

Burden and Correlates of Sleep Disorders Among Older Adults in India: A Secondary Analysis of the Longitudinal Ageing Study in India (LASI) Wave 1

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Abstract

Objective: This study aimed to assess the prevalence and patterns of sleep disorders among older adults in India and examine the influence of depression, functional status (ADL and IADL) and physical activity on sleep health.

Methods: A secondary analysis of the 2017-2018 Longitudinal Ageing Study in India (LASI) was conducted among adults aged ≥60 years with complete sleep-related data. Sleep disorder was defined as self-reported frequent sleep disturbances. Weighted prevalence estimates and multivariable logistic regression accounting for complex survey design were used to identify sociodemographic, behavioural and health-related determinants. Results are presented as Adjusted Odds Ratios (AORs) with 95% Confidence Intervals (CIs).

Results: The prevalence of frequent sleep disorder among older adults was 0.95% as per the symptom-based definition. However, a substantially larger proportion reported occasional sleep disturbances, indicating a broader burden of sleep-related complaints. In adjusted analysis, depression emerged as a strong independent predictor of sleep disorder. Older adults with depressive symptoms had higher odds of reporting a sleep disorder compared to those without depression. Multimorbidity (2 or more chronic conditions) was also truly associated with increased odds of sleep disorder. Physical inactivity was identified as an additional modifiable risk factor. Sociodemographic factors such as age, sex and marital status were not associated with sleep disorders after adjusting for health-related variables.

Conclusion: Despite low prevalence under the LASI definition, sleep disorders remain important among older Indians. Mental health, chronic diseases and lifestyle factors outweigh demographics, highlighting the need for integrated sleep, mental health and geriatric care.

Keywords: Sleep Disorder; Older Adults; Depression; Multimorbidity; Physical Activity; India; LASI

Introduction

Sleep is a critical physiological process essential for maintaining physical health and psychological well-being. Despite its importance, sleep disturbances have emerged as a significant public health challenge, particularly among older populations, where they are linked to reduced quality of life and increased morbidity [1]. The ageing process is naturally characterised by shifts in sleep architecture, including diminished deep sleep stages and a higher frequency of nighttime awakenings [2]. These

biological changes are frequently compounded by a complex interplay of chronic morbidities, mental health disorders and lifestyle factors [3,4].

According to the International Classification of Sleep Disorders (ICSD-3-TR), sleep-related conditions are organised into six primary groups based on their clinical characteristics and underlying causes [5]. Chronic insomnia is identified by long-term struggles with sleep initiation or maintenance, often involving premature awakening and resulting in significant daytime impairment [6]. Sleep-related breathing disorders include conditions in which abnormal respiration disrupts sleep, most commonly obstructive sleep apnea, central sleep apnea and sleep-related hypoventilation [7]. Central disorders of hypersomnolence involve excessive daytime sleepiness not primarily caused by disturbed nighttime sleep, including narcolepsy (with or without sudden muscle weakness), idiopathic hypersomnia and Kleine-Levin syndrome [8,9]. However, until recently, there has been a lack of comprehensive, nationally representative data to guide screening programs and sleep hygiene education. Understanding sleep prevalence and aetiology of sleep disorders in this context is essential for informed public health planning and the facilitation of healthy ageing. To address this gap, we use the LASI Wave 1 data for comprehensive evaluation, a nationally representative survey of adults aged 45 years and above and their spouses, which has detailed information on health, functioning and lifestyle circumstances of older Indians. Although LASI surveys adults aged ≥ 45 years, the present analysis focuses on individuals aged ≥ 60 years. This dataset enables an in-depth assessment of sleep problems and their correlates within the broader context of multimorbidity and ageing in India [10]. This study aims to assess the burden of sleep disorders among adults aged 60 years and above in India and to identify key determinants, including sociodemographic, health-related, functional and lifestyle factors. The findings contribute to the existing literature on sleep health and provide evidence to inform targeted interventions and policy strategies for ageing populations in low- and middle-income countries.

Methodology

Study Design and Data Source

This study is a secondary data analysis based on Wave 1 (2017-2018) of the Longitudinal Ageing Study in India (LASI), a nationally representative longitudinal survey conducted by the International Institute for Population Sciences (IIPS), Mumbai, under the Ministry of Health and Family Welfare, Government of India. LASI collected detailed information on health, economic and social well-being from 72,250 individuals aged 45 years and above and their spouses across 31 states and union territories. For the present analysis, the sample was restricted to respondents aged 60 years and above, in accordance with the World Health Organization (WHO) definition of older adults. A total of 31,464 individuals aged 60 years and above were included in the descriptive analysis, while 30,633 participants with complete information on key covariates were retained for the multivariable regression analysis. Fig. 1 study flow diagram describing the selection of participants from the LASI Wave-1 dataset for the analysis of sleep disorders among older adults (≥ 60 years).

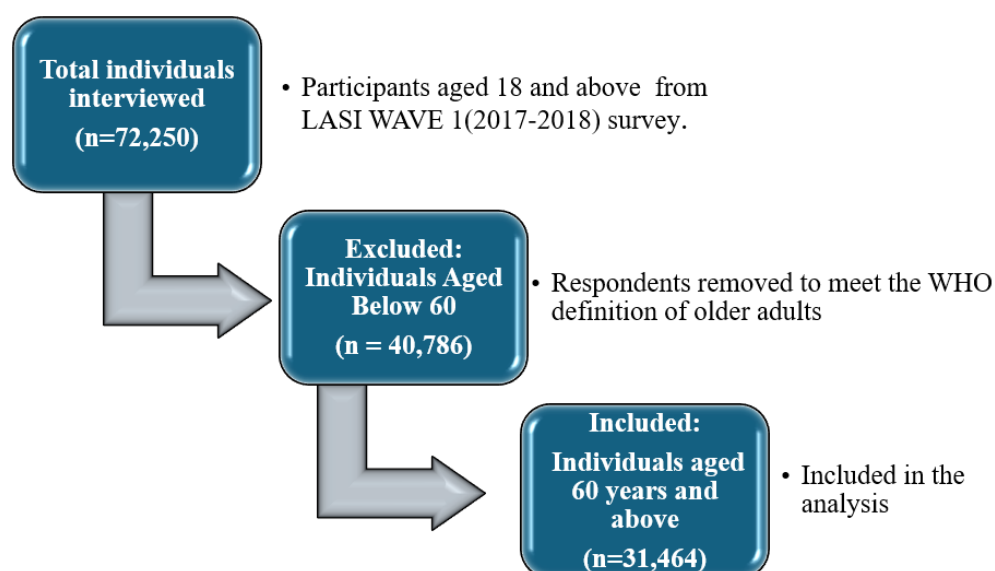


Figure 1: Study flow diagram describing the selection of participants from the LASI Wave-1 dataset for the analysis of sleep disorders among older adults (≥ 60 years).

Sleep Disorder (Outcome Variable)

Sleep disorder was assessed using sleep-related measures derived from the Jenkins Sleep Scale (JSS), as included in the Longitudinal Ageing Study in India (LASI). The JSS is a validated, widely used instrument for assessing common sleep complaints in population-based surveys. It captures key dimensions of sleep disturbance, including difficulties with sleep initiation, sleep maintenance, early morning awakening, daytime fatigue and daytime napping, thereby providing a practical measure of sleep problems in large epidemiological studies. Respondents were asked about the frequency of sleep problems experienced during the past month across five domains: difficulty falling asleep, repeated awakenings at night, waking earlier than desired, feeling tired during the daytime and daytime napping. Each item was measured on a four-point Likert scale: never, rarely (1-2 nights per week), occasionally (3-4 nights per week) and frequently (5 or more nights per week). Following LASI methodology, respondents who reported experiencing sleep problems “frequently” were classified as having a symptom-based sleep disorder. The outcome variable was dichotomized as sleep disorder present (1) or absent (0) [10].

Independent Variables

Based on the literature review and availability in LASI, the following covariates were included. The analysis was restricted to individuals aged 60 years and above, in accordance with the classification of older adults by the World Health Organization. Age was categorised into two groups: 60-79 years (older adults) and ≥ 80 years (oldest old). After applying the age restriction (≥ 60 years), the final analytical sample comprised 31,464 older adults. Sex was classified as male or female. Place of residence was categorised as rural or urban. Social group (caste) and religion were included as categorical variables based on self-reported responses. Religion was regrouped into major categories (Hindu, Muslim and Others) by combining smaller religious groups. Marital status was categorised into three groups: currently married; currently unmarried (widowed/divorced/separated); and never married. Educational attainment was classified into three levels. Retirement status was assessed as a binary variable (yes/no).

Clinical Design

Chronic morbidity was assessed using self-reported diagnoses of nine chronic conditions, including hypertension, diabetes, heart disease, stroke, lung disease, arthritis, osteoporosis, cancer and neurological conditions. A chronic disease count was generated by summing the presence of these conditions. The count was further categorized into no chronic condition, one chronic condition and two or more chronic conditions.

Mobility limitations were measured using nine items assessing difficulty in physical movements. A mobility difficulty score was generated by summing reported difficulties and categorized into no difficulty, one to two difficulties and three or more difficulties. Limitations in “Activities of Daily Living” (ADL) were measured using six items, while limitations in “Instrumental Activities of Daily Living” (IADL) were evaluated using seven items. For both ADL and IADL, counts were generated and categorised as no difficulty, one or more limitations and two or more limitations.

Depression was assessed using two validated instruments: Standardised instruments, including the “Centre for Epidemiologic Studies Depression Scale” (CES-D) and the “Composite International Diagnostic Interview” (CIDI), were used to evaluate depressive symptoms. For CES-D, ten items were recoded into binary indicators, with reverse coding applied to positively worded items. A total CES-D score was generated by summing all items and depression was defined as a score of ≥ 4 , indicating the presence of depressive symptoms. For CIDI, two separate symptom clusters were evaluated. Binary variables were generated for each symptom and cluster-specific scores were calculated. Major depression was defined as the presence of symptoms in either cluster. A composite depression variable was created, classifying participants as having depression if they screened positive on either CES-D or CIDI.

Statistical Analysis

Data were analysed using Stata version 14.1 StataCorp LP, College Station, TX, USA. All analyses accounted for the complex survey design of the Longitudinal Ageing Study in India (LASI), including stratification and clustering. Sampling weights were applied to obtain nationally representative estimates. Descriptive statistics were used to summarise the characteristics of the study population. computed to summarise the distribution of sociodemographic, health-related, functional and lifestyle characteristics of the study population. The prevalence of sleep disorders was estimated with corresponding 95% confidence intervals.

Bivariate analyses were conducted to examine the association between sleep disorders and selected explanatory variables using appropriate statistical tests. Subsequently, multivariable logistic regression models were fitted to assess the independent association of key determinants-such as depression, multimorbidity, functional limitations and physical inactivity-with sleep disorders after adjusting for relevant covariates. Adjusted Odds Ratios (AORs) along with their 95% Confidence Intervals (CIs) were presented. Statistical significance was considered at a p-value of less than 0.05. The spatial distribution map was prepared using QGIS version 3.44 (Solothurn), an open-source geographic information system software.

Ethical Considerations

Since the study was based on secondary analysis of publicly available data, additional ethical approval was not required. Ethical approval for the original data collection of the Longitudinal Ageing Study in India (LASI) was obtained from multiple collaborating institutions, including the “Indian Council of Medical Research, New Delhi”; the “Institutional Review Board” (IRB) of the “International Institute for Population Sciences (IIPS), Mumbai”; the IRB of the Harvard T.H. Chan School of Public Health; the IRB of the University of Southern California; the IRB of the ICMR-National AIDS Research Institute; and the IRBs of the Regional Geriatric Centres under the Ministry of Health and Family Welfare (MoHFW). Written informed consent was obtained from all participants prior to participation in the survey. The present study utilized an anonymized dataset made publicly available for research purposes, ensuring confidentiality and privacy of respondents.

Results

A total of 31,464 individuals aged 60 years and above from Wave 1 (2017-2018) of the Longitudinal Ageing Study in India were included in the descriptive analysis in Table 1. The majority of respondents (89.2%) were aged 60-79 years, while 10.8% belonged to the oldest-old age group (≥ 80 years), consistent with the classification of older adults by the World Health Organization. Just over half of the participants were female and most resided in rural areas (65.9%), reflecting the predominantly rural distribution of India’s older population. Nearly two-thirds (63.3%) were currently married, 34.9% were widowed, divorced or separated and 1.8% had never married. Educational qualification was generally low, with a substantial proportion having no formal schooling, followed by those with primary or lower education and a smaller share attaining secondary or higher education. In terms of social group, Other Backward Classes (OBCs) were the largest caste category, followed by Scheduled Castes and Scheduled Tribes. The majority of respondents identified as Hindu, with smaller proportions reporting Muslim, Christian, Sikh and other religious affiliations.

Health-related characteristics showed that a considerable proportion of participants reported one or more chronic conditions and a proportion of participants reported functional limitations in performing Activities of Daily Living (ADL) or Instrumental Activities of Daily Living (IADL). Symptoms indicative of depression were present in a notable fraction of the population. Approximately 1% of respondents ($n=300$) met the criteria for sleep disorder, based on the composite sleep score used in the analysis. In summary, the population largely consisted of rural older adults with varied socioeconomic status, alongside a high prevalence of chronic morbidity and functional impairments, which are key considerations in assessing sleep health in later years.

The state-level distribution shows regional variation in the prevalence of sleep disorders (Fig. 2). The pattern suggests geographic disparities in sleep disorder prevalence across Indian states, with some southern and northern regions reporting relatively higher levels compared to northeastern and smaller union territories (Fig. 3).

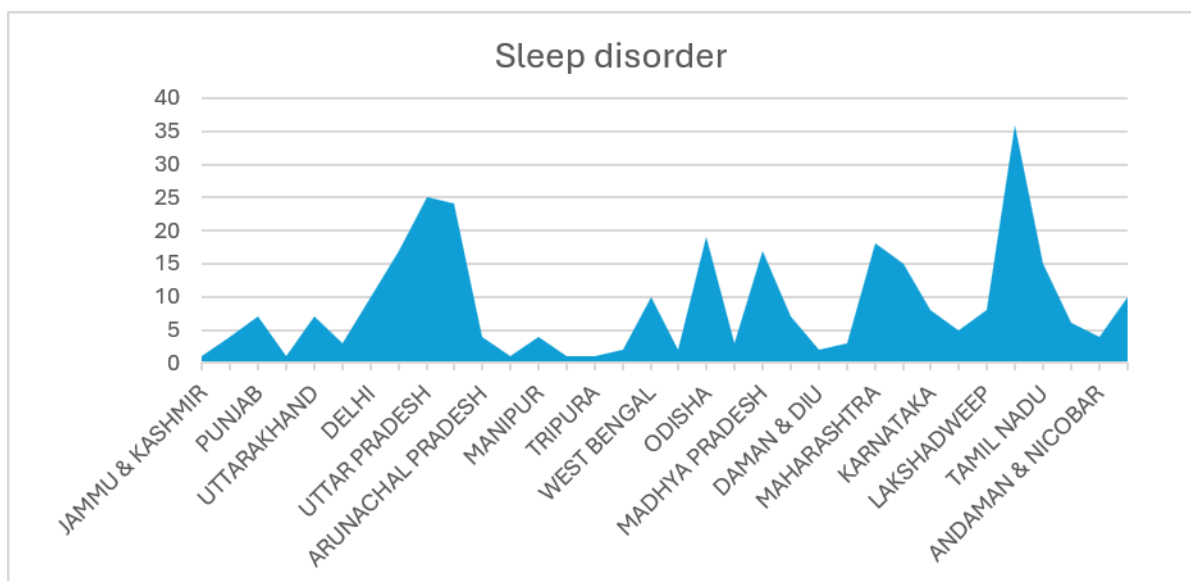


Figure 2: State-wise prevalence of sleep disorders among older adults in India, Longitudinal Ageing Study in India (LASI) Wave 1 (2017-2018).

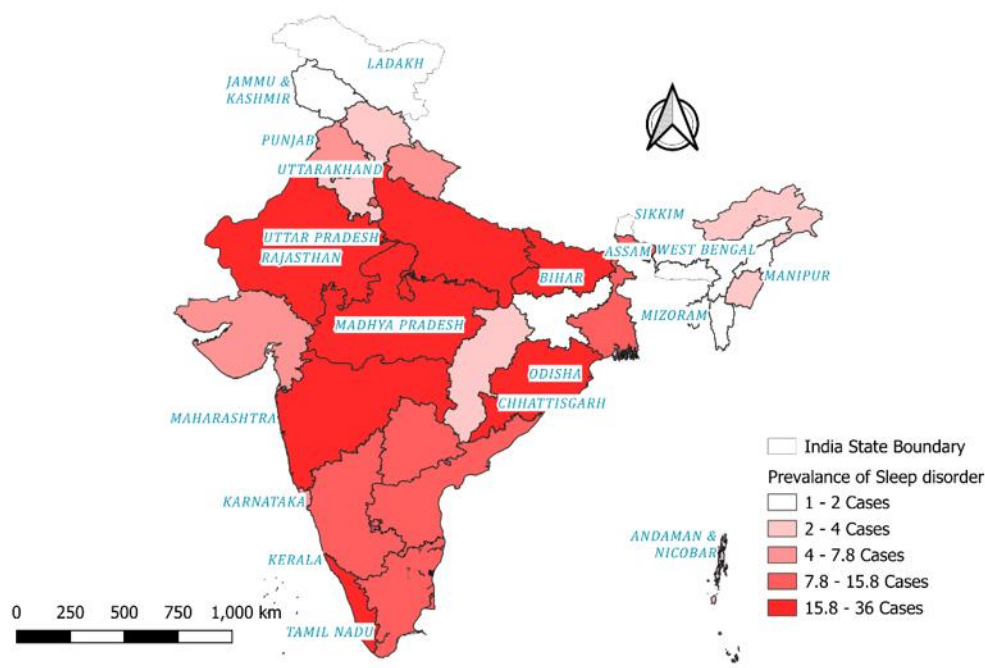


Figure 3: Prevalence of Sleep Disorder among Older Adults (≥ 60 years) in India.

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	Older adults (60-79)	28,075	89.23
	Oldest old (≥ 80)	3,389	10.77
Sex	Male	15,098	47.98
	Female	16,366	52.02
Place of residence	Rural	20,725	65.87

	Urban	10,739	34.13
Caste category	Scheduled Caste	5,140	16.9
	Scheduled Tribe	5,173	17.01
	Other Backward Class	11,886	39.08
	None of these	8,218	27.02
Religion	Hindu	23,037	73.22
	Muslim	3,731	11.86
	Others*	4,695	14.92
Marital status	Currently married	19,920	63.31
	Currently unmarried†	10,974	34.88
	Never married	570	1.81
Education level	No schooling	16,889	53.69
	Primary or lower	7,560	24.03
	Secondary or higher	7,015	22.28
Officially retired‡	Yes	2,693	11.9
	No	19,941	88.1
*Others include Christian, Sikh, Buddhist, Jain, Parsi/Zoroastrian, Jewish and other religions †Includes widowed, divorced, separated ‡Among respondents with available data (n = 22,634)			

Table 1: Socio-demographic characteristics of study participants aged ≥ 60 years (N = 31,464).

Among the 31,464 older adults included in the study, a considerable proportion reported having one or more chronic health conditions. Functional health limitations were common: a segment of participants reported difficulties in Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), indicating varying levels of dependence in routine functioning. Symptoms suggestive of depression were observed among a proportion of respondents, highlighting the burden of mental health conditions in later life, in Table 2. Regarding sleep health, approximately 1% of participants met the criteria for a sleep disorder, based on the composite sleep score derived from multiple sleep-related indicators.

In terms of health behaviours, patterns of substance use, including tobacco and alcohol consumption, varied across the study population. Self-reported health status also differed, with some respondents expressing dissatisfaction with their overall health. Collectively, these findings reflect a population with a considerable burden of physical, functional and mental health challenges, underscoring the importance of integrated approaches to address sleep health and related outcomes among older adults.

Variable	Category	Frequency (n)	Percentage (%)
Chronic conditions	None	14,420	45.83
	One chronic condition	9,245	29.38
	Two or more	7,799	24.79
Mobility difficulties	None	8,369	26.6
	One to two difficulties	5,476	17.4
	Three or more difficulties	17,619	56
ADL limitations	No difficulty	24,770	78.72
	One or more ADL limitations	2,740	8.71
	Two or more ADL limitations	3,954	12.57
IADL limitations	No difficulty	17,609	55.97
	One or more IADL limitations	3,419	10.87
	Two or more IADL limitations	10,436	33.17
Use of supportive aids	Yes	13,894	44.34
	No	17,439	55.66
Depression (CES-D)	Absent	22,958	72.97

	Present	8,506	27.03
Major depression (CIDI)	Absent	29,152	92.65
	Present	2,312	7.35
Overall depression (CES-D or CIDI)	Absent	21,998	69.91
	Present	9,466	30.09
Ever used tobacco	Yes	12,178	39.03
	No	19,026	60.97
Ever consumed alcohol	Yes	5,364	17.19
	No	25,846	82.81
Physical activity	Every day	5,533	17.74
	More than once a week	1,715	5.5
	Once a week	955	3.06
	1-3 times/month	1,342	4.3
	Hardly ever/never	21,653	69.41
Sleep disorder (composite)	No	31,164	99.05
	Yes	300	0.95

Table 2: Health-related characteristics and health behaviors of participants (N = 31,464).

In Table 3 the unadjusted weighted logistic regression analysis, depression was strongly associated with sleep disorder, with participants reporting depression having nearly three times higher odds compared with those without depression (OR = 2.88; 95% CI: 2.07-3.99; $p < 0.001$). Female participants had significantly higher odds of sleep disorder than males (OR = 1.42; 95% CI: 1.03-1.94; $p = 0.03$). Older adults aged ≥ 80 years showed higher odds compared with those aged 60-79 years (OR = 1.55; 95% CI: 1.04-2.32; $p = 0.031$). Currently unmarried individuals had higher odds than married participants (OR = 1.51; 95% CI: 1.10-2.09; $p = 0.012$), while never-married status was not significantly associated.

Education showed a protective association, with individuals having primary or lower education reporting lower odds of sleep disorder compared with those with no education (OR = 0.65; 95% CI: 0.44-0.97; $p = 0.036$). The presence of chronic conditions demonstrated a dose-response relationship, with higher odds observed among participants with one condition (OR = 1.77; 95% CI: 1.19-2.63; $p = 0.005$) and those with two or more conditions (OR = 2.85; 95% CI: 1.93-4.21; $p < 0.001$), compared with those reporting none.

Lower life satisfaction was significantly associated with sleep disorder, particularly among those reporting no satisfaction (OR = 2.74; 95% CI: 1.36-5.53; $p = 0.005$). Participants not currently working had higher odds than those who were working (OR = 1.48; 95% CI: 1.03-2.12; $p = 0.034$). Functional limitations were also strongly associated, with increased odds observed among participants reporting three or more mobility difficulties (OR = 2.27; 95% CI: 1.50-3.46; $p < 0.001$), ADL limitations (OR = 3.09; 95% CI: 2.14-4.46; $p < 0.001$) and IADL limitations (OR = 2.02; 95% CI: 1.46-2.80; $p < 0.001$).

Physical inactivity was associated with substantially higher odds of sleep disorder, with participants who hardly ever or never engaged in physical activity having over threefold higher odds compared with those active daily (OR = 3.67; 95% CI: 2.16-6.23; $p < 0.001$). Residence, religion, tobacco use and alcohol consumption were not significantly associated with sleep disorder in the unadjusted analysis.

Variable	Category	OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Depression (scale)	No (Ref.)	1	-	-	1	-	-
	Yes	2.88	2.07 - 3.99	<0.001	2.87	1.98 - 4.14	<0.001
Sex	Male (Ref.)	1	-	-	1	-	-
	Female	1.42	1.03 - 1.94	0.03	0.96	0.65 - 1.43	0.855
Residence	Rural (Ref.)	1	-	-	1	-	-

	Urban	0.98	0.70 - 1.37	0.917	1.21	0.78 - 1.86	0.397
Age group	60-79 (Ref.)	1	-	-	1	-	-
	≥80	1.55	1.04 - 2.32	0.031	0.98	0.70 - 1.38	0.928
Marital status	Married (Ref.)	1	-	-	1	-	-
	Currently unmarried	1.51	1.10 - 2.09	0.012	1.04	0.73 - 1.48	0.839
	Never married	0.26	0.04 - 1.85	0.178	0.25	0.03 - 1.86	0.177
Religion	Hindu (Ref.)	1	-	-	1	-	-
	Other	0.99	0.62 - 1.57	0.967	0.69	0.46 - 1.05	0.082
	Missing/Other	1.39	0.80 - 2.42	0.241	1.07	0.68 - 1.68	0.781
Education	No education (Ref.)	1	-	-	1	-	-
	Primary or lower	0.65	0.44 - 0.97	0.036	1.49	0.98 - 2.26	0.061
	Secondary+	0.78	0.52 - 1.18	0.24	1.89	1.26 - 2.83	0.002
Chronic conditions	None (Ref.)	1	-	-	1	-	-
	One	1.77	1.19 - 2.63	0.005	0.41	0.20 - 0.84	0.015
	Two or more	2.85	1.93 - 4.21	<0.001	1.32	0.83 - 2.09	0.242
Life satisfaction	Very satisfied (Ref.)	1	-	-	1	-	-
	Not at all satisfied	2.74	1.36 - 5.53	0.005	0.8	0.46 - 1.40	0.431
Currently working	Yes (Ref.)	1	-	-	1	-	-
	No	1.48	1.03 - 2.12	0.034	1.29	0.83 - 1.99	0.256
Self-rated health	Good (Ref.)	1	-	-	1	-	-
	Poor	0.4	0.26 - 0.62	<0.001	0.79	0.42 - 1.49	0.468
Mobility difficulties	None (Ref.)	1	-	-	1	-	-
	One or two difficulties	0.47	0.24 - 0.93	0.03	0.85	0.58 - 1.24	0.394
	More than three difficulties	2.27	1.50 - 3.46	<0.001	1	0.66 - 1.52	0.998
ADL limitation	None (Ref.)	1	-	-	1	-	-
	Two or more	3.09	2.14 - 4.46	<0.001	0.94	0.54 - 1.64	0.832
IADL limitation	None (Ref.)	1	-	-	1	-	-
	Two or more	2.02	1.46 - 2.80	<0.001	1.08	0.65 - 1.80	0.766
Physical activity	Daily (Ref.)	1	-	-	1	-	-
	Hardly ever/never	3.67	2.16 - 6.23	<0.001	1.1	0.60 - 2.03	0.762
Tobacco use	No (Ref.)	1	-	-	1	-	-
	Yes	0.86	0.61 - 1.21	0.386	1.44	0.67 - 3.07	0.35
Alcohol use	No (Ref.)	1	-	-	1	-	-
	Yes	0.79	0.50 - 1.24	0.308	1.55	0.68 - 3.53	0.295

Table 3: Factors associated with sleep disorder among older adults (unadjusted weighted (N = 31,464) and multivariable weighted logistic regression (N = 30,633)).

In Table 3 the adjusted logistic regression analysis, depression emerged as a strong and statistically significant predictor of sleep disorder. Older adults with depression had nearly three times higher odds of reporting sleep disorder compared to those without depression (AOR = 2.87; 95% CI: 1.98-4.14; $p < 0.001$). Among chronic conditions, respondents with two or more chronic diseases had significantly higher odds of sleep disorder (AOR = 1.89; 95% CI: 1.26-2.83; $p = 0.002$), while having one chronic condition showed a borderline association (AOR = 1.49; 95% CI: 0.98-2.26; $p = 0.061$). Physical inactivity was also significantly associated with sleep disorder; individuals who hardly ever or never engaged in physical activity had more than twice the odds of sleep disorder compared to those engaging daily (AOR = 2.64; 95% CI: 1.54-4.52; $p < 0.001$). Respondents reporting one to two

functional difficulties had significantly lower odds of sleep disorder compared to those reporting none (AOR = 0.41; 95% CI: 0.20-0.84; $p = 0.015$).

Overall, the findings indicate that depression, multimorbidity (two or more chronic conditions) and low frequency of physical activity are key determinants of sleep disorder among older adults, independent of sociodemographic and other health-related factors.

Sleep-related Variable	Group A: The Majority (Combining 'Never' and 'Rarely')	Group B: The Chronic Sufferers (Combining 'Occasionally' and 'Frequently')
Trouble falling asleep	79.78%	20.22%
Wake up during the night	76.27%	23.73%
Wake up too early	77.69%	22.31%
Feeling unrested	79.08%	20.93%
Take nap during the day	70.91%	29.10%

Table 4: Distribution of self-reported sleep-related symptoms among older adults.

Based on the frequency of occurrence, sleep-related responses were categorised into two groups in Table 4. Overall, most participants were classified under Group A across all assessed domains. Specifically, 79.78% of respondents reported rarely or never having difficulty initiating sleep, 76.27% rarely experienced nocturnal awakenings and 77.69% seldom reported early morning awakenings. In addition, 79.08% indicated that they rarely felt unrested after sleep. These findings indicate that a large proportion of the study population did not frequently experience major symptoms associated with insomnia.

However, a considerable proportion of participants fell into Group B, reflecting a notable burden of sleep disturbances. This higher prevalence may indicate compensatory behaviour for inadequate night sleep or age-related alterations in sleep patterns.

In summary, while the majority of participants reported relatively stable sleep patterns, approximately 20% to 30% experienced recurring sleep disturbances, highlighting a non-negligible burden of sleep-related problems in this older adult population.

Discussion

Sleep disorders are a major public health concern among older adults because they adversely affect physical health, cognitive function, emotional well-being and overall quality of life. With advancing age, physiological changes in sleep architecture, the increasing burden of chronic diseases, functional limitations and mental health conditions contribute to a higher risk of sleep disturbances. Despite the growing ageing population in India, nationally representative evidence on the burden and determinants of sleep disorders remains limited. Using data from the Longitudinal Ageing Study in India (LASI) Wave 1, the present study provides comprehensive national estimates of the prevalence of sleep disorders among older adults and identifies key sociodemographic, health-related and functional factors associated with sleep disorders. These findings contribute to the existing literature and provide evidence to inform targeted public health strategies for improving sleep health among India's ageing population.

This study provides important insights into the burden and determinants of sleep disorders among older adults in India. Although only 0.95% of respondents met the strict definition of frequent sleep disorder (i.e., reporting symptoms "frequently"), a substantially larger proportion reported recurrent sleep complaints when "occasionally" responses were included. These findings imply that while strictly defined severe sleep disorders are uncommon, subclinical sleep issues are widespread and may constitute an emerging public health concern among older adults in India. Sleep disorders are common among older adults and are associated with aging, depression, functional limitations and chronic diseases.

In the adjusted analysis, depression emerged as one of the strongest and most consistent predictors of sleep disorder. Older adults with depressive symptoms had significantly higher odds of reporting frequent sleep problems compared to those without depression. This finding aligns with established evidence demonstrating a bidirectional relationship between sleep disturbances

and depression [11,12]. Disruptions to the sleep-wake cycle often occur when an individual's internal biological clock is out of sync with their external surroundings, such as during shift work or travel [13,14]. Parasomnias refer to abnormal physical events or experiences that occur during sleep or during transitions between sleep and wakefulness. These include non-REM sleep arousal disorders such as sleepwalking and sleep terrors, REM sleep behavior disorder, nightmares and sleep-related hallucinations. Finally, sleep-related movement disorders are characterised by repetitive or stereotyped movements that disturb sleep, including restless legs syndrome, periodic limb movement disorder, sleep-related bruxism and sleep-related leg cramps [12-14]. Together, these categories encompass the full spectrum of clinically recognised sleep disorders.

The demographic landscape of India adds a layer of urgency to this issue. India is undergoing a rapid demographic transition, with the population expected to increase to reach 1.5 billion by the year 2050 [18]. The elderly population (aged 60+) is expected to grow significantly to around 319-347 million by then, representing about 20% of the total population [18]. Poor sleep quality impairs cognitive function, heightens chronic disease risks and diminishes quality of life, particularly in aging populations with rising multimorbidity.

In India, where adults over 60 face unique stressors like unemployment, retirement or sedentary/low-demand jobs and limited healthcare access, sleep problems aggravate vulnerabilities in diabetes (~24% prevalence) and CVD pathways [19]. Disrupted sleep patterns and habits negatively affect overall well-being [20]. Some sleep disorders interfere with normal brain function, preventing individuals from achieving restful sleep. While adults typically require 7 to 8 hours of rest, insufficient sleep can impair cognitive function and diminish quality of life [21]. Chronic insomnia is linked to insulin resistance via sympathetic activation, consistent across large prospective designs. Short sleep duration compounds this effect, with combined risks exceeding traditional factors like obesity [22]. The consequences of sleep disorder extend beyond mere tiredness. They can weaken the immune system, making individuals more susceptible to infections [23]. Persistent sleep disorders have been associated with a serious condition of developing chronic conditions such as diabetes, cardiovascular disease and cancer [24,25]. Poor sleep can aggravate depressive symptoms through neurobiological and psychosocial pathways, while depression itself disrupts sleep architecture and circadian regulation. These results underscore the importance of integrating sleep assessment within mental health screening programs for older adults [12,26].

Multimorbidity was another significant determinant. Participants with two or more chronic conditions had elevated odds of sleep disorder compared to those without chronic illnesses. Chronic diseases such as hypertension, diabetes and arthritis are often accompanied by pain, discomfort, medication effects and psychological stress, all of which can impair sleep continuity and quality [27]. The combined impact of multiple conditions may intensify physiological dysregulation, increasing the risk of ongoing sleep disturbances [28]. These findings highlight the need for comprehensive chronic disease management approaches that incorporate sleep health as a routine component of care.

Physical inactivity also showed a significant association with sleep disorder. Older adults who did not engage in regular physical activity were more likely to report frequent sleep problems. Physical activity is known to regulate circadian rhythms, improve mood, reduce systemic inflammation and enhance overall sleep quality [29]. The observed association reinforces the potential role of lifestyle interventions in promoting healthy sleep among older populations. Community-based programs encouraging age-appropriate exercise may therefore serve as cost-effective strategies to mitigate sleep-related problems. Overall, the findings emphasise that sleep disorder in later life is closely linked to mental health, chronic disease burden and lifestyle factors than demographic characteristics [30,31]. Public health strategies aimed at promoting healthy aging in India should therefore incorporate routine screening for depression, strengthened management of multimorbidity and promotion of physical activity. Addressing these modifiable determinants may substantially improve sleep health and overall quality of life among India's rapidly growing older population. The results highlight the need for a multidisciplinary approach to sleep health in India. Public health programs should integrate sleep assessments into primary care, particularly for high-risk groups such as women, older adults and those with depression or chronic conditions. Community-based interventions promoting physical activity, tailored to the physical capabilities of older adults, could yield significant benefits. Mental health services, including CBT-I and depression screening, should be scaled up, especially in rural areas where access is limited. Policy initiatives, such as the National Programme for Health Care of the Elderly (NPHCE), should incorporate sleep health as a core component of geriatric care. Additionally, public awareness campaigns can educate older adults about sleep hygiene and the importance of lifestyle modifications.

Limitations

Due to LASI is a cross-sectional data; therefore, causal relationships cannot be established and the temporal direction between sleep disorders and associated factors such as depression or chronic conditions cannot be determined. The use of pre-existing survey variables limited the analysis to available measures, restricting the inclusion of potentially important factors such as detailed medication use, clinical sleep diagnoses and comprehensive lifestyle variables. Sleep disturbances were assessed through self-reported responses, which may be subject to recall bias and misclassification. Cultural practices, environmental sleep conditions and regional differences were not specifically captured in the dataset and therefore could not be examined in depth.

Strength of Study

This study identifies key sociodemographic, mental health, functional and behavioural factors associated with sleep disorders among older adults in India. The study adopts the World Health Organisation (WHO) classification of older adults, defining the geriatric population as individuals aged 60 years and above [32].

Depression, multimorbidity (multiple chronic conditions), functional limitations and physical inactivity were significantly associated with higher odds of sleep disorders, even after adjusting for potential confounders in multivariable models. The findings highlight the importance of routine screening for sleep disorders within geriatric care, especially among individuals with multimorbidity and functional impairment, to support early identification and integrated management.

Utilizing follow-up waves of the LASI can help establish temporal relationships between sleep disorders and their influencing factors. Intervention trials testing non-pharmacological approaches, such as exercise programs or mindfulness-based therapies, are needed to develop strategies suitable for widespread applications. Exploring the role of social determinants, such as income inequality or family structure, could provide deeper insights into sleep disparities. Additionally, qualitative studies can uncover cultural perceptions of sleep and barriers to seeking treatment, informing culturally tailored interventions.

Conclusion

This secondary analysis of nationally representative data demonstrates that sleep disturbances are highly prevalent among older adults in India, with a substantial proportion reporting difficulty initiating or maintaining sleep and experiencing daytime fatigue. Depression, multimorbidity, functional limitations and physical inactivity emerged as key determinants of poor sleep, while women, older individuals (≥ 60 years) and those who are currently unmarried were particularly vulnerable. Higher education and regular physical activity showed protective associations. These findings indicate the need to recognise sleep health as a critical component of healthy ageing in India. Integrating routine sleep assessment into primary care, strengthening mental health services, promoting physical activity and addressing chronic disease management may substantially improve sleep outcomes and overall well-being among older adults. Targeted interventions for high-risk groups are essential to reduce the growing burden of sleep disorders in an ageing population.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement

This study is based on publicly available data from the Longitudinal Ageing Study in India (LASI) Wave 1 (2017-2018). Researchers may obtain access to the dataset through the LASI data repository upon registration and approval. No new data were created in this study.

Declaration of AI-Assisted Writing

The authors used an artificial intelligence (AI)-based language tool solely to assist with grammar correction, language refinement and sentence structure improvement during manuscript preparation. The authors reviewed, edited and verified all content and take full responsibility for the accuracy, integrity and originality of the manuscript. No AI tool was used for data analysis, interpretation of results or generation of scientific conclusions.

Ethical Statement

Ethical approval for the original data collection of the Longitudinal Ageing Study in India (LASI) was obtained from multiple collaborating institutions, including the “Indian Council of Medical Research, New Delhi”; the “Institutional Review Board” (IRB) of the “International Institute for Population Sciences (IIPS), Mumbai”; the IRB of the Harvard T.H. Chan School of Public Health; the IRB of the University of Southern California; the IRB of the ICMR-National AIDS Research Institute; and the IRBs of the Regional Geriatric Centres under the Ministry of Health and Family Welfare (MoHFW). Written informed consent was obtained from all participants prior to participation in the survey.

Informed Consent Statement

Informed consent was obtained from all participants included in the study.

Authors’ Contributions

SK and SP conceptualized and designed the study; SP and SKe conducted data curation and formal analysis, SP and SKe interpreted the findings, SP and RP prepared visualisations and drafted the manuscript. All authors reviewed, revised and approved the final version of the manuscript.

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