Health Perceptions and Mental Well-Being: A LASI-Based Study of Depression in Indian Older Adults

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A B S T R A C T

Background: Depression among older adults is an emerging public health challenge in India, often influenced by complex interactions between physical health and socio-demographic factors. While self-rated health is a widely recognized determinant of overall well-being, its association with depression in the Indian older adults remains underexamined. The objective was to assess the relationship between self-rated health and depression among older Indian adults, while adjusting for demographic, socioeconomic, and health-related variables.

Methods: Data were drawn from the Longitudinal Ageing Study in India (LASI, Wave 1), including 64,695 individuals aged 45 and above. Depression was measured using the CES-D 10-item scale, with scores 4 or above indicating likely depression. Self-rated health was categorized as good, average, or poor. A multivariable binary logistic regression model was used to estimate adjusted odds ratios (AOR) with 95% confidence intervals (CI), accounting for complex survey design.

Results: Older adults reporting poor self-rated health had significantly higher odds of depression (AOR = 2.47, 95% CI: 2.36–2.59), and those with average health also showed increased odds (AOR = 1.46, 95% CI: 1.42–1.50), compared to those reporting good health. Other significant predictors included lower education (e.g., up to secondary: AOR = 0.56, 95% CI: 0.50–0.64), female (AOR = 1.07, 95% CI: 1.01–1.13), single marital status (AOR = 1.46, 95% CI: 1.32–1.61), functional limitations (AOR = 1.39, 95% CI: 1.31–1.47), and multimorbidity (AOR = 1.77, 95% CI: 1.54–2.03). Dissatisfaction with living arrangements was also strongly associated with depression (AOR = 2.83, 95% CI: 2.42–3.31).

Conclusion: Self-rated health is a robust predictor of depression among older adults in India. These findings highlight the urgent need for integrated health and social care strategies that consider both physical health and social determinants to reduce the mental health burden in aging populations.

Keywords: Depression, Self-Rated Health, Older Adults, India, LASI, Logistic Regression

A R T I C L E   I N F O

INTRODUCTION

Depression is a common and debilitating mental health condition that affects millions of people worldwide, with older adults facing heightened vulnerability due to physiological decline, social isolation, and life course transitions. According to the World Health Organization, depression in older age is associated with impaired daily functioning, poor quality of life, and increased risk of mortality.[1] In this study, "older adults" are defined as individuals aged 45 and above, in alignment with sampling framework of Longitudinal Ageing Study in India (LASI).

India, like many low- and middle-income countries, is experiencing a demographic shift, with a growing proportion of its population entering later life. While the prevalence and determinants of depression among older adults have been extensively explored in Western contexts, research in India remains relatively limited. In particular, the role of self-rated health (SRH) a subjective measure of an individual's perceived physical and mental health has received considerable attention in global studies for its predictive value in identifying depressive symptoms.[2,3] However, despite its growing recognition as a robust psychosocial indicator, SRH has been underutilized in Indian research on geriatric mental health.

Existing Indian studies have primarily focused on objective health conditions such as multimorbidity, functional disability, or chronic illnesses as predictors of depression, often overlooking individuals' perceptions of their own health. For example, research in Indian context examined depression among postmenopausal women using LASI data, concentrating on multimorbidity and disability but without including self-rated health (SRH), in their models.[4] Similarly, two India based studies- one explored links between chronic disease combinations and functional limitations[5], and another assessed the impact of multimorbidity on depressive symptoms using propensity score matching[6], yet neither study incorporated SRH as a covariate. This consistent omission highlights a key gap in the Indian literature, where SRH remains underexamined as a determinant of depression among older adults.

Given the cultural, structural, and healthcare differences between India and high-income countries, it is important to evaluate how SRH operates as a predictor of depression in the Indian context. Understanding this relationship may help identify vulnerable subgroups who; despite lacking clinically diagnosed illnesses, experience psychological distress rooted in negative health perceptions.

This study addresses this research gap by investigating the association between self-rated health and depression among older adults in India, using nationally representative data from LASI. By considering SRH as a key explanatory variable while controlling for demographic, socio-economic, and health-related factors, this research offers novel insights into the subjective dimensions of health and their implications for mental well-being in later life.

METHODOLOGY

Data Source: The study uses data from the first wave of Longitudinal Ageing Study in India (LASI), 2020, a nationally representative survey that collects detailed information on the health, socio-economic status, and well-being of older adults in India. The LASI Wave 1 field survey was conducted across India from April 2017 to December 2018 and the overall household response rate was 96.6%. The LASI addresses a host of factors, from health behaviours and chronic conditions to mental health and living status and socio-economic status, and is therefore, a very rich dataset with the potential to study depression in older adults. LASI employs a multistage stratified sampling design. First, states and union territories in India were split into rural and urban areas, and then districts were chosen within each state. Within all selected districts, a number of urban and rural sites were selected. Enumerators randomly selected households from these locations, giving a representative of the demographic and regional diversity across India. The survey targets individuals aged 45 and above with their partner irrespective of age and the sample is designed to be representative of entire older population of India. For detailed methodology, including the sampling technique and data collection process, please refer to the LASI India Report.[7]

Variables of Interest: The primary variable of interest in this study is depression, which is categorized as either depressed or non-depressed. Generally, in the existing literatures, two internationally recognized and comparable instruments were used to evaluate depressive symptoms and episodes. These are Center for Epidemiologic Studies Depression (CES-D) scale[8] and Composite International Diagnostic Interview Short Form (CIDI-SF) scale[9]. In this study, depression was measured using the 10-item version of the Center for Epidemiologic Studies Depression Scale (CES-D). This standardized scale assesses the frequency of depressive symptoms experienced in the past week, including issues such as concentration difficulties, feelings of depression, fatigue or low energy, fear, overall satisfaction, loneliness, irritability over trivial matters, perceiving daily activities as burdensome, hopefulness about the future, and happiness. Of the ten items, seven reflect negative symptoms, while three are positive in nature. To ensure consistency in scoring, the three positive items were reverse-coded originally rated from (1) rarely or never (<1 day) to (4) most or all the time (5–7 days) so that higher total scores uniformly indicate greater depressive symptomatology. The first two responses of these questions that are rarely and sometimes are coded as zero while often or most of time is coded as one. The resulting depression score ranges from 0 to 10, with scores 4 or above classified as indicating depression[5,10], serves as the dependent

variable. The key independent variable is self-rated health, categorized as good, average, or poor, which captures an individual's subjective assessment of their overall health. This measure has been extensively used in previous literature as a predictor of mental health outcomes, as poor self-rated health is frequently associated with higher levels of psychological distress and depression.[11]

In addition to self-rated health, several other independent variables are considered in the analysis. Demographic variables include age and sex (male/female), while socio-economic variables consist of education level (no education, up to primary, up to secondary, higher education) and wealth status. Wealth status was measured using the wealth quintile variable provided in LASI Wave 1, which was derived through principal component analysis (PCA) based on household asset ownership, housing quality, and access to consumer durables. For the present analysis, the wealth quintiles were collapsed into two categories: "poor" (comprising the lowest two quintiles) and "non-poor" (comprising the middle, fourth, and highest quintiles), following approaches commonly used in LASI-based studies[12].

Multimorbidity was operationalized using self-reported information on chronic conditions. Respondents were categorized as having "multimorbidity" if they reported two or more chronic diseases, such as hypertension, diabetes, heart disease, stroke, cancer, or chronic lung disease. Those reporting only one condition were classified as having "one morbidity," and those reporting no chronic conditions were labelled as having "no morbidity." This classification aligns with definitions used in previous Indian ageing research.[13,14]

Sleep time was measured based on two time-use questions from LASI. Respondents were asked, "What time did you wake up today?" and "What time did you go to sleep yesterday?" Interviewers recorded both hours and minutes, following a 24-hour clock format with hard checks to ensure valid entries. Total sleep duration was then calculated as the difference between reported bedtime and wake-up time, expressed in continuous hours, and used as a continuous variable in the analysis like in previous studies.[15,16]

Sleep duration was calculated using following STATA command:

```
gen double sleep = clock(tu002, "hm")
gen double wake = clock(tu001, "hm")
gen sleep time = cond(sleep > wake, (wake +
86400000 - sleep) / (60 * 60 * 1000), (wake - sleep)
/ (60 * 60 * 1000)).
```

Similarly, living arrangements, including whether older adults live alone or with a spouse or children, as well as their satisfaction with these arrangements, are also considered. The region of residence is another important variable, as geographical differences within India can influence access to healthcare and mental health outcomes.

Moreover, In the LASI study, participants were asked whether they experienced any limitations in activities of daily living (ADLs) that lasted for more than three months. The survey assessed six basic ADLs and seven instrumental ADLs. The six basic ADLs included tasks such as dressing, bathing, walking across a room, eating, getting in or out of bed, and using the toilet. The seven instrumental ADLs encompassed telephone use, taking medications, grocery shopping, preparing a hot meal (including cooking and serving), performing household chores, managing finances, and navigating unfamiliar places or finding an address. For the purpose of this study, summary indices for ADLs and instrumental ADLs (IADLs) were created by tallying the number of limitations in each category, with scores ranging from 0 to 6 for basic ADLs and 0 to 7 for instrumental ADLs. Additionally, an overall ADL-IADL summary index was calculated by combining both sets of disability scores, ranging from 0 to 13. A higher score reflected a greater level of disability in ADLs.[17] The sample selection criteria have been mentioned in Figure 1. These variables allow the study to examine how health status interacts with demographic, socio-economic, and regional factors to influence depression scores. The detailed description of the variables is mentioned in Appendix A.
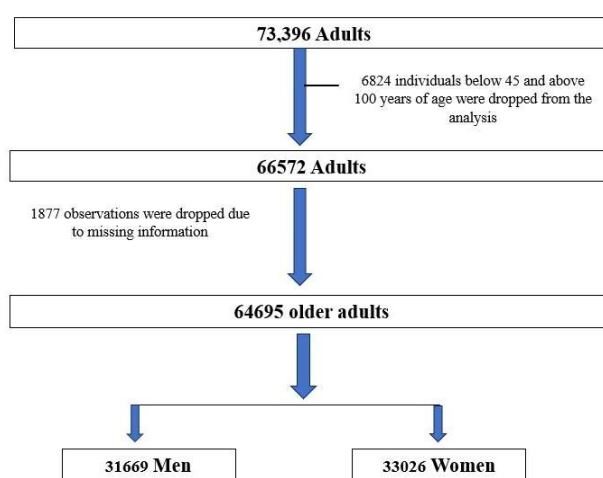
Figure 1: Sample Selection Criteria

Statistical Analysis: The analytical approach employed is binary logistic regression, which is suitable for examining the relationship between a binary dependent variable (depression) and multiple independent variables.

The study estimates the following regression model

$$\log\left(\frac{Depressed}{1-Depresse}\right) = \beta_0 + \beta_1(Self-Rated\ Health) + \beta_2(Education\ Level) + \beta_3(Living\ Arrangement) + \beta_4(Wealth\ Status) + \beta_5(Age) + \beta_6(Sex) + \beta_7(MaritalStatus) + \beta_8(Religion) + \beta_9(Caste) + \beta_{10}(Region) + \beta_{11}(Sleep\ Time) + \beta_{12}(Multimorbidity) + \beta_{13}(FunctionalLimitationsScore) + \varepsilon \quad \ldots\ldots\ldots(1)$$

In equation (1), the expression log (Depressed / (1 - Depressed)) represents the log-odds of an individual being classified as depressed. The equation models this log-odds as a linear combination of several independent variables. Here, β_0 is the intercept, and the coefficients β_1 through β_{13} represent the effects of key predictors: self-rated health (β_1), education level (β_2), living arrangement (β_3), wealth status (β_4), age (β_5), sex (β_6), marital status (β_7), religion (β_8), caste (β_9), region (β_{10}), sleep time (β_{11}), Multimorbidity (β_{12}) and Functional limitations Score (β_{13}). Each coefficient quantifies the change in the log-odds of depression associated with a one-unit change in the respective variable, holding other variables constant. The term ε denotes the error term, capturing unobserved influences on depression.

Logistic regression enables the estimation of odds ratios (ORs), which reflect the likelihood of experiencing depression at different severity levels for each variable. The odds ratios indicate how the odds of depression change with each predictor variable. To account for potential clustering in the data and ensure robust results, robust standard errors are used. Statistical significance is determined at a 5% level (p <0.05). Additionally, Wald Chi-Square test is used to assess the model's goodness of fit.

Data analysis is performed using Stata (version 18), a statistical software that is widely used for survey data analysis. The study accounts for sample weights and clustering adjustments with 'svyset' command to ensure that the results are representative of the older adult population in India.

RESULTS

Sample Characteristics and Comparative Profile of Depressed and Non-Depressed Older Adults in India:

Table 1 describes the socio-demographic, economic, and health-related characteristics of the study population, disaggregated by depression status. The analysis is based on 64,695 individuals aged 45 years and above, with 72.9% classified as non-depressed and 27.1% as depressed.

In terms of self-rated health, a greater proportion of non-depressed individuals reported their health as good (65.9%), whereas among those with depression, this proportion was lower at 52.5%. Meanwhile, the share of individuals rating their health as poor was notably higher in the depressed group (16.5%) compared to the non-depressed (7.7%).

Educational attainment showed visible variation across depression status. Individuals with no formal education accounted for a larger percentage among the depressed group (53.1%) than among the non-depressed (44.6%). Similarly, the proportion of respondents with higher education was smaller among the depressed (3.7%) compared to the non-depressed (5.7%).

Regarding living arrangements, the majority of participants in both groups reported living with a spouse, children, or others. However, the percentage of individuals living alone was nearly twice as high among the depressed group (5.4%) as compared to the non-depressed group (2.8%).

The distribution of wealth status showed a relatively balanced pattern across both groups, with approximately 60.6% of non-depressed and 59.1% of depressed individuals falling in the non-poor category. The mean age differed slightly, with non-depressed respondents being, on average, older (28.5 years) than those classified as depressed (25.1 years).

Sex distribution indicated a higher share of females among the depressed group (58.2%), while males accounted for a larger proportion among the non-depressed (48.2%). Marital status also differed, as individuals who were unmarried, widowed, divorced, or separated made up a greater proportion of the depressed group (31.4%) compared to the non-depressed group (22.1%).

When examining religion, Hindus constituted a larger proportion among those identified as depressed (76.6%) compared to minorities (23.5%). Caste composition appeared relatively similar across both groups, with around three-quarters identifying as belonging to backward castes.

Satisfaction with current living arrangements revealed marked differences. Among non-depressed individuals, 83.3% reported being satisfied with their living arrangements, while this figure dropped to 70.3% among those classified as depressed. Correspondingly, neutral and not satisfied responses were more prevalent in the depressed group.

The place of residence showed a slightly higher proportion of rural residents among the depressed group (66.5%) compared to the non-depressed (64.5%). Regional distribution reflected variations, with a smaller percentage of depressed individuals from the northeast region (6.5%) and comparatively higher proportions from central and southern regions.

Average sleep time was marginally higher among the depressed group (54.82 minutes) than among non-depressed individuals (53.50 minutes). In terms of morbidity, those with more than one reported health condition made up a larger share of the depressed group (23.5%) than the non-depressed (17.3%). Functional limitation scores were also higher among depressed individuals, with an average score of 2.03 compared to 1.01 among non-depressed respondents.

In sum, this comparative descriptive overview highlights observable differences in socio-demographic, economic, and health-related characteristics between non-depressed and depressed older adults, based on key indicators such as self-rated health, education, living arrangements, marital status, region, morbidity, and functional status.

Table 1: Socio-Demographic, Economic, and Health-Related Characteristics of the Study Population by Depression Status Among

Indicators	Depression Status		Total	Chi² /t test
	Non-Depressed (%)	Depressed (%)		
Total Sample (N)	47,178 (72.9)	17,517 (27.1)	64,695 (100.0)	
Self-Rated Health				
Good	31,107 (65.94)	9,197 (52.51)	40,304 (62.30)	<0.001
Average	12,433 (26.35)	5,420 (30.95)	17,853 (27.60)	
Wealth Status				
Non-Poor				
Poor	3,636 (7.71)	2,897 (16.54)	6,533 (10.10)	
Education Level				
No Education	21,039 (44.60)	9,295 (53.06)	30,334 (46.89)	<0.001
Up to Primary	16,518 (35.01)	5,618 (32.07)	22,136 (34.22)	
Up to Secondary	6,927 (14.68)	1,962 (11.20)	8,889 (13.74)	
Higher	2,693 (5.71)	642 (3.67)	3,335 (5.16)	
Current Living Arrangements				
Living Alone	1,317 (2.79)	938 (5.35)	2,255 (3.49)	<0.001
Living with Spouse/ Children/ Others	45,861 (97.21)	16,579 (94.65)	62,440 (96.51)	
Wealth Status				
Non-Poor	28,587 (60.59)	10,348 (59.07)	38,935 (60.18)	<0.001
Poor	18,591 (39.41)	7,169 (40.93)	25,760 (39.82)	
Age of the Respondents (mean (SD))	28.54 (25.06)	25.08 (25.16)	27.61 (25.13)	<0.001
Sex				
Male	22,744 (48.21)	7,318 (41.78)	30,062 (46.47)	<0.001
Female	24,434 (51.79)	10,199 (58.22)	34,633 (53.53)	
Marital Status				
Currently Married or in a Living Relationship	36,750 (77.90)	12,009 (68.56)	48,759 (75.37)	<0.001
Unmarried/ Widowed/ Divorced/ Separated	10,426 (22.10)	5,508 (31.44)	15,934 (24.63)	
Religion				
Minorities	13,249 (28.08)	4,107 (23.45)	17,356 (26.83)	<0.001
Hindu	33,929 (71.92)	13,410 (76.55)	47,339 (73.17)	
Caste				
Backward	35,680 (75.63)	13,217 (75.45)	48,897 (75.58)	0.643
Forward	11,498 (24.37)	4,300 (24.55)	15,798 (24.42)	
Satisfaction with Current Living Arrangement				
Satisfied	39,292 (83.32)	12,304 (70.26)	51,596 (79.78)	<0.001
Neutral	6,554 (13.90)	3,772 (21.54)	10,326 (15.97)	
Not satisfied	1,314 (2.79)	1,435 (8.19)	2,749 (4.25)	
Place of residence				
1 Rural	30,425 (64.49)	11,646 (66.48)	42,071 (65.03)	<0.001
2 Urban	16,753 (35.51)	5,871 (33.52)	22,624 (34.97)	
Region				
North	8,364 (18.03)	3,302 (19.11)	11,666 (18.32)	<0.001
Central	5,752 (12.40)	2,850 (16.49)	8,602 (13.51)	
East	8,176 (17.62)	3,163 (18.31)	11,339 (17.81)	
Northeast	7,180 (15.48)	1,114 (6.45)	8,294 (13.03)	
West	6,400 (13.79)	2,141 (12.39)	8,541 (13.41)	
South	10,522 (22.68)	4,708 (27.25)	15,230 (23.92)	
Sleep time (mean (SD))	53.50 (23.23)	54.82 (23.87)	53.85 (23.41)	0.002
Morbidity				
None	26,289 (55.72)	8,260 (47.15)	34,549 (53.40)	<0.001
One	12,732 (26.99)	5,149 (29.39)	17,881 (27.64)	
More than one	8,157 (17.29)	4,108 (23.45)	12,265 (18.96)	
Functional Limitation Score (mean (SD))	1.01 (2.11)	2.03 (3.10)	1.28 (2.46)	<0.001

Source: Authors' calculations using data from the Longitudinal Ageing Study in India (LASI) Wave 1, 2017–18.

Regional Variation in Depression Among Older Adults: In addition to individual and household characteristics, notable regional variations in the prevalence of depression among older adults were observed across India, as illustrated in Figure 2 and detailed in Appendix B. The highest proportions of depressed individuals were recorded in Jammu & Kashmir (46.7%), Karnataka (45.5%), and Andaman and Nicobar Islands (45.6%), while substantially lower prevalence was seen in several northeastern states such as Nagaland (7.9%), Meghalaya (8.0%), and Assam (12.7%). States like West Bengal (39.8%), Delhi (37.4%), and Madhya Pradesh (35.8%) also reported relatively higher levels of depression compared to the national average of 27.1%.

These geographical patterns may reflect a combination of contextual factors, including differences in so-

cial support structures, healthcare accessibility, socio-political environments, and cultural perceptions of mental health. For example, higher reported depression levels in Jammu & Kashmir could be influenced by prolonged periods of socio-political instability and limited mental health resources in the region. In contrast, lower prevalence in northeastern states such as Nagaland and Meghalaya may relate to stronger community ties, cultural coping mechanisms, or under-reporting due to stigma or access challenges. These observations highlight the importance of considering regional context when interpreting depression prevalence among older adults in India.

Source: Prepared by the authors from LASI Data
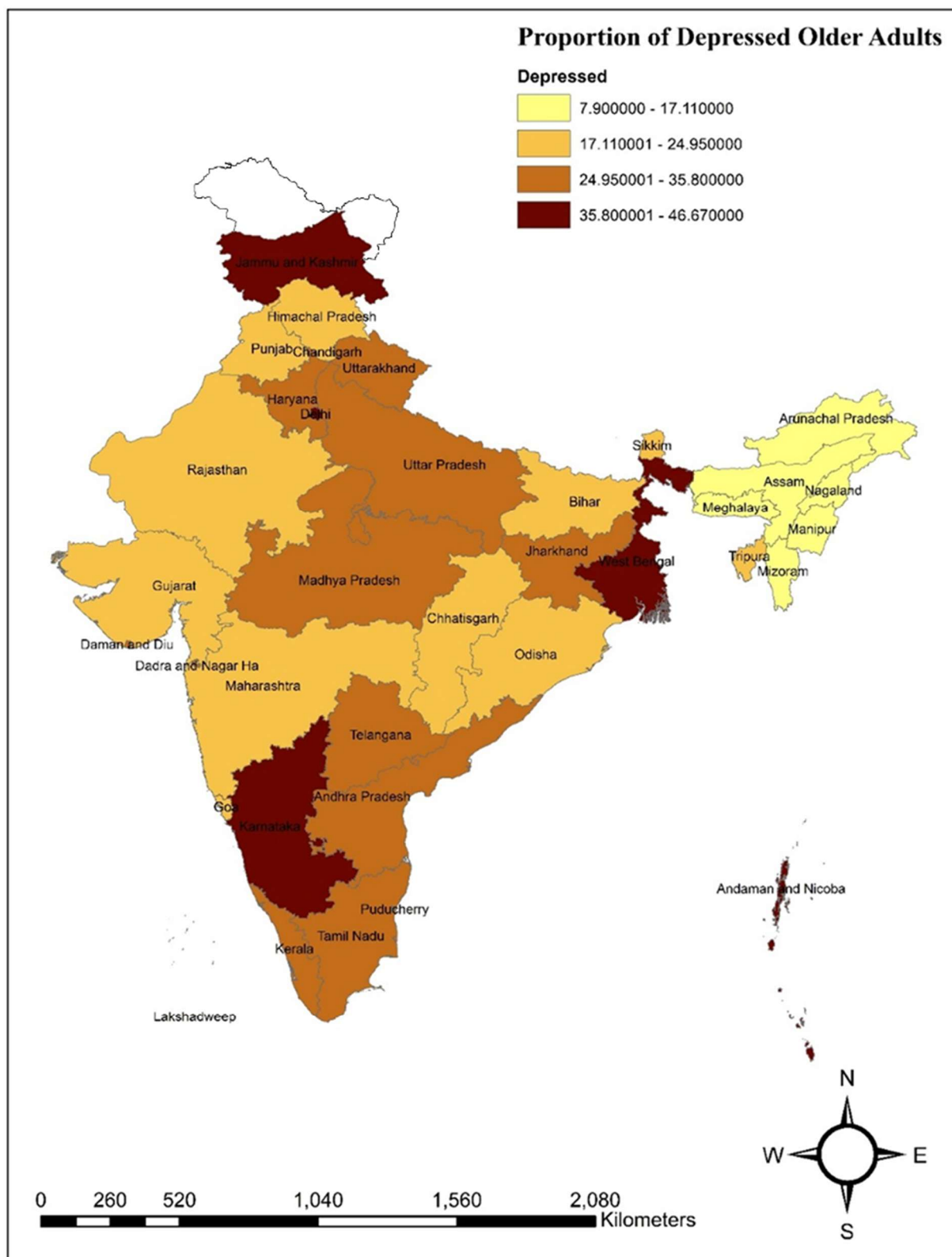
Figure 2: Prevalence of Depression Among Older Adults in Different States in India

Unpacking the Predictors: What Drives Depression Among India's Older Population?: Before discussing the results, it's important to assess the model's fit using the log-likelihood and Wald Chi-Square. The log-likelihood value of -35,775,627 indicates a reasonable model fit, while the Wald Chi-Square value of 519.09 (p <0.01) shows that the model's predictors are statistically significant and contribute meaningfully to explaining depression among older adults in India.

The logistic regression model examining factors influencing depression among older adults in India identified several significant predictors, with self-rated health emerging as the most influential, as presented in Table 2. Older adults who reported poor self-rated health had 2.47 times higher odds of experiencing depression (AOR = 2.47), while those who rated their health as average exhibited 1.46 times higher odds (AOR = 1.46) as compared to those who reported their health as good. This highlights the central role of self-rated health in shaping mental well-being.

Education also played a significant role, with individuals having Up to Primary education and Up to Secondary education showing significantly lower odds of depression compared to those with no formal education. Specifically, the odds of depression were 0.16 times lower for individuals with Up to Primary education (AOR = 0.84) and 0.44 times lower for those with Up to Secondary education (AOR = 0.56). This suggests that education acts as a protective factor against depression. However, those with Higher education did not show a statistically significant difference in depression odds (AOR = 0.80).

Living arrangements also matters: the older adults living alone has lower odds of depression (AOR = 0.92), highlighting the importance of social support for mental health. Those living with a spouse, children or others have a slight, but not significant, decrease in the odds of depression, suggesting the importance of companionship and social networks.

Wealth status has no significant effect, and poorer individuals have marginally lower odds of depression relative to higher wealth status individuals (AOR = 0.93), but this is not statistically significant. Age has a negligible positive association with the odds of depression (AOR = 1.01), which may indicate the link of aging-related difficulties with slight increases in depressive symptoms.

Additionally, results reveal higher odds of depression among women (AOR = 1.07), consistent with broader findings indicating that women are more susceptible to depression. Unmarried status is also associated with increased depression, as unmarried older adults have 1.46 odds of depression compared to their married counterparts, suggesting that the protective effects of marital support may impact mental health.

Religion and Caste also emerged as impactful parameters; Hindus has marginally lower odds of having depression when compared to other minority population (AOR = 0.88), however this result is not statistically significant. Similarly, Relative to backward castes, individuals from forward castes are 1.16 times more likely to be depressed (AOR = 1.16), which again emphasizes the mental health disadvantages associated with social stratification.

Depression is also significantly affected by satisfaction with current living arrangements. Compared with those who feel satisfied with their current living arrangements, those who feel neutral have 1.02 times greater odds of having depression (AOR = 2.02), and those who reported being dissatisfied with their living arrangements have 1.83 times greater odds of being depressed (AOR = 2.83). This shows how integral to mental health the realization of human satisfaction is.

When examining the impact of place of residence, there is no significant effect (AOR = 1.09), with those who living in urban areas than their rural counterparts. However, this effect varies widely by region, as older adults who lives in Northeastern India has lower odds of depression by 0.59 times (AOR = 0.41), while the corresponding odds for Central India are greater by 0.51 times (AOR = 1.51). Also, older adults living in the South have a lower chance of depression (AOR = 1.20) than in the North, and both strata represent regional variations in mental health outcomes.

Lastly, sleep time is significantly associated with depression. People who reported more daily sleep time are 0.12 times less likely to have depression (AOR = 0.88) supporting the relationship between sleep and mental health.

Additionally, in line with health status, the odds of depression are more in individuals having one morbidity [AOR = 1.03] and more than one [AOR = 1.17] as compared to those who have none. Similarly, Higher functional limitations' score also leads to higher depression [AOR = 1.39].

Additional Results: To further strengthen our findings, we conducted supplementary analyses, detailed in Supplementary file 1. Interaction models revealed that the association between self-rated health and depressive symptoms varied by sex and region: women with poor self-rated health showed significantly higher odds of depression compared to men (AOR for poor self-rated health × female = 1.15; 95% CI: 1.04–1.28), and older adults from Central India exhibited greater vulnerability compared to those from other regions. Sensitivity analyses using alternative CES-D cut-off scores (≥3 and ≥5) demonstrated that while the absolute prevalence of depressive symptoms varied ranging from 81.3% (≥3 cut-off) to as low as 4.3% (≥5 cut-off) the relative patterns across states remained consistent. Finally, a post hoc power calculation confirmed that the sample size of 64,695 participants was sufficient to detect significant associations, with a minimum required sample of approximately 5,000 participants.

Table 2: Multivariate Logistic Regression Results Predicting Depression Among Older Adults in India

Variable	UOR	CI	AOR	CI	z-value
Self-Rated Health					
Good ®					
Average	1.45***	1.42-1.53	1.46	1.42-1.50	5.90***
Poor	2.69 ***	2.55-2.84	2.47	2.36-2.59	9.37***
Education					
No Education ®					
Up to Primary	0.77 ***	0.74-0.80	0.84	0.80-0.88	-2.26**
Up to Secondary	0.64 ***	0.61-0.68	0.56	0.50-0.64	-4.12***
Higher	0.53 ***	0.49-0.59	0.8	0.68-0.95	-1.12*
Current Living Arrangements					
Living Alone ®					
Living with Spouse/Children/Others	0.51 ***	0.47-0.55	0.92	0.84-1.01	-0.55*
Wealth Status					
Non-Poor ®					
Poor	1.07 ***	1.03-1.10	0.93	0.87-1.00	-1.11
Age	0.99 ***	0.99-1.00	1.01	1.00-1.03	-2.28**
Sex					
Male ®					
Female	1.30 ***	1.25-1.34	1.07	1.01-1.13	1.03*
Marital Status					
Currently Married or in a Living Relationship ®					
Unmarried/ Widowed/ Divorced/ Separated	1.62 ***	1.56-1.68	1.46	1.32-1.61	4.48***
Religion					
Minorities ®					
Hindu	1.28 ***	1.22-1.33	0.88	0.78-1.00	-1.42*
Caste					
Backward Castes ®					
Forward Caste	1.01 *	0.97-1.05	1.16	1.03-1.31	2.13**
Satisfaction with Current Living Arrangement					
Satisfied ®					
Neutral	1.84 ***	1.76-1.92	2.02	1.83-2.24	8.32***
Not satisfied	3.49 ***	3.23-3.77	2.83	2.42-3.31	7.92***
Place of Residence					
Rural ®					
Urban	0.92 ***	0.88-0.95	1.09	0.99-1.20	1.07*
Region					
North ®					
Central	1.26 ***	1.18-1.33	1.51	1.31-1.74	4.84***
East	0.98 ***	0.93-1.04	1.02	0.91-1.14	0.21
Northeast	0.39 ***	0.36-0.42	0.41	0.36-0.47	-8.01***
West	0.85 ***	0.80-0.90	0.94	0.82-1.08	-0.58
South	1.13 ***	1.07-1.20	1.20	1.00-1.43	1.81*
Sleep Time	0.92 ***	0.89-0.97	0.88	0.83-0.94	-1.46**
Morbidity					
None ®					
One	1.29 ***	1.24-1.34	1.03	0.98-1.09	5.45 ***
More than one	1.60 ***	1.53-1.68	1.77	1.54-2.03	6.87 ***
Functional Limitation Score	1.16 ***	1.15-1.17	1.39	1.31-1.47	5.93 ***
_cons	-	-	0.49	0.41-0.59	-3.53
Log-pseudolikelihood				-35775627	
Wald Chi-Square				519.09***	

Dependent Variables: Depression Score
Note: (1) *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.; (2) UOR and AOR represent Unadjusted and Adjusted Odds Ratios, respectively.; (3) ® indicates the reference category.; (4) Reference categories:
Self-Rated Health – Good; Education – No Education; Current Living Arrangements – Living Alone; Wealth Status – Non-Poor; Sex – Male; Marital Status – Currently Married or in a Living Relationship; Religion – Minorities; Caste – Backward Castes; Satisfaction with Current Living Arrangement – Satisfied; Place of Residence – Rural; Region – North; Morbidity – None.
Source: Estimated by the authors

DISCUSSION

This study examined depression patterns among older adults in India, revealing clear differences across self-rated health, education, living arrangements, marital status, region, and physical health conditions. These patterns reflect how social, economic, and health-related factors collectively shape mental well-being, aligning with the social determinants of health framework, which emphasizes that health outcomes are influenced by broader social and structural conditions.[18,19]

Older adults with poor self-rated health reported a higher prevalence of depressive symptoms. This find-

ing is consistent with previous research highlighting how subjective health reflects not only clinical diagnoses but also functional limitations, fatigue, and broader life satisfaction [11]. Self-rated health, as framed by social determinants theory, captures both material circumstances and psychosocial factors influencing mental well-being.[20]

Educational attainment showed a similar pattern: those with some formal education reported lower depression prevalence than those without. Education likely enhances mental health resilience by improving health literacy, access to care, and coping mechanisms, as noted in earlier studies.[21,22] These observations reinforce education's role as a key social determinant of health, influencing opportunities and health behaviours across the life course.

Living arrangements also stood out, with older adults living with wife, children or with others experiencing lower odds of depression than those living alone. In India's family-centric culture, co-residential arrangements offer emotional support, while living alone may increase social isolation and loneliness, echoing findings from existing studies[10] and theories around social capital and health.[23,24]

Wealth status differences were present but less marked. While economic resources often buffer against mental health challenges, this study suggests that material wealth does not guarantee emotional well-being. Non-material factors like social connections and cultural expectations also play a role, a nuance recognized in social determinants theory.[18]

Gender and marital status patterns were consistent with established evidence: women and unmarried, widowed, or divorced older adults showed higher depression prevalence.[25,26] These findings reflect both biological vulnerabilities and socio-cultural pressures, including caregiving responsibilities, gender-based inequities, and loss of social support.

Regional differences were also prominent. Higher depression prevalence in states such as Jammu & Kashmir and Karnataka, and lower rates in northeastern states like Nagaland and Meghalaya, likely reflect variations in healthcare access, community cohesion, and socio-political conditions.[27] These patterns are consistent with theories linking place, social structure, and health.[28]

It is important to note the study's cross-sectional design limits causal inference. While self-rated health, living arrangements, and other factors show clear patterns, the possibility of reverse causality where depression influences perceived health cannot be excluded.[29] Longitudinal studies are needed to better understand these dynamics.

Lastly, the strong association between multimorbidity, functional limitations, and depression underlines the need for integrated healthcare strategies that address both physical and mental health. These findings corroborate with existing research[30] and align with WHO's healthy ageing framework[20], emphasizing comprehensive, person-centered approaches to late-life health.

In summary, this study's findings complement existing Indian research while illustrating how social, economic, and health-related factors intersect with mental health among older adults. Grounded in social determinants of health theory, these results underscore the importance of holistic, regionally tailored mental health strategies across India's diverse population.

LIMITATIONS

This study has certain limitations that should be noted. Given its cross-sectional design, the analysis cannot establish causal relationships between self-rated health, socio-demographic factors, and depression. The direction of these associations remains unclear. Additionally, some relevant factors such as social stigma, access to mental health services, and cultural perceptions of depression were not included in the analysis. These unmeasured variables may have influenced both the experience and reporting of depressive symptoms. Finally, depression was assessed using the 10-item CES-D scale. Although widely used in large surveys, this shorter version may have lower sensitivity and specificity compared to the full 20-item scale[31], potentially affecting the accuracy of prevalence estimates.

Despite these limitations, the study offers valuable insights that contribute to understanding depression patterns among older adults in India and highlight areas for future research.

CONCLUSION

The present study establishes that self-rated health is a significant predictor of depression among older adults in India, where worse self-rated health is associated with a greater risk of depression. The study's results also emphasize social demographic factors like education, living arrangements, sex, marital status, region, morbidity and functional limitations that predict mental health output. The study reaffirms that depression among older adults is inextricably linked to both physical and social well-being. This study highlights the importance of integrated health care policies focusing on both physical and mental health among older adults.

POLICY IMPLICATIONS

The findings of this study highlight several priority areas for policy action to support the mental health of older adults in India. Foremost, improving access to affordable geriatric healthcare is essential, particularly for individuals reporting poor self-rated health. Expanding routine screenings for chronic illnesses, ensuring the availability of affordable medi-

cations, and strengthening geriatric care services through telemedicine and mobile health units can help address both physical and mental health needs, especially in rural and underserved regions.

Reducing social isolation among older adults must also be a key focus. Community-based programs, including senior citizen support groups, local wellness centers, and government-led initiatives, can offer both social and emotional support. Special attention should be given to those living alone, as this group showed higher levels of depressive symptoms. Caregiving support policies, including caregiver training, respite services, and financial assistance for families providing care, can further alleviate psychological burdens linked to ageing and caregiving responsibilities.

Given the observed regional differences in depression prevalence, mental health strategies should be adapted to local contexts. Expanding mental health services in regions with higher prevalence, such as Central India, and strengthening existing community support structures in lower-prevalence areas like the Northeast would ensure that resources are allocated efficiently and equitably. This regional approach acknowledges India's social and cultural diversity while addressing local gaps in healthcare infrastructure.

Finally, policies must be sensitive to gender differences in mental health outcomes. Targeted programs focusing on older women particularly those in rural areas are necessary to address their heightened vulnerability to depression. These should include gender-responsive mental health services, social support initiatives, and economic empowerment opportunities tailored to the specific needs of ageing women.

Together, these focused, actionable policy recommendations reflect a holistic approach to promoting mental well-being among India's older adults. By integrating healthcare access, social support, education, region-specific planning, and gender sensitivity, such strategies can help reduce the burden of depression and enhance quality of life for India's ageing population.

Authors Contribution: SP conceptualized the study, supervised the research process, and contributed to the methodology and analysis. **JD** contributed to synthesizing the literature, structuring the manuscript, and proofreading. **UP** played a key role in data collection, cleaning, and preliminary analysis, in addition to contributing to the literature review. **DD** contributed medical insights and supported the interpretation of health-related findings within the study, ensuring that medical perspectives were properly incorporated. All authors participated in writing, reviewing, and approving the final manuscript.

Availability of Data: Data is available online upon request from
https://www.iipsindia.ac.in/content/LASI-data.

No use of generative AI tools: This article was prepared without the use of generative AI tools for content creation, analysis, or data generation.

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Appendix A: Description and Coding of Variables Used in the Study

Variable	Description	Coding and Scoring Details
Depression (CES-D 10-item Scale)	Assesses depressive symptoms using the short form of the Center for Epidemiologic Studies Depression Scale.	Ten items: 7 negative and 3 positives were recoded into binary scores (1 = symptom present, 0 = symptom absent). Positive items were reverse-coded. Total score range: 0–10. Depression classified as CES-D score ≥ 4. Scale reliability (Cronbach's alpha): 0.702.
Sleep Time	Self-reported total daily sleep duration.	Continuous, calculated from bedtime (tu002) and wake time (tu001) using Stata clock functions. Expressed in hours per day (range: 0–24 hours).
Living Arrangements	Household composition or living situation.	0 = Alone, 1 = Living with Spouse/Children or Others.
Satisfaction with Living Arrangements	Respondent's reported satisfaction level with current living arrangements.	1 = Satisfied, 2 = Neutral, 3 = Not Satisfied.
Place of Residence	Rural or Urban classification.	1 = Rural, 2 = Urban.
Multimorbidity	Number of self-reported chronic conditions.	Sum of 9 conditions (hypertension, diabetes, cancer, lung disease, heart disease, stroke, bone disorders, psychiatric problems, cholesterol). Categorized as: 0 = None, 1 = One morbidity, 2 = More than one morbidity.
Functional Limitation Score	Limitations in Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL).	Sum of 13 items: dressing, walking, bathing, eating, waking, toilet use, meal preparation, shopping, telephone use, medication management, working, money management, addressing. Score range: 0–13. Higher scores indicate greater functional limitation.
Self-Rated Health	Respondent's perception of overall health.	Categories: Good, Average, Poor.
Wealth Status (Poverty)	Household economic status based on Monthly Per Capita Expenditure (MPCE) quintiles.	Quintiles collapsed into two categories: 0 = Non-Poor (quintiles 3–5), 1 = Poor (quintiles 1–2).
Education Level	Highest educational attainment.	0 = No Education, 1 = Up to Primary, 2 = Up to Secondary, 3 = Higher.
Age	Respondent's age in years.	Continuous (years).
Sex	Respondent's gender.	1 = Male, 2 = Female.
Marital Status	Current marital status.	1 = Currently Married or in a Living Relationship, 2 = Unmarried/Widowed/Divorced/Separated.
Religion	Religious affiliation.	0 = Minorities, 1 = Hindu.
Caste	Caste category.	0 = Backward Castes (SC, ST, OBC), 1 = Forward Castes (Other Caste).
Region	Geographic region of residence.	North: Jammu & Kashmir, Himachal Pradesh, Punjab, Chandigarh, Uttarakhand, Haryana, Delhi, Rajasthan, Central: Uttar Pradesh, Chhattisgarh, Madhya Pradesh. East: Bihar, West Bengal, Jharkhand, Odisha, Northeast: Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, West: Gujarat, Daman and Diu, Dadra and Nagar Haveli, Maharashtra, Goa, South: Andhra Pradesh, Karnataka, Lakshadweep, Kerala, Tamil Nadu, Puducherry, Andaman and Nicobar Islands, Telangana.

Appendix B: State-Wise Distribution of the Prevalence of Depression Among Older Adults in India

State	% of Depressed Older Adults	State	% of Depressed Older Adults
Andaman and Nicobar	45.59	Lakshadweep	15.88
Andhra Pradesh	28.19	Madhya Pradesh	35.8
Arunachal Pradesh	17.11	Maharashtra	24.14
Assam	12.72	Manipur	14.44
Bihar	22.06	Meghalaya	8.04
Chandigarh	18.95	Mizoram	17.1
Chhattisgarh	24.17	Nagaland	7.9
Dadra and Nagar Ha	28.73	Odisha	20.48
Daman and Diu	28.51	Puducherry	31.98
Delhi	37.44	Punjab	20.67
Goa	22.74	Rajasthan	24.95
Gujarat	24.86	Sikkim	24.23
Haryana	33.75	Tamil Nadu	26.72
Himachal Pradesh	20.78	Telangana	31.3
Jammu and Kashmir	46.67	Tripura	18.49
Jharkhand	27.01	Uttar Pradesh	34.13
Karnataka	45.5	Uttarakhand	30.08
Kerala	30.3	West Bengal	39.81