7.76	
Health status compared to last year			
Better	3.60	3.27	0.89
Same	59.60	56.33	
Worse	34.80	38.78	
Don't know	2.00	1.63	
Health status compared to others			
Better	27.20	24.49	1.48
Same	44.40	49.39	
Worse	26.00	23.27	
Don't know	2.40	2.86	

Source: Authors computed from Survey data, * If p-value is < 0.05 & ** if p-value is < 0.01

There was also a statistically significant difference in self-rated health status among parents of migrant sons and parents of non-migrants. About 60% of the older parents of migrant sons reported their health was the same compared to last year, and 56% of the parents of non-migrants also reported the same. When health was compared to others, 26% of the parents of migrant sons reported their health was worse compared to others, and 23% were parents of non-migrants (Table 2).

Table 3 depicts the characteristics of migrant son(s) and their parents' self-reported health status. About 64% of parents whose sons migrated to another district for employment rated their health as good. In comparison, 50% of parents reported good health whose sons migrated to another state, and 46% of parents reported good health whose sons migrated to another country (only for open-border migration). Approximately 15% of the parents of migrant sons rated their health as poor among those whose all living sons migrated, and 20% of parents whose some living sons migrated. Approximately 65% of parents who received remittances from their migrant sons rated their health as good, compared to only 35% of parents who did not receive remittances from their sons. A higher proportion of parents whose sons migrated for formal work (government or private) purposes rated their health as good compared to those whose sons migrated for wage labour or other purposes. Table 4 represents the generation-wise household types and self-reported health Status of older adults. Analysis indicated that about 26% of the parents with migrant sons rated their health as poor, whereas 13% of parents with non-migrant sons lived in one generational household. Of those parents who lived in two-generational households, a lower proportion of them rated their health as poor, but parents of migrant and non-migrant sons also differed. About 15% of older parents with migrant sons who Lived in three or more generational households rated their health as poor, while 7% of parents with non-migrant sons did the same (Tables 3 and 4).

Table 3 Characteristics of migrant son(s) and their parent's self-reported health status in rural Koch Bihar, West Bengal

Characteristics of Migrants Son(s)	Self-reported health status			
Type of Migration	**Good**	**Fair**	**Poor**	**χ^2 values**
Intra state	63.64	22.73	13.64	
Inter state	50.79	30.37	18.85	2.61
International (open border only)	46.67	33.33	20.00	
No. of migration				
All living children migrated	59.76	25.61	14.63	
Some of them migrated	49.40	30.95	19.64	2.42
Remittance				
Send	64.05	28.20	18.00	
Not send	35.05	29.90	35.05	35.08**
Work type				
Govt. Job	86.36	9.09	4.55	
Private Job	64.71	23.53	11.76	
Wage labour	47.46	32.77	19.77	13.21*
Others	52.94	26.47	20.59	

Source: Authors computed from Survey data, * If p-value is < 0.05 & ** if p-value is < 0.01

Table 4 Generation-wise household types and self-reported health status of older adults in rural Koch Bihar, West Bengal

Self-Rated Health				
Self-Rated Health Status (parents with migrant sons)	**Good**	**Fair**	**Poor**	**χ^2 values**
One generation	41.18	32.94	25.88	
Two generation	62.69	25.37	11.94	9.07*
Three or more generation	56.12	28.57	15.31	
Self-Rated Health Status (parents with non-migrant sons)	Good	Fair	Poor	
One generation	53.85	32.69	13.46	
Two generation	75.34	19.18	5.48	9.73*
Three or more generation	58.33	35.00	6.67	

Source: Authors computed from Survey data, * If p-value is < 0.05 & ** if p-value is < 0.01

Physical health of older adult parents

Physical health is a fundamental aspect of an individual's overall wellbeing. Physical health refers to the state of the body and its ability to perform proper functional activity. According to the World Health Organization (WHO), Physical health is "*the condition of the body, with normal status being without disease or serious illness.*" Therefore, the significance of physical health extends beyond the physical body; it also impacts an individual's mental wellbeing, mental stability, and overall quality of life. In light of this, we have compiled a list of physical health conditions that pertain to chronic diseases and the overall functional health of parents of migrants.

Chronic morbidity

Chronic morbidity refers to diseases that persist for an extended period over months or years, often requiring ongoing treatment rather than a complete cure. Chronic morbidity has a prolonged course and affects one's wellbeing, in contrast to acute illnesses, which develop in short periods of time and resolve quickly. With age, the prevalence of chronic non-communicable diseases increases, and at present, chronic diseases are the leading causes of death and impairment in India [42, 43] (Table 5).

Table 5 shows the prevalence of chronic ailments and functional limitations of parents aged 60 and above in rural Koch Bihar of West Bengal. Nearly 7 out of 10 (71.60%) of the parents of migrants were reported to suffer from any chronic ailment, whereas the prevalence of any chronic ailment was 57.38% among the parents of non-migrants. Among the parents of migrants, the prevalence of any chronic ailment was significantly higher than

Table 5 Prevalence of chronic morbidity of older adult parents in rural Koch Bihar, West Bengal

	Parents of Migrants			Parents of non-migrants			*Z*values
Chronic Morbidity	**Total**	**Fathers**	**Mothers**	**Total**	**Fathers**	**Mothers**	
Any chronic ailment	*71.60*	*62.22*	*82.61*	*57.38*	*53.57*	*62.41*	*3.08***
Multi chronic ailment	*29.20*	*25.93*	*33.04*	*17.96*	*12.50*	*22.56*	*1.36*
Mostly suffer chronic ailments							
High blood pressure	*40.80*	*37.04*	*45.22*	*29.80*	*29.46*	*30.08*	*−1.49*
Arthritis/rheumatism/Osteoporo-sis/other bone/joint diseases	*44.00*	*31.85*	*58.26*	*26.12*	*14.29*	*36.09*	*−2.35***
Others	*18.40*	*21.48*	*14.78*	*21.63*	*23.21*	*20.30*	*0.39*

Source: Authors computed from Survey data; Note: **P = < 0.05; * P = < 0.01

Table 6 Prevalence of physical limitations of older adult parents in rural Koch Bihar, West Bengal

	Parents of migrants			Parents of non-migrants			Zvalues
Functional Limitations	**Total**	**Fathers**	**Mothers**	**Total**	**Fathers**	**Mothers**	
1^+ ADL limitations	5.20	3.70	6.96	11.43	8.93	13.53	0.63
1^+ IADL limitations	60.40	42.22	81.74	68.98	46.43	87.97	−1.99*
2^+ ADL limitations				2.02	2.68	5.26	
2^+ IADL limitations	12.80	7.41	19.13	24.08	11.61	34.59	−1.28
Any Limitations	60.80	42.96	81.74	70.20	48.21	88.72	−1.77

Source: Authors computed from Survey data; Note: **P = < 0.05; * P = < 0.01

that of the parents of non-migrants. A higher percentage of mothers suffered from any chronic ailment than their counterparts. About 30% of parents of migrants suffered from multiple chronic ailments, while their counterparts were 18%. The prevalence of multi-chronic ailments was also higher among mothers compared to their counterparts. Among the parents of migrants, the most suffered chronic ailment was arthritis (44%; fathers 31.85%; mothers 58.26%), followed by hypertension (40.80%; fathers 37.04%; mothers 45.22%). In comparison, the most commonly suffered chronic ailment was hypertension (29.80%; fathers 29.46%; mothers 30.08%), followed by arthritis (26.12%; fathers 14.29%; mothers 36.09%) among parents of non-migrants. Parents of migrants, particularly mothers, are significantly more likely to suffer from arthritis compared to parents of non-migrants. About 2 out of 10 parents in both groups suffered from other chronic ailments.

Functional activities

As a person becomes older, their ability to function decreases. The World Health Organisation states that functional activities that impact an individual's well-being are essential for healthy ageing [44]. Functional ability is the capacity to perform essential activities for survival independently or without assistance [45]. Functional health is affected by health, surroundings, and personal factors, and it provides reliable information about a person's ability to do daily tasks. Table 6 depicts the functional limitations of the parents of migrants and non-migrants in rural Koch Bihar of West Bengal, focusing on Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). The Z value indicates the significant difference between the two groups. About 5 out of 100 parents of migrants had 1^+ ADL limitation, with 3.70% fathers and 6.96% mothers. On the contrary, 11 out of 100 parents of non-migrants had 1^+ ADL limitation, with 8.93% fathers and 13.53% mothers. Three-fifths of the parents of migrants had 1^+ IADL limitations, with about two-fifths of fathers and four-fifths of mothers affected. In contrast, nearly 7 out of 10 parents of non-migrants had 1^+ IADL limitations, with 46.43% of fathers and 87.97% of mothers. There was a statistically significant difference between the parents of migrants and non-migrants with 1^+ IADL limitations. About 13% of the parents of migrants had 2^+ IADL limitations, whereas 24% were among parents of non-migrants. Three-fifths of the parents of migrants had either ADL or IADL limitations, whereas seven out of ten parents of non-migrants had. Specifically, mothers had higher functional limitations, with 81.74% of mothers of migrants and 88.72% of non-migrants.

Indian society is primarily based on filial piety, like in other Asian countries, where the responsibility for supporting the older parent is with the son(s), not the daughter [10]. Daughters may view their assistance to their parents as a gesture of kindness rather than a duty. The migration of a son(s), which leads to physical separation and sometimes the sending of remittances by son(s), can significantly impact the physical health of older parents, especially in the form of their ability to seek healthcare. Table 7 represents the physical health status of the parents of migrants based on the characteristics of their migrant sons in rural Koch Bihar, West Bengal. Parents whose sons migrated to different districts within the same state had a higher rate (9.09%) of facing at least

Table 7 Physical Health Status of Older Parents of migrants by Characteristics of Migrants Son(s) in Rural Koch Bihar, West Bengal

Characteristics of Migrants Son(s)	Functional limitations		Chronic ailments
Type of Migration	1⁺ ADL limitations	1⁺ IADL limitations	Any Chronic ailments
Intra state	9.09	47.73	68.18
Inter state	4.71	63.35	71.73
International (open border only)		60.00	80.00
No. of migration			
All living children migrated	7.17	51.22	67.07
Some of them migrated	4.17	64.88	73.81
Remittance			
Send	3.92	52.94	64.05
Not send	7.22	72.16	83.51
Work type			
Govt. Job		22.73	68.18
Private Job		29.41	70.59
Wage labour	5.08	66.67	71.75
Others	11.76	67.65	73.53

Source: Authors computed from Survey data

one limitation in ADL (Activities of Daily Living) than those whose sons moved to other states (4.71%) or to other countries (to countries with open borders). However, parents whose sons moved within the same state but to different districts had fewer cases of at least one IADL (47.73%) and chronic health issues (68.18%) compared to those whose sons moved to other states (63.35% for IADL and 71.73% for chronic ailments) or to other countries (to countries with open borders) (60% for IADL and 80% for chronic ailments). When all of their sons moved away for work, parents had more issues with at least one ADL limitation (7.17%) but fewer problems with at least one IADL (52.94%) and chronic health issues (67.07%) compared to parents with only some sons who migrated (1⁺ADL: 4.17%; 1⁺IADL: 64.88%; any Chronic ailments: 73.81%). Parents who received remittances had better functional capability and chronic health (1⁺ADL: 3.92%; 1⁺IADL: 52.92%; any Chronic ailments: 64.05%) than those who did not receive remittances (1⁺ADL: 7.22%; 1⁺IADL: 72.16%; any Chronic ailments: 83.51%). Parents whose migrant son(s) worked as wage labourers or in other similar jobs had lower levels of functional capability and chronic health compared to those whose sons were employed in the government or private sectors (Tables 6 and 7).

Table 8 depicts the physical health status of the parents of migrants and non-migrants based on their household types. Approximately 7% of parents of migrants living in one-generation households had at least one ADL limitation, 61% had at least one IADL limitation, and 81% had at least one chronic ailment. About 4% of parents with migrant sons living in two-generation, three-generation, or more-generation households had at least one ADL limitation. Additionally, more than 50% had at least one IADL limitation, and over 60% suffered from chronic ailments. The parents of migrants living in two-generational and three or more-generational households suffered fewer functional limitations and chronic ailments compared to those who belonged to one-generational households. Among parents of non-migrants, those in two-generation and three or more-generation households usually had better chronic health and functional health than those in one-generation households, except for IADL limitations within three or more-generation households (Table 8).

The association between sons' migration and the physical health of their parents

Table 9 estimates the odds ratio for ADL, IADL limitations, and chronic ailment among older parents. Older parents of migrant sons were 0.42 times (uOR:0.42; 95%CI: 0.21–0.84; P: < 0.01) less likely to experience one or more ADL (Activities of Daily Living) Limitations and 0.68 times (uOR:0.68; 95%CI: 0.47–0.99; *P*: < 0.05) less likely to have one or more IADL (Instrumental Activities of Daily Living) limitations than parents of non-migrant sons. However, the probability of suffering from any chronic ailments was 79% higher (aOR: 1.79; 95%CI: 1.24–2.61; *P*: < 0.01) among parents with migrant sons

Table 8 Physical Health of Older Parents by Household Type in rural Koch Bihar, West Bengal

	Parents of migrants			Parents of non-migrants		
	Functional limitations		Chronic ailments	Functional limitations		Chronic ailments
Household type	1⁺ ADL limitations	1⁺ IADL limitation	Any Chronic ailments	1⁺ ADL limitations	1⁺ IADL limitation	Any Chronic ailments
One generation	7.06	61.18	81.18	13.46	73.08	69.23
Two generation	4.48	52.24	64.18	9.59	47.95	46.58
Three or more generation	4.08	65.31	68.37	11.67	80.00	60.83

Source: Computed from Survey data

Table 9 Estimates the odds through binary logistic regression for older adult parents with physical limitations and chronic ailments in rural Koch Behar, West Bengal

	1⁺ADL limitations	*1⁺IADL limitations*	*Any Chronic ailments*	*1⁺ADL limitations*	*1⁺IADL limitations*	*Any Chronic ailments*
Background	uOR [95% CI]	uOR [95% CI]	uOR [95% CI]	aOR [95% CI]	aOR [95% CI]	aOR [95% CI]
Parents type						
Parents of Migrants	0.42** [0.21–0.84]	0.68* [0.47–0.99]	1.79** [1.24–2.61]	0.46* [0.20–1.05]	0.79 [0.47–1.35]	1.84** [1.22–2.76]
Parents of non-migrant@						
Household asset score				0.92 [0.76–1.11]	0.61** [0.51–73]	0.95 [0.84–1.08]
Age				1.15** [1.10–1.21]	1.09** [1.03–1.15]	1.05 [1.01–1.09]
Working status						
Currently working				0.36 [0.82–1.20]	0.34** [0.16–0.68]	0.83 [0.48–1.43]
Currently not working @						
Years of schooling				0.99 [0.82–1.20]	0.66** [0.59–0.75]	0.98 [0.90–1.07]
Sex						
Male@						
Female				0.52 [0.13–1.01]	2.32** [1.11–4.81]	1.16 [0.65–2.05]
Marital status						
Currently married				0.36* [0.13–1.01]	0.76 [0.40–1.44]	0.49** [0.29–0.82]
Currently not married@						
Living arrangement						
Living alone or only with spouse@						
Living with others (spouse with children/only children/relative/others)				0.49 [0.17–1.11]	2.33** [1.16–4.67]	0.49* [0.28–0.86]
Living children				0.75 [0.51–1.11]	0.88 [0.68–1.14]	0.88 [0.72–1.08]
Living son				0.86 [0.48–1.54]	1.11 [0.79–1.54]	1.30 [0.99–1.71]

*Note: uOR: Unadjusted Odd Ratio; aOR: Adjusted Odd Ratio; @: reference category; * If p-value is < 0.05 & ** if p-value is < 0.0; CI: 95% confidence*

than those with non-migrant sons. This effect of son' migration on their parents' physical health remained significant even after adjusting for their socio-economic and demographic background. After adjusting for socio-economic and demographic background of older parents of migrant sons were 0.46 times (uOR:0.46; 95%CI: 0.20–1.05; P: < 0.05) less likely to experience one or more ADL (Activities of Daily Living) limitations, and the probability of suffering from any chronic ailments was 84% higher (aOR:1.84; 95%CI: 1.22–2.76; P: < 0.01) than parents of non-migrant sons. However, after considering the economic and socio-demographic backgrounds of the older parents, having migrant sons no longer seemed to affect their ability to handle daily tasks (Table 9).

Subjective health of older adults' parents

Subjective health refers to one's personal assessment of one's health and wellbeing. Individuals'subjective health, as opposed to their objective health, stems from their feelings about their own health and wellbeing. Subjective health reflects the individual's physical, emotional, and social wellbeing. Traditional clinical assessments may overlook the psychological aspects of health, particularly in relation to emotional and social wellbeing. This is particularly relevant in the active ageing process among older populations. Mental health indicators, feelings of loneliness or social isolation, and life satisfaction are the main indicators of one's subjective health. (Table 10).

Table 10 depicts the subjective health status of older parents in rural Koch Bihar, West Bengal. The mean scores for psychological distress, loneliness, and life satisfaction were depicted along with their standard deviations. Furthermore, a two-sample Wilcoxon rank-sum (Mann–Whitney) test (Z) was applied to determine whether there were significant differences in subjective health status between parents of migrants and their counterparts because none of the dependent variables had a normal distribution. The mean psychological

Table 10 Subjective health of older adult parents in rural Koch Bihar, West Bengal

	Parents of Migrants			Parents of non-migrants			*Z* values
Mental Health	**Total**	**Fathers**	**Mothers**	**Total**	**Fathers**	**Mothers**	
Psychological distress score	30.08(6.02)	28.88(5.89)	31.47(5.89)	22.27 (3.74)	21.81(3.52)	22.65(3.88)	14.15**
Loneliness	23.62(14.05)	21.10(13.63)	26.56(14.01)	16.37 (12.09)	15.36(11.48)	17.21(12.55)	5.84**
Life Satisfaction	18.96 (6.01)	19.93(5.79)	17.82(6.10)	20.28(5.68)	20.69(5.45)	19.93(5.87)	−2.78**

Source: Author computed from Survey data; Note: ** $P = < 0.05$; * $P = < 0.01$

Table 11 Characteristics of migrant son(s) and their parent's subjective health status in rural Kuch Bihar, West Bengal

Characteristics of Migrants Son(s)	**Subjective Health**		
Type of Migration	**Psychological distress score**	**Loneliness score**	**Life Satisfaction**
Intra state	28.36(5.51)	17.75(13.32)	21.45(5.83)
Inter state	30.28(6.06)	24.63(13.97)	18.56(5.98)
International (open border only)	32.4(6.20)	27.8(13.31)	16.73(5.21)
No. of migration			
Some of the living sons migrated	29.30(5.96)	22.01(13.86)	20.06(5.84)
All living son(s) migrated	30.45(6.04)	24.39(14.11)	18.42(6.04)
Remittance			
Send	27.89(5.37)	19.29(12.99)	21.03(5.26)
Not send	33.51(5.37)	30.43(12.97)	15.70(5.69)
Work type			
Govt. Job	24.18(4.68)	9.40(9.95)	24.36(4.81)
Private Job	27.82(5.47)	15.47(11.71)	23.41(4.61)
Wage labour	30.93(5.86)	26.10(13.39)	17.68(5.68)
Others	30.52(5.65)	23.94(14.20)	19.88(6.05)

Source: Author computed from Survey data

distress score was higher (mean: 30.08; S.D.: 6.02) among parents of migrants compared to parents of non-migrants (mean: 22.27; S.D.: 3.74). Parents of migrants were more distressed compared to parents of non-migrants, and this difference was statistically significant. Among the parents of migrants, mothers (mean: 31.89; S.D.: 5.89) experienced higher levels of distress than fathers (mean: 28.88; S.D.: 5.89); the same observation was also found among parents of non-migrants. Emotional health was also worse among parents of migrants compared to parents of non-migrants. The parents of migrants felt lonelier (mean: 23.62; S.D.: 14.05) than parents of non-migrants (mean: 16.37; S.D.:12.09). This difference was also statistically significant. Furthermore, mothers felt more loneliness than fathers across both groups of parents. The mean life satisfaction score was lower among the parents of migrants (mean: 18.96; S.D.: 6.01) compared to the parents of non-migrants (mean: 20.28; S.D.: 5.68); however, this difference was not statistically significant.

Characteristics of migrants' son(s) and their parents' subjective health

Table 11 presents the subjective health conditions of parents of migrants by the characteristics of their migrant son(s). The distance of a son's migration significantly impacts the subjective health of older parents. Parents with sons who migrated within the same state had lower mean scores for psychological distress (mean: 28.36; S.D.: 5.51) and loneliness (mean: 17.75; S.D.: 13.32) and higher life satisfaction (mean: 21.45; S.D.: 5.83) than those with sons who migrated to other states (psychological distress mean: 30.28; S.D.: 6.06; loneliness mean: 24.63; S.D.: 13.97; Life satisfaction mean: 18.56; S.D.: 5.98) or internationally (across open borders only) (psychological distress mean: 32.4; S.D.: 6.20; isolation mean: 27.8; S.D.: 13.31; Life satisfaction mean: 16.73; S.D.: 5.21). Parents of migrants who had all living son(s) were migrants had higher mean scores for psychological distress (mean: 30.45; S.D.: 6.04), loneliness (mean: 24.39; S.D.: 14.11), and lower life satisfaction (mean: 18.42; S.D.: 6.04) mean score compared to those who had some of the living son(s) who were non-migrants (psychological distress mean: 29.30; S.D.: 5.96; loneliness mean: 22.01; S.D.: 13.86; Life satisfaction mean: 20.06; S.D.: 5.84). Parents who received remittances from their migrant son(s) had lower mean scores for psychological distress (mean: 27.89; S.D.: 5.37) and loneliness (mean: 19.29; S.D.: 12.99), as well as higher mean life satisfaction (mean: 21.03; S.D.: 5.26), compared to those who did not receive remittances (psychological distress mean: 33.51; S.D.: 5.37); loneliness mean: 30.43; S.D.: 12.97); Life satisfaction mean: 15.70; S.D.: 5.69). Parents whose migrant sons worked in government or private jobs had lower mean ratings for psychological distress and loneliness and higher life satisfaction scores compared to parents whose sons worked as wage labourers or in other occupations (Table 11).

Table 12 illustrates the subjective health status of older parents categorised by household types. The living arrangements of older parents have a significant impact on the subjective wellbeing of left-behind parents. When children migrate, living arrangements often change, affecting the subjective health of the left-behind parents. Parents of migrants living in one-generation households had higher levels of psychological distress (mean: 32.61; S.D.: 5.77) and loneliness (mean: 25.75; S.D.: 14.05) compared to parents of non-migrants in similar household

Table 12 Subjective health status of older parents by household types in rural Koch Bihar, West Bengal

	Parents of migrants			Parents of non-migrants		
Household type	**Psychological distress score**	**Loneliness score**	**Life Satisfaction**	**Psychological distress score**	**Loneliness score**	**Life Satisfaction**
One generation	32.61(5.77)	29.95(12.9)	16.15(6.16)	24.28 (5.06)	25.75(14.05)	16.15(6.01)
Two generation	28.05(5.59)	19.94(13.49)	19.98(5.09)	21.32(3.00)	12.21(9.53)	21.58(5.09)
Three or more generation	29.25(5.82)	20.63(13.54)	20.70(5.62)	21.96(3.12)	14.83(10.42)	21.28(5.06)

Source: Author computed from Survey data

Table 13 Estimates the β coefficients of linear regression for psychological distress, loneliness, and life satisfaction scores among older parents in rural Koch Behar

	Psychological Distress score	***Loneliness***	***Life satisfaction***	***Psychological Distress score***	***Loneliness***	***Life satisfaction***
Background	Unadjusted β (95%CI)	Unadjusted β (95%CI)	Unadjusted β (95%CI)	Adjusted β (95%CI)	Adjusted β (95%CI)	Adjusted β (95%CI)
Parents type						
Parents of Migrants	0.29** [0.26 to 0.32]	0..82** [.54 to 1.09]	-.076** [-.13 to -.01]	0.29**[0.26 to 0.31]	0.75**[0.52 to.98]	-.046*[-.09 to.006]
Parents of non-migrant@						
Household asset score				-.03**[-.039 to -.022]	-.33**[-.40 to -.26]	.067**[.051 to.082]
Age				.002[-.001 to.002]	.0004[-.01 to.01]	.0026[-.0013 to.006]
Working status						
Currently working				-.05**[-.089 to -.012]	-.29[-.59 to.01]	.008[-.061 to.078]
Currently not working @						
Years of schooling				-.003[-.008 to 0.003]	-.03[-.079 to.018]	0.009[-.002 to.019]
Sex						
Male@						
Female				-.005[-.046 to 0.034]	-.11[-.44 to.20]	-.021[-.096 to.05]
Marital status						
Currently married				-.04*[-.077 to -.005]	-.37**[-.66 to -.09]	.05[-.014 to.11]
Currently not married@						
Living arrangement						
Living alone or spouse only@						
Living with others (spouse with children/only children/relative/others)				-.044*[-.083 to -.005]	-.32*[-.63 to -.013]	.11**[.038 to.17]
Living children				.001[-.012 to.015]	-.03[-.15 to.073]	.024[-.001 to.049]
Living son				-.001[-.019 to.019]	.08[-.06 to.23]	-.032[-.067 to.003]

uOR: Unadjusted Odd Ratio; aOR: Adjusted Odd Ratio; @: reference category; * If p-value is < 0.05 & ** if p-value is < 0.01; CI: 95% confidence`

types (psychological distress mean: 24.28; S.D.: 5.06; loneliness mean: 25.75; S.D.: 14.05). Even parents of migrants living in one-generation households had higher mean scores for psychological distress (mean: 32.61; S.D.: 5.77) and loneliness (mean: 25.75; S.D.: 14.05), along with lower life satisfaction scores (mean: 16.15; S.D.: 6.16), compared to those living in two-generation (psychological distress mean: 28.05; S.D.: 5.59; loneliness mean: 19.98; S.D.: 5.09; Life satisfaction mean: 19.98; S.D.: 5.09) or three-generation households (psychological distress mean: 29.25; S.D.: 5.82; loneliness mean: 20.63; S.D.: 13.54; Life satisfaction mean: 20.70; S.D.: 5.62). Parents of non-migrants also exhibited similar results (Table 12).

The association between sons' migration and the subjective health of their parents

Table 13 estimates the log and squared β coefficients of linear regression for psychological distress, loneliness, and life satisfaction scores among older parents in rural Koch Bhar. The responses indicated a non-normal

distribution for psychological distress, loneliness, and life satisfaction scores. After checking the best ways to change the data using the ladder and gladder commands, a logarithmic transformation was applied to the psychological distress and loneliness scores, while a squared transformation was used for the life satisfaction score. Positive log β coefficients indicated that the mean psychological distress and loneliness scores were lower among older parents of migrant sons compared to those of non-migrant sons. On the contrary, negative squared β coefficients indicated that the mean life satisfaction score was lower among older parents of migrant sons compared to those of non-migrant sons. The log β coefficients were 0.29 (β: 0.29; 95%CI: 0.26 to 0.32; *P*: < 0.01) for psychological distress scores and 0.82 (β: 0.82; 95%CI: 0.54 to 1.09; *P*: < 0.01) for loneliness among older parents of migrant sons. This finding indicates that the mean psychological distress and loneliness scores were higher among older parents of migrant sons compared to their counterparts. Even after considering the social and economic backgrounds of older parents with migrant sons, their average scores were 0.29 points (β: 0.29; 95%CI: 0.26 to 0.32; *P*: < 0.01) higher for psychological distress and 0.75 points (β: 0.29; 95%CI: 0.26 to 0.32; *P*: < 0.01) higher for loneliness compared to parents with non-migrant sons. The unadjusted squared β coefficient for life satisfaction was −0.076 (β: −0.076; 95% CI: −0.13 to −0.01; *P*: < 0.01), which means that parents of migrant sons reported Life satisfaction scores that were 0.076 points lower than those of parents with non-migrant sons. Even after considering the social and economic backgrounds of older parents with migrant sons, their average Life satisfaction scores were still 0.046 points (β: −0.046; 95% CI: −0.09 to −0.006; *P* < 0.01) lower compared to parents of non-migrant sons (Table 13).

Table 14 Caregiver characteristics of older parents in rural Koch Bihar, West Bengal

Characteristics of caregivers	Parents of migrants (%)	Parents of non-migrants (%)
Primary caregiver for ADL limitation (n = 41)		
Spouse	23.07	10.71
Family Member	61.53	78.57
Non-family Member	15.38	10.71
Caregiver during hospitalisation (who stay during hospitalisation) (n = 27)		
Spouse	25.00	26.67
Family Member	58.33	66.66
Non-family Member	16.66	6.67
Caregiver for acute sickness (Who accompanied) (n = 188)		
None (Self)	52.48	25.29
Spouse	17.82	25.29
Family Member	26.73	47.13
Non-family Member	2.97	2.30
Caregiver for chronic morbidity (Who pay) (n = 285)		
None (Self)	43.31	35.94
Spouse	7.64	9.38
Family Member	40.13	46.88
Non-family Member	8.92	7.81
Caregiver for locomotor disability (who pays for aids) (n = 119)		
None (Self)	64.81	40.00
Spouse	1.85	3.08
Family Member	29.63	43.08
Non-family Member	13.85	3.70

Source:—Authors calculated from Survey data

Adult son's migration and shifting of caregivers' pattern

As migration increases, particularly in rural areas, the number of adult migrants increases, leading to significant changes in caregiving dynamics for older parents left behind. In households where sons have migrated, the responsibility of caregiving for older parents often changes, which creates challenges for older parents of migrant sons. Migrant sons may provide financial support; nevertheless, the daily emotional and physical care typically depends on other family members or non-family members. This developing situation significantly affects the traditional caregiving patterns of older parents.

Table 14 depicts the characteristics of caregivers for older parents living in rural Koch Bihar. The analysis indicated that family members typically serve as the primary carers, assisting with activities of daily living (ADL), staying during hospitalisations, and providing payments for chronic illnesses and locomotor disabilities. However, notable differences in caregiving patterns emerged when comparing parents of migrant sons and parents of non-migrants. In both groups, family members were the main carers, but the pattern of carers varied, possibly due to the absence of sons in migrant households, which may require more non-familial caregiving solutions for the parents of migrants. Family members assisted about 61.53% of parents of migrant sons with activities of daily living (ADL) Limitations, compared to 78.57% of parents of non-migrant sons.

Furthermore, around 23% of carers for parents of migrant sons were spouses, and 15% were non-family members due to limitations in activities of daily living (ADL). In comparison, only around 11% of caregivers for parents of non-migrants were spouses and non-family members. During the hospitalisation of the parents of migrant sons, around 17% of non-familial members stayed with them; in comparison, about 67% of family members stayed with the parents of non-migrants. When older parents get sick, only 27% of the parents of migrant sons were accompanied by their family members, whereas their family members accompanied 47% of the parents of non-migrants. Around 53% of the parents

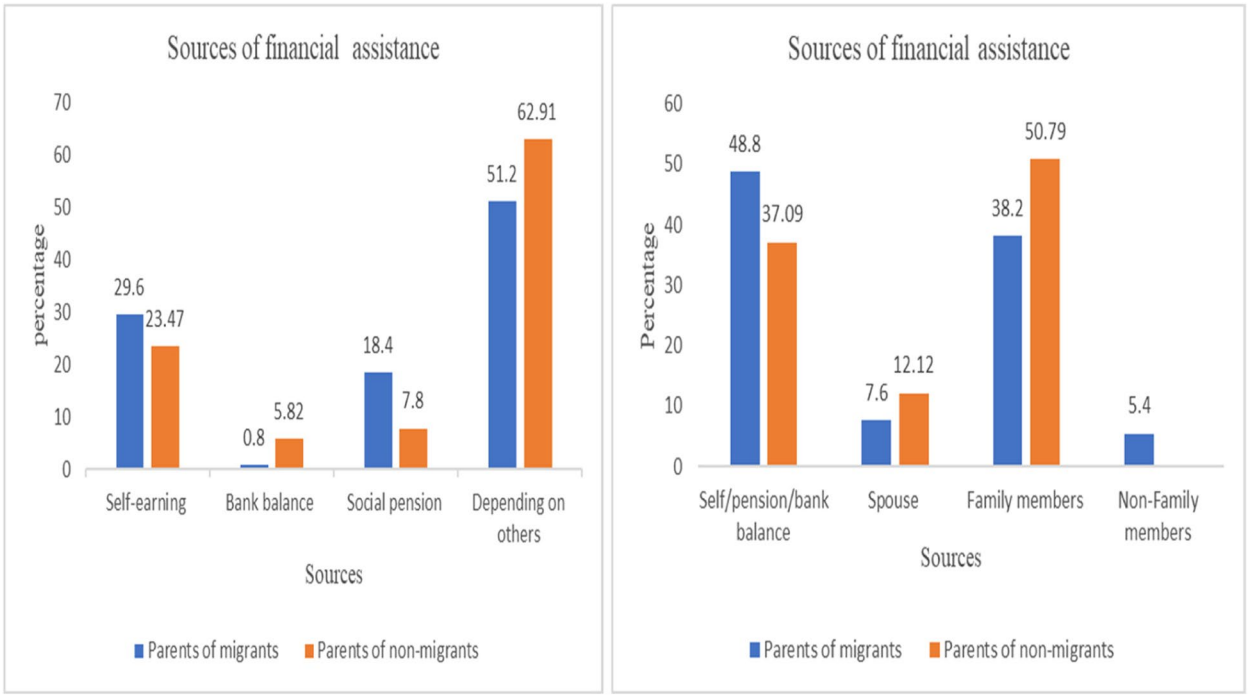

Fig. 1 Primary sources of financial assistance among older parents

of migrant sons did not get any accompaniment during their acute sickness. Similarly, around 43% of parents of migrant sons covered expenses for chronic ailments themselves only, compared to 35% of parents of non-migrants (Table 14).

Additionally, 9% of parents of migrant sons received payment for chronic morbidity from non-family members, 8% from their spouses, and 40% from other family members. In contrast, about 47% of non-migrant parents received payment for chronic morbidity from their family members. Among the parents of migrant sons, 65% paid for their locomotor disability aids themselves, only 30% by their family members, and 14% by non-family members. On the contrary, among the parents of non-migrants, 40% of them paid for their locomotor disability aids themselves; 43% of them received payment from their family members; and nearly 3% from their non-family members and spouses. Figure 1 depicts the financial assistance sources for older parents in rural Koch Bihar, comparing parents of migrant sons and those of non-migrants. The analysis indicated that 51.2% of parents of migrant sons were financially dependent on others, while a higher 62.91% of parents of non-migrant sons were financially dependent on others. Among the parents of migrant sons, 30% were financially independent, and 18% of them depended on social pensions. There was a significant difference between the parents of migrant sons and the parents of non-migrants. Furthermore, about 49% of parents of migrant sons manage their financial needs through their self-income, social pensions, or bank savings. On the contrary, only 37% of the parents with non-migrant sons financially rely on similar sources. Additionally, about 38% of the parents of migrant sons rely on their family members for financial needs, 5% rely on non-family members, and 8% depend on their spouse. In contrast, 37% of parents of non-migrants were financially independent, 51% relied on family members, and 12% depended on their spouse. The parents of migrant sons tend to depend more on themselves, pensions, or savings, while those with non-migrant sons depend more on their families for financial support.

Discussion

This study explains how adult sons' migration impacts their older adult parents' health and wellbeing and how caregiver patterns shift in rural areas in Koch Bihar, West Bengal. The study indicated that the son's migration impacted their older parents' health. The study indicated that the son's migration impacted their older parents' health. About 18% of parents with migrant sons rated their health as poor, while only 8% of parents with non-migrant sons did. A previous study in six major states in India was consistent with this finding [46]. Additionally, this study reveals that the migration type of the sons, the receipt of remittances, and the work type of migrant sons influenced parents' health perceptions. A higher proportion of parents with migrant sons rated their health as good when their sons migrated to other districts, sent remittances, and engaged in the formal sector, compared to parents whose sons migrated to other states

or countries, did not receive remittances, and whose migrant sons worked in the informal sector. These findings were consistent with prior studies [47, 48]. The older adult parents' chronic ailments were assessed by asking, *"Has a doctor or nurse ever told you that you have any of the following ailments?"* based on self-reported responses. A higher proportion of parents of migrants reported they had chronic ailments compared to parents of non-migrants. Previous studies have also reported similar results in Nepal [49], India [23], and China [50]. A higher proportion of parents with migrant sons, particularly mothers, reported having chronic ailments compared to parents of non-migrant sons. This finding aligns with the results of a previous study conducted at the Indian national level [23]. The most common chronic condition was arthritis, followed by hypertension. Factors such as distance, remittances, and the type of work undertaken by the migrant sons significantly impacted the chronic health of older parents of migrant sons. Parents whose sons migrated to other states or open-border countries reported higher rates of chronic ailments than those who migrated to other districts. However, parents who received remittances from their immigrant/outmigrant sons suffered lower chronic health issues. On the other hand, parents whose sons migrated to wage labour or other types of work had a higher prevalence of chronic illnesses.

This study assessed functional health through Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). ADL included six tasks: *bathing, dressing, toileting, mobility, continence, and feeding*, while IADL consisted of eight tasks: the *ability to use the telephone, shopping, food preparation, housekeeping, laundry, transportation, medication, and finances*. Older parents of migrants experienced better functional health than those of the parents of non-migrants. Parents of migrants were less likely to report any ADL or IADL tasks or any functional limitations. Moreover, the probability of functional limitations was lower among parents of migrant sons than among parents of non-migrants. Researchers conducted a study across seven states in India and also reported similar findings [51]. Mothers of migrant sons reported more functional limitations than their fathers. This finding was also consistent with results from country-specific studies [52]. Parents whose sons migrated to other districts had more ADL limitations, but their IADL and chronic health status were better than those whose sons moved to other states or open-border countries. Additionally, parents whose sons migrated for wage labour and did not send remittances had worse functional health than those whose sons went for government or private jobs and sent remittances. Older parents living in one-generation households experienced more ADL limitations compared to those living in two- or three-generation households. This finding contrasts with a country-based study [53]. At the same time, IADL performance was somewhat better for those in two-generation households, consistent with prior study findings [53]. The findings of this study align with the New Economics of Labour Migration (NELM) theory, emphasising the role of remittances in enhancing the physical health of parents of migrants by improving their access to healthcare. Unlike traditional labour migration theories, which focus on migration as an individual decision, NELM views migration as a household strategy aimed at income diversification and risk mitigation [32]. In this context, remittances may be served as a crucial financial resource that enables migrant households to invest in healthcare, thereby positively influencing the well-being of older parents.

We assessed the subjective health of parents with migrants using the GHQ-12, UCLA Loneliness Scale, and the Satisfaction with Life Scale (SWLS). The analysis revealed that parents of migrant sons had higher mean scores for psychological distress [46] and loneliness [34], while their life satisfaction [54] was lower compared to parents of non-migrants, which was consistent with findings from several previous studies. Previous studies supported the findings that mothers of migrant sons experienced more distress, loneliness, and lower life satisfaction than fathers [55, 56]. Furthermore, parents of migrants were more likely to report higher distress, feelings of loneliness, and lower life satisfaction than parents of non-migrants. Living arrangements played a significant role in their subjective wellbeing. Several factors related to their son's migration influenced the parents' subjective health. Parents whose sons migrated within the same state but different districts reported lower distress, loneliness, and higher life satisfaction than those who migrated to other states or countries with open borders [57], which was also consistent with findings from a study conducted in Nepal [57]. If all living sons migrated for work, the parents faced more loneliness, distress, and lower life satisfaction than parents with some sons remaining nearby; a previous study further confirmed this [58]. Additionally, parents experienced lower levels of distress and loneliness and greater life satisfaction when their sons migrated for government or private sector jobs and sent remittances, compared to those whose sons migrated for wage labour or other work and did not send remittances. Older parents living in one-generation households reported subjective health compared to those in two and three-or-more-generational households [53], with the worst outcomes observed among parents with migrant sons. The subjective health of migrants is often affected by family disruption, leading to emotional discomfort and poor psychological well-being. Attachment theory suggests emotional bonding between parents and

children is crucial for psychological wellbeing. Physical separation from children can strain these bonds, leaving parents feeling left behind and lonely [30, 31].

The analysis indicated that 62% of parents of migrant sons were assisted by family members with ADL Limitations, compared to 79% of parents of non-migrants. Among caregivers, 23% of caregivers for parents of migrant sons were spouses, and 15% were non-family members, compared to only 11% for non-migrant parents. The study reveals that family members are the primary caregivers for both older parents of migrants and non-migrants, assisting with Activities of Daily Living (ADL) limitations and staying during hospitalisations. This finding also aligned with a prior nationally based study [25] in the South Indian state of Kerala [18]. This shift in ADL assistance from family members to non-family members for parents of migrants highlights changing caregiving dynamics. During hospitalisation, acute illness, or locomotor disability, parents with migrant sons had fewer familial carers compared to those with non-migrant sons. Monetary support for chronic ailments was also less among parents of migrants than their counterparts with non-migrant sons. Overall, the caregiving pattern for parents of migrants is shifting from familial to non-familial caregiver sources; a previous study conducted in Goa and Kerala found a similar finding [59].

This study had several strengths. Firstly, it was based on recent data collected from a micro-study site, with a reference group of participants with similar backgrounds. Secondly, this study examines different types of adult sons' migration patterns and employment types, comparing their impact on the health of left-behind older adult parents and those with empty nest situations. In contrast, other studies focused only on adult children. Despite these strengths, this study had some limitations. Firstly, this study was based on cross-sectional data on adult son migration and older adult parent–child nexus, so the study cannot claim there was a causal relationship. Secondly, this study was conducted in a micro area, so the study's findings cannot be generalised to national rural older situations. Thirdly, this study examines the health of older adult parents using a quantitative, semi-structured schedule. Additionally, the open-ended responses provide valuable insights into the emotional experiences of older parents, which can be further explored in future research on the nexus between adult sons' migration and the health of their elderly parents.

Conclusion

The health and wellbeing of older parents in rural Koch Bihar differ significantly based on the migratory status of their sons. Parents with migrant sons generally report poorer health, higher chronic morbidity, higher psychological distress, and higher feelings of loneliness compared to parents with non-migrant sons. Although family members serve as primary caregivers for older adult parents, parents with migrant sons were more likely to rely on non-family caregivers and take on the financial responsibility for their care. Based on the study's findings, there is a clear need for targeted rural older care policies that address the health vulnerabilities of parents affected by son out-migration. This study highlights the critical role of adult migration in shaping the physical and subjective wellbeing of older adult parents in rural areas of West Bengal.

Abbreviations

ADL	Activities of Daily Living
C.I	Confidence Interval
GHQ	General Health Question
IADL	Instrumental Activities of Daily Living
NELM	New Economic Labour Migration Model
S.D	Standard Deviation
SWLS	Satisfaction with Life Scale
TFR	Total Fertility Rate
UCLA	University of California, Los Angeles
WHO	World Health Organization

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Authors' contributions

M.D. and H.L. contributed to the conception and design of the study. M.D. analysed the datasets, interpreted the results, and contributed to the discussion. M.D. and H.L. jointly drafted the article and critically revised the manuscript. Both M.D. and H.L. read, revised, and approved the final version of the manuscript.

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Data availability

The datasets used or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Ethical clearance was taken from the Student Research Ethics Committee of the International Institute for Population Sciences (IIPS). The purpose and procedure of the data collection were thoroughly explained to obtain permission and cooperation from the district social welfare officer and the Gram Pradhan. Potential respondents were approached, and Informed consent was obtained from all participants. Confidentiality was assured, and respondents were informed that they could skip any questions or end the interview at any point. No incentives were offered to the respondents for their participation in the study. All the methods and procedures carried out in this study were in accordance with the relevant guidelines.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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