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Ageing and the Accumulation of Chronic Disease: A National Analysis of Multimorbidity in India

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Abstract

Population ageing and the increasing burden of non-communicable diseases have intensified the prevalence of multiple chronic conditions among elderly. This study examines the prevalence and socio-demographic determinants of single morbidity and multimorbidity among elderly individuals in India using data from the first wave of the Longitudinal Ageing Study in India (LASI), 2017–18. The analysis included individuals aged 60 years and above. Descriptive statistics and multivariate logistic regression models were employed to estimate prevalence and identify determinants of multimorbidity. Results show that 29.3% of elderly individuals reported single morbidity, while 16.6% experienced multimorbidity. The likelihood of multimorbidity increased with age and was significantly higher among urban residents, individuals with higher educational attainment, and those belonging to wealthier households. Conversely, currently working elderly individuals were less likely to report multimorbidity. Significant regional variations were also observed across states and union territories. The findings highlight the need for integrated and person-centered healthcare strategies to address the growing burden of chronic diseases among India's ageing population.

Keywords: Single morbidity, Multimorbidity, Elderly

Introduction

Population ageing is emerging as one of the most significant demographic transformations of the twenty-first century. Globally, the number of individuals aged 60 years and above is projected to double by 2050, reaching over 2 billion [1]. India, home to one of the largest ageing populations in the world, is experiencing a rapid demographic transition characterized by declining fertility, increasing life expectancy, and epidemiological shifts from communicable to non-communicable diseases (NCDs). According to recent estimates, the proportion of elderly persons in India is steadily increasing, creating new challenges for health systems that were traditionally oriented toward infectious disease control [2].

In parallel with demographic ageing, India is undergoing an epidemiological transition marked by a rising burden of chronic non-communicable diseases such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers. These conditions now account for more than 60% of total deaths in the country (India State-Level Disease Burden Initiative Collaborators, 2017). As life expectancy improves, elderly's are increasingly exposed to prolonged periods of chronic disease risk, resulting not merely in single disease conditions but in the coexistence of multiple chronic illnesses.

Multimorbidity, commonly defined as the presence of two or more chronic conditions in the same individual, has emerged as a critical public health concern, particularly among ageing populations [3]. Unlike single morbidity, multimorbidity complicates clinical management, increases polypharmacy, raises healthcare expenditures, and substantially reduces quality of life [4]. Individuals with multimorbidity are more likely to experience functional limitations, mental health problems, and premature mortality [5]. Furthermore, health systems in low- and middle-income countries (LMICs), including India, are often structured around vertical disease-specific programs, making integrated care for multimorbid patients particularly challenging.

Evidence from high-income countries suggests that multimorbidity increases sharply with age and disproportionately affects socioeconomically disadvantaged populations [5,3]. However, emerging evidence from LMICs presents a more complex pattern. In India, some studies indicate higher reporting of multimorbidity among individuals with greater educational attainment and wealth, possibly reflecting improved diagnosis and healthcare access rather than true disease differentials [6]. Urban– rural disparities further complicate the landscape, as urban residents may face higher exposure to lifestyle risk factors such as sedentary behavior, pollution, and dietary transitions, while rural populations may experience underdiagnosis due to limited healthcare access.

Gender differences in multimorbidity have also been documented, with women often reporting higher prevalence due to longer life expectancy and cumulative lifetime health disadvantages [7]. Marital status, employment, and social support networks play significant roles in shaping health outcomes among elderlys. Social determinants such as caste, wealth, and education remain deeply embedded in India's health inequalities framework, influencing access to preventive care and treatment.

Despite growing recognition of multimorbidity as a major health challenge, nationally representative evidence on its prevalence and determinants in India remains limited. Earlier studies have often relied on localized surveys or focused on specific disease combinations. The availability of data from the Longitudinal Ageing Study in India (LASI) 2017–18**,** a nationally representative survey of elderlys, provides an unprecedented opportunity to examine the burden and socio-demographic determinants of multimorbidity across states and union territories.

Understanding the patterns of multimorbidity is critical for informing integrated geriatric care models, designing preventive strategies, and allocating healthcare resources efficiently. As India's elderly population continues to expand, addressing multimorbidity will require a shift from disease-specific approaches toward person-centered and comprehensive chronic care frameworks.

Therefore, the present study aims to examine the prevalence, socio-demographic determinants of single morbidity and multimorbidity among elderly individuals in India by state/UTs.

Materials and Methods

Data Source

This study utilizes data from Wave 1 of the Longitudinal Ageing Study in India (LASI), 2017-18, a nationally representative survey conducted by the International Institute for Population Sciences (IIPS), Mumbai, in collaboration with national and international partners.

Study Population

The analytical sample comprises elderly respondents aged 60 and above with complete information on chronic disease status and relevant socio-demographic variables.

Outcome Variable

Morbidity was categorized into two mutually exclusive groups: single morbidity, and multimorbidity. Single morbidity was defined as the presence of exactly one chronic condition, while multimorbidity was defined as the coexistence of two or more chronic conditions within the same individual. The chronic conditions considered in the analysis included cardiovascular diseases, chronic lung disease, diabetes, and cancer, based on self-reported physician diagnoses available in the LASI 2017-18 dataset.

Explanatory Variables

The explanatory variables included a range of demographic, socio-economic, behavioral, and social characteristics that are theoretically and empirically associated with chronic disease accumulation. Demographic variables comprised sex (male/female), and marital status (never married, currently married, widowed/divorced/separated). Socio-economic variables included current working status (working/not working), educational attainment (no education, less than 5 years, 5-9 years, and 10 years or more), wealth quintile (poorest, poorer, middle, richer, richest), caste (Scheduled Caste, Scheduled Tribe, Other Backward Class, and others), and place of residence (rural/urban). Behavioral factors such as ever smoked (yes/no), ever consumed alcoholic beverages (yes/no), and level of physical activity (very active, fairly active, not active) were also included. Additionally, living arrangements (living alone; living with spouse and/or others; living with spouse and children; living with children and others; living with others only) were considered to capture social support dynamics among the elderly population.

Statistical Analysis

The statistical analysis was carried out in three stages: descriptive analysis, bivariate analysis, and multivariate logistic regression modeling.

Initially, descriptive statistics were computed to estimate the prevalence of single morbidity and multimorbidity among elderly individuals aged 60 years and above. Prevalence rates were calculated as the proportion of individuals reporting morbidity divided by the total elderly population in the sample and expressed as percentages. Estimates were disaggregated by age group, sex, marital status, educational attainment, wealth quintile, caste, employment status, place of residence, behavioral characteristics, and living arrangements. State-level and rural– urban differentials were also examined.

To examine the determinants of morbidity, multivariate logistic regression analysis was employed. Logistic regression is appropriate when the dependent variable is dichotomous. In this study, two separate binary outcomes were constructed: (i) single morbidity (1 = presence of one chronic condition; 0 = none) and (ii) multimorbidity (1 = presence of two or more chronic conditions; 0 = fewer than two conditions). Let $\pi(X)$ denote the probability that an individual experiences morbidity (single or multiple), given a set of covariates $X = (X1, X2, ..., Xk)$. The logistic regression model specifies this probability using the logistic (inverse logit) function:

$$\pi(x) = \frac{e^{\beta 0 + \beta 1 X1 + \beta 2 X2 + \cdots + \beta \rho X\rho}}{1 + e^{\beta 0 + \beta 1 X1 + \beta 2 X2 + \cdots + \beta \rho X\rho}}$$

where:

- $\pi(X)$= probability of experiencing morbidity
- β_0= intercept
- $\beta_1, \beta_2, . . . , \beta_k$= regression coefficients
- $X_1, X_2, . . . , X_k$= explanatory variables

To obtain a linear relationship between predictors and the dependent variable, the logit transformation of the probability function was applied:

$$\text{Logit} [\pi (X) = \text{In} [\frac{\pi(X)}{1-\pi(X)}]$$

Substituting the logistic function, the multivariate logistic regression equation becomes: $\text{logit} [\pi (x)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_\rho X\rho$

This formulation transforms the probability, which ranges between 0 and 1, into a continuous scale ranging from $-\infty$ to $+\infty$, making it suitable for linear modeling.

The coefficients β_k represent the change in the log odds of morbidity associated with a one-unit increase in the corresponding predictor variable, holding other variables constant. Exponentiating the coefficients provides odds ratios (OR):

$OR=e^{\beta k}$

An odds ratio greater than 1 indicates increased odds of morbidity, while an odds ratio less than 1 indicates reduced odds relative to the reference category.

Interpretation of the Intercept (β_0)

The intercept β_0 represents the log odds of morbidity when all explanatory variables are set to zero (i.e., for the reference categories). The baseline probability of morbidity when all covariates equal zero is given by:

$$\pi(x) = \frac{e^{\beta 0}}{1+e^{\beta 0}}$$

Thus, β_0 establishes the baseline event rate for the reference group.

To assess the factors associated with multimorbidity among the elderly, multivariate logistic regression analysis was conducted, given the binary nature of the outcome variable (presence of two or more chronic conditions versus fewer than two conditions). The model estimates the likelihood of experiencing multimorbidity as a function of demographic, socio-economic, behavioral, and social characteristics.

Four sequential models were specified to examine the contribution of different sets of predictors. Model I included demographic variables such as age, sex, and marital status. Model II further incorporated socio-economic factors, including educational attainment, employment status, caste, and place of residence. Model III added behavioral and social variables such as smoking, alcohol consumption, physical activity, and living arrangements. Finally, Model IV was the fully adjusted model that included all explanatory variables simultaneously to estimate their independent effects on multimorbidity. The results are presented as odds ratios with corresponding 95% confidence intervals.

Results

Prevalence of Single Morbidity and Multimorbidity

At the national level, 54.0% of elderly individuals aged 60 years and above reported no chronic morbidity, 29.3% reported single morbidity, and 16.6% experienced multimorbidity. These findings indicate that nearly one in six elderlys in India lives with two or more chronic conditions (Table 1).

Multimorbidity increased with age. Among individuals aged 60–65 years, 14.6% reported multimorbidity, which rose to 16.8% among those aged 65–70 and peaked at 19.5% among those aged 70–75 years. A slight decline was observed among those aged 75 years and above (17.3%). A similar age gradient was observed for single morbidity, with prevalence increasing from 26.8% in the youngest elderly cohort to 32.0% among those aged 75+.

Sex differences were evident. Females reported higher single morbidity (31.5%) compared to males (27.0%). However, multimorbidity was slightly more prevalent among males (17.0%) than females (16.3%). Marital status showed variation in morbidity patterns, with widowed, divorced, or separated individuals exhibiting higher single morbidity (32.0%), while currently married individuals reported slightly higher multimorbidity (17.1%) compared to never married individuals (11.0%).

Employment status demonstrated a notable protective pattern. Elderly individuals who were currently working reported substantially lower multimorbidity (8.8%) compared to those not working (19.9%). Similarly, working individuals had lower single morbidity prevalence (22.9%) than non-working individuals (31.0%).

A socio-economic gradient was observed in multimorbidity prevalence. Individuals with 10 or more years of education reported the highest prevalence (27.6%), compared to 11.8% among those with no education. Wealth quintile showed a similar pattern: the richest quintile had a multimorbidity prevalence of 24.3%, compared to 11.2% among the poorest.

Place of residence revealed marked differences. Rural residents reported higher multimorbidity (25.3%) compared to urban residents (12.2%) in descriptive estimates. Caste differentials were also present, with Scheduled Tribe individuals showing lower multimorbidity (9.3%) compared to Scheduled Caste individuals (13.2%) and those in other caste categories (22.4%).

State-Level Variation

Substantial geographic variation in multimorbidity prevalence was observed across states and Union Territories. Kerala reported the highest prevalence at 36.0%, followed by Goa (26.6%), Chandigarh (30.9%), Lakshadweep (29.4%), and Puducherry (28.1%). In contrast, the lowest prevalence was observed in Nagaland (4.6%), Arunachal Pradesh (8.4%), and Meghalaya (6.5%) (Table 2).

Single morbidity also varied widely across states. Goa (40.6%), Haryana (39.2%), and Punjab (38.5%) recorded high levels of single morbidity, whereas Nagaland (13.8%) and Arunachal Pradesh (19.1%)

reported comparatively lower levels.

Sex-disaggregated state-level analysis revealed modest differences between males and females in most regions. In states such as Goa and Lakshadweep, females exhibited higher multimorbidity than males, whereas in Haryana and Punjab, males reported slightly higher prevalence. In several states, including Himachal Pradesh and Delhi, prevalence levels were nearly identical across sexes.

Rural–Urban Differentials

Nationally, multimorbidity prevalence was higher in urban areas (25.3%) compared to rural areas (12.1%) when stratified by residence in adjusted state-level comparisons. Across most states, urban residents exhibited greater multimorbidity than rural residents (Table 3). For example, in Andhra Pradesh, multimorbidity was 32.3% in urban areas compared to 20.3% in rural areas. Similar patterns were observed in Karnataka (31.2% vs. 13.3%) and Maharashtra

(29.0% vs. 14.0%).

However, exceptions were noted. In Kerala and Lakshadweep, multimorbidity prevalence was similar across rural and urban settings, suggesting relatively uniform chronic disease burden within these regions (Table 4).

Table 1: Prevalence (%) of single morbidity and multimorbidity by background characteristics, 2017-18.

Background Characteristics	Prevalence (%)	
Age	**Single morbidity**	**Multimorbidity**
60-65	26.8	14.6
65-70	30.1	16.8
70-75	29.6	19.5
75+	32.0	17.3
Sex		
Male	27.0	17.0
Female	31.5	16.3
Current Marital Status		
Never married	24.6	11.0
Currently married	27.9	17.1
Widowed/divorced/separated	32.0	16.1
Currently working		
No	31.0	19.9
Yes	22.9	8.8
Missing	33.6	20.1
Educational status		
No education	27.5	11.8
Less than 5 years	30.5	18.2
5-9 years completed	30.7	20.7
10 years or more	33.0	27.6
Wealth quintile		
Poorest	24.6	11.2
Poorer	28.1	13.4
Middle	30.2	15.7
Richer	31.2	19.5
Richest	33.0	24.3
Place of residence		
Urban	26.8	12.2
Rural	34.1	25.3
Caste		
Schedule caste	28.5	13.2
Schedule tribe	22.6	9.3
Other backward class	29.7	16.9

None of them	33.0	22.4
Ever smoked		
No	30.7	18.7
Yes	27.1	13.5
Consume alcohol		
No	30.1	17.1
Yes	25.4	14.6
Play out door game/sports/exercise/yoga		
Very much active	33.6	25.0
Fairly active	29.7	18.1
Total	**29.3**	**16.6**

Table 2: Prevalence (%) of single morbidity and multimorbidity in India by states/UT's, 2017-18.

States	**Prevalence**	
	Single morbidity	**Multimorbidity**
Andhra Pradesh	31.0	23.3
Arunachal Pradesh	19.1	8.4
Assam	32.4	12.0
Bihar	25.4	11.3
Chhattisgarh	19.3	7.5
Goa	40.6	26.6
Gujarat	27.2	15.7
Haryana	39.2	13.4
Himachal Pradesh	31.8	16.7
Jharkhand	24.2	9.5
Karnataka	25.8	18.6
Kerala	33.0	36.0
Madhya Pradesh	22.4	9.2
Maharashtra	30.6	21.1
Manipur	29.3	11.0
Meghalaya	29.3	6.5
Mizoram	30.1	12.0
Nagaland	13.8	4.6
Odisha	26.0	10.1
Punjab	38.5	20.4
Rajasthan	30.8	14.1
Tamil Nadu	30.1	22.2
Telangana	32.8	16.5
Tripura	30.3	14.9
Uttar Pradesh	23.0	9.7

Uttarakhand	29.9	11.8
West Bengal	34.2	21.7
Union Territories		
A & Nicobar	34.6	20.8
Chandigarh	31.7	30.9
D & Nagar Haveli	20.4	8.2
Daman & Diu	29.0	21.4
Delhi	33.9	22.2
Jammu & Kashmir	36.5	19.1
Lakshadweep	33.0	29.4
Puducherry	34.6	28.1
India	**29.3**	**16.6**

Table 3: Prevalence (%) of multimorbidity by place of residence and by background characteristics India ,2017-18.

Background Characteristics	Prevalence (%)	
Age	**Rural**	**Urban**
60-65	10.6	22.3
65-70	11.8	26.3
70-75	14.1	29.7
75+	13.6	24.7
Sex		
Male	12.6	26.0
Female	11.8	24.7
Current Marital Status		
Never married	6.1	16.9
Currently married	12.5	26.2
Widowed/divorced/separated	11.7	24.1
Currently working		
No	15.4	28.1
Yes	6.5	16.3
Missing	14.8	27.0
Educational status		
No education	9.6	19.6
Less than 5 years	13.7	26.3
5-9 years completed	15.8	27.0
10 years or more	23.0	30.2
Wealth quintile		
Poorest	6.7	19.7
Poorer	8.7	22.5
Middle	11.6	24.0
Richer	15.2	27.8

Richest	19.4	33.5
Caste		
Schedule caste	10.3	22.0
Schedule tribe	6.7	18.4
Other backward class	12.7	24.9
None of them	17.2	28.5
Ever smoked		
No	13.4	26.6
Yes	10.7	22.0
Ever consumed any alcoholic beverages		
No	12.5	25.3
Yes	10.7	25.5
Play out door game/sports/exercise/yoga		
Very much active	19.8	28.6
Fairly active	13.9	23.7
Not at all active	11.8	25.3
Total	**12.2**	**25.3**

Table 4: Prevalence (%) of multimorbidity by place of residence in India by State/UTs, 2017-18.

States	**Prevalence**		
	Rural	**Urban**	**Total**
Andhra Pradesh	20.3	32.3	23.3
Arunachal Pradesh	9.1	4.5	8.4
Assam	10.4	21.1	12.0
Bihar	11.0	14.3	11.3
Chhattisgarh	5.0	18.7	7.5
Goa	25.6	27.3	26.6
Gujarat	13.4	18.8	15.7
Haryana	11.0	19.3	13.4
Himachal Pradesh	15.8	25.4	16.7
Jharkhand	6.1	23.0	9.5
Karnataka	13.3	31.2	18.6
Kerala	36.0	36.0	36.0
Madhya Pradesh	6.5	17.5	9.2
Maharashtra	14.0	29.0	21.1
Manipur	8.6	15.7	11.0
Meghalaya	5.4	12.9	6.5
Mizoram	8.8	15.3	12.0
Nagaland	3.3	8.3	4.6
Odisha	8.1	21.1	10.1
Punjab	17.5	28.0	20.4
Rajasthan	11.5	23.7	14.1
Tamil Nadu	15.0	27.6	22.2
Telangana	10.8	29.2	16.5
Tripura	12.3	24.7	14.9
Uttar Pradesh	7.8	17.2	9.7
Uttarakhand	9.1	20.8	11.8
West Bengal	14.0	29.4	21.7
Union Territories			
Andaman & Nicobar	17.5	26.4	20.8
Chandigarh	0.0	31.2	30.9
Dadar & Nagar Haveli	4.0	16.5	8.2
Daman & Diu	15.5	24.6	21.4
Delhi	12.5	22.3	22.2
Jammu & Kashmir	16.9	25.3	19.1
Lakshadweep	29.2	29.5	29.4
Puducherry	22.0	30.4	28.1
India	**12.1**	**25.3**	**16.6**

Determinants of Single Morbidity

Binary logistic regression analysis demonstrated that age was significantly associated with single morbidity. Compared to individuals aged 60–65 years, those aged 65–70 had 15% higher odds of single morbidity (OR = 1.15; 95% CI: 1.08–1.23), and those aged 75+ had 17% higher odds (OR = 1.17; 95% CI: 1.09–1.26).

Females were 17% more likely than males to experience single morbidity (OR = 1.17; 95% CI: 1.09–1.25). Currently working individuals were 26% less likely to report single morbidity compared to non-working individuals (OR = 0.74; 95% CI: 0.70–0.79). Urban residence increased the likelihood of single morbidity by 25% (OR = 1.25; 95% CI: 1.19–1.33). Scheduled Tribe individuals had significantly lower odds of single morbidity compared to Scheduled Caste individuals (OR = 0.74; 95% CI: 0.67–0.81) (Table 5).

Determinants of Multimorbidity

Multivariate logistic regression analysis identified age as the strongest predictor of multimorbidity. In the fully adjusted model, individuals aged 70–75 years were 33% more likely to experience multimorbidity compared to those aged 60–65 years (OR = 1.33; 95% CI: 1.20–1.44). Those aged 75+ had 10% higher odds (OR = 1.10; 95% CI: 1.00–1.21).

Marital status was significantly associated with multimorbidity. Currently married individuals had nearly twice the odds (OR = 1.92; 95% CI: 1.32–2.79), and widowed/divorced/separated individuals had 79% higher odds (OR = 1.79; 95% CI: 1.23–2.62), compared to never married individuals.

Employment remained protective; working individuals were 55% less likely to report multimorbidity (OR = 0.45; 95% CI: 0.41–0.49). Urban residence significantly increased the likelihood of multimorbidity (OR = 1.85; 95% CI: 1.73–1.98). Educational attainment showed a positive association, with individuals having 10 or more years of education exhibiting 65% higher odds compared to those with no education (OR = 1.65; 95% CI: 1.50–1.83).

Scheduled Tribe individuals had lower odds of multimorbidity compared to Scheduled Caste individuals (OR ≈ 0.67). Behavioral factors demonstrated mixed effects, with some associations potentially reflecting survival bias rather than causal relationships (Table 6).

Table 5: Odds ratio (OR) along with 95% confidence interval (CI) of single morbidity among the elderly by background characteristics, 2017-18

Background characteristics	OR (95% CI)
Age	
60-65®	
65-70	1.15 (1.08-1.23)
70-75	1.08 (1.00-1.17)
75+	1.17 (1.09-1.26)
Sex	
Male®	
Female	1.17 (1.09-1.25)
Current Marital Status	
Never married ®	
Currently married	1.04 (0.78-1.38)
Widowed/divorced/separated	0.78 (0.53-1.16)

Currently working	
No®	
Yes	0.74 (0.70-0.79)
Educational status	
No education®	
Less than 5 years	1.18 (1.09-1.28)
5-9 years completed	1.15 (1.07-1.23)
10 years or more	1.16 (1.06-1.26)
Place of residence	
Rural®	
Urban	1.25 (1.19-1.33)
Caste	
Schedule caste®	
Schedule tribe	0.74 (0.67-0.81)
Other backward class	0.98 (0.91-1.06)
None of them	1.02 (0.94-1.10)
Ever smoked	
No®	
Yes	1.00 (0.94-1.06)
Ever consumed any alcoholic beverages	
No®	
Yes	0.96 (0.89-1.03)
Play out door game/sports/exercise/yoga	
Very much active®	
Fairly active	0.92 (0.80-1.05)
Not at all active	0.93 (0.82-1.05)

Living arrangements	
Living alone®	
Living with spouse and/or others	0.99 (0.73-1.34)
Living with spouse and children	1.03 (0.77-1.39)
Living with children and others	1.09 (0.97-1.23)
Living with others only	1.07 (0.91-1.24)

Table 6: Odds ratio (OR) along with 95% confidence interval (CI) of multimorbidity by demographic and socio-economic characteristics in India, 2017-18.

	OR (95% CI)			
Background characteristics	**Model I**	**Model II**	**Model III**	**Model IV**
Age				
60-65®				
65-70	1.19 (1.10-1.29)			1.13 (1.04-1.23)
70-75	1.45 (1.33-1.58)			1.33 (1.20-1.44)
75+	1.27 (1.17-1.39)			1.10 (1.00-1.21)
Sex				
Male®				
Female	1.00 (0.93-1.06)			0.90 (0.83-0.99)
Current Marital Status				
Never married ®				
Currently married	1.69 (1.17-2.43)			1.92 (1.32-2.79)
Widowed/divorced/separated	1.49 (1.03-2.15)			1.79 (1.23-2.62)
Currently working				
No®				
Yes		0.44 (0.40-0.47)		0.45 (0.41-0.49)
Missing		1.00 (0.93-1.07)		1.03 (0.95-1.12)
Educational status				
No education®				
Less than 5 years		1.53 (1.388-1.68)		1.51 (1.37-1.67)
5-9 years completed		1.60 (1.48-1.74)		1.57 (1.44-1.72)
10 years or more		1.74 (1.59-1.91)		1.65 (1.50-1.83)
Place of residence				
Rural®				
Urban		1.86 (1.74-1.99)		1.85 (1.73-1.98)
Caste				
Schedule caste®				
Schedule tribe		0.66 (0.58-0.75)		0.67 (0.59-0.76)
Other backward class		1.10 (1.00-1.21)		1.09 (0.99-1.20)
None of them		1.16 (1.05-1.29)		
Ever smoked				
No®				
Yes			0.68 (0.64-0.73)	0.85 (0.78-0.91)

Ever consumed any alcoholic beverages		
No®		
Yes	0.96 (0.88-1.05)	1.02 (0.93-1.13)
Play out door game/sports/exercise/yoga		
Very much active®		
Fairly active	0.66 (0.56-0.77)	0.89 (0.76-1.04)
Not at all active	0.58 (0.51-0.66)	0.96 (0.84-1.19)
Living arrangements		
Living alone®		
Living with spouse and/or others	1.31 (1.12-1.53)	1.21 (0.82-1.78)
Living with spouse and children	1.31 (1.13-1.52)	1.31 (0.89-1.92)
Living with children and others	1.23 (1.06-1.44)	1.17 (1.00-1.37)
Living with others only	1.11 (0.91-1.35)	1.16 (0.94-1.42)

Discussion

Using nationally representative data from LASI 2017–18, this study provides comprehensive evidence on the prevalence and determinants of multimorbidity among elderlys in India. We find that 16.6% of elderly individuals live with two or more chronic conditions, with prevalence rising sharply with age and varying substantially across socio-economic and geographic contexts. These findings must be interpreted within the broader framework of India's demographic and epidemiological transitions.

India is undergoing a classic epidemiological transition characterized by a shift from infectious to non-communicable diseases [8,9]. As mortality from infectious causes declines and life expectancy increases, populations experience prolonged exposure to cardiometabolic and degenerative conditions. The age gradient observed in this study—where individuals aged 70 years and above exhibit significantly higher odds of multimorbidity—aligns with cumulative biological wear and tear across the life course. This is consistent with the concept of "allostatic load," whereby long- term exposure to stressors accelerates physiological decline [10].

The slight decline in prevalence among those aged 75+ may reflect selective survival. Individuals with severe multimorbidity may have lower survival probabilities, leading to a healthier surviving cohort at older ages—a phenomenon widely discussed in ageing research [11].

Contrary to evidence from many high-income settings where lower socio-economic status predicts higher multimorbidity [5], this study finds higher reported prevalence among more educated and wealthier elderly individuals. This pattern may reflect the "diagnostic access hypothesis," whereby socio-economically advantaged individuals are more likely to undergo screening and receive medical diagnoses. In low- and middle-income countries, detection bias can reverse the expected socio-economic gradient in chronic disease prevalence [12].

At the same time, urban lifestyles associated with affluence—sedentary behavior, dietary transition, and

stress—may genuinely elevate cardiometabolic risk. Thus, the observed association likely reflects both improved detection and genuine lifestyle-related disease burden.
hese findings underscore the importance of distinguishing between diagnosed prevalence and true underlying morbidity in settings with unequal healthcare access.
Urban residents had significantly higher odds of multimorbidity in adjusted models. This finding is consistent with urban health penalty theories, which argue that rapid urbanization in lower-middle income countries (LMICs) produces increased exposure to pollution, psychosocial stress, and unhealthy dietary patterns [13]. Urban areas may also facilitate earlier detection due to better healthcare infrastructure.
Conversely, lower reported prevalence in rural areas may not imply lower disease burden but rather underdiagnosis. Rural populations often face limited healthcare access, reduced screening, and delayed diagnosis. Therefore, rural–urban differences likely reflect both structural health system inequalities and genuine differences in exposure to non-communicable disease risk factors.
The coexistence of high chronic disease burden alongside persistent infectious disease risk illustrates the "double burden of disease" characteristic of transitional economies.
While single morbidity was higher among women, multimorbidity prevalence was similar between sexes nationally, with state-level variation. Gender differences in multimorbidity must be interpreted through both biological and social lenses. Women's longer life expectancy increases cumulative exposure to chronic disease risk [7]. Moreover, gendered life-course disadvantage including limited economic autonomy and caregiving burdens may contribute to chronic stress and poorer long-term health outcomes. However, gender differences in healthcare utilization also shape reporting patterns. Women may engage more frequently with healthcare services, increasing diagnosis likelihood. This interplay between biology, social determinants, and health-seeking behavior complicates simplistic interpretations of gender disparities.
Employment emerged as a strong protective factor. Working elderly individuals were significantly less likely to report multimorbidity. This finding resonates with active ageing theory [14], which emphasizes continued participation in economic and social activities as critical for maintaining health and functional capacity.
However, reverse causality must be considered. Healthier individuals are more likely to remain employed, a classic "healthy worker effect." Longitudinal data would be required to disentangle whether employment causally protects against multimorbidity or simply reflects baseline health selection.
Nonetheless, the findings suggest that policies promoting flexible employment opportunities for elderly may contribute indirectly to healthier ageing trajectories.
Marital status showed a significant association with multimorbidity. While marriage is often protective due to social support mechanisms [15], the higher odds among currently married and widowed individuals suggest more complex dynamics. Shared lifestyle exposures within marriage and psychosocial stress following widowhood may elevate chronic disease risk. Social isolation following marital disruption may further compound health deterioration, consistent with social integration theory (Berkman & Syme, 1979). These findings emphasize the role of social networks and emotional support structures in shaping late-life health.
Kerala and several Union Territories reported particularly high prevalence of multimorbidity. Kerala's advanced demographic transition, high life expectancy, and robust health infrastructure likely contribute to higher detection rates. In contrast, lower prevalence in northeastern states may reflect younger population age structures or limited healthcare access. Regional heterogeneity suggests that

multimorbidity patterns are embedded within broader demographic and institutional contexts. Health system capacity, state-level development, and cultural factors likely shape both exposure and diagnosis.

Conclusion

This study positions multimorbidity as a central challenge of population ageing in India. The burden is substantial and patterned by age, socio-economic position, marital status, employment, and geography. The findings reinforce epidemiological transition theory while highlighting detection inequalities in lower-resource settings.

The positive association between wealth and multimorbidity underscores the need to interpret chronic disease prevalence within the context of healthcare access and diagnostic infrastructure. Urban–rural disparities further illustrate structural inequalities in exposure and detection. Employment's protective association supports active ageing frameworks but requires longitudinal validation.

Policy responses must shift from vertical, disease-specific approaches toward integrated, person-centered chronic care systems. Strengthening primary healthcare, expanding routine screening in rural areas, and addressing lifestyle risk factors in urban settings are critical.

Future research should adopt longitudinal designs to examine disease clustering, trajectories, and causal pathways. Additionally, integrating biomarkers with self-reported data would improve accuracy and reduce detection bias. As India's elderly population expands rapidly, understanding and addressing multimorbidity will be central to achieving equitable and sustainable health system development.

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References

1. United Nations. World population ageing 2020 highlights: Living arrangements of older persons. New York: United Nations Department of Economic and Social Affairs; 2020.
2. Arokiasamy P, Bloom DE, Lee J, Feeney K, Ozolins M. Longitudinal Aging Study in India: Vision, design, implementation, and preliminary findings. Washington (DC): National Academies Press; 2015.
3. Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, et al. Aging with multimorbidity: A systematic review of the literature. Ageing Res Rev. 2011;10(4):430–9.
4. Violan C, Foguet-Boreu Q, Flores-Mateo G, Salisbury C, Blom JW, Freitag M, et al. Prevalence, determinants and patterns of multimorbidity in primary care: A systematic review of observational studies. PLoS One. 2014;9(7):e102149.
5. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: A cross-sectional study. Lancet. 2012;380(9836):37–43.
6. Pati S, Swain S, Hussain MA, Kadam S, Salisbury C. Prevalence and outcomes of multimorbidity in South Asia: A systematic review. BMJ Open. 2015;5(10):e007235.
7. Juster RP, McEwen BS, Lupien SJ. Allostatic load biomarkers of chronic stress and impact on health

and cognition. Neurosci Biobehav Rev. 2010;35(1):2–16.

8. Omran AR. The epidemiologic transition: A theory of the epidemiology of population change. Milbank Mem Fund Q. 1971;49(4):509–38.
9. India State-Level Disease Burden Initiative Collaborators. Nations within a nation: Variations in epidemiological transition across the states of India, 1990–2016. Lancet. 2017;390(10111):2437–60.
10. McEwen BS, Seeman T. Protective and damaging effects of mediators of stress: Elaborating and testing the concepts of allostasis and allostatic load. Ann N Y Acad Sci. 1999;896:30–47.
11. Fries JF. Aging, natural death, and the compression of morbidity. N Engl J Med. 1980;303(3):130–5.
12. Subramanian SV, Corsi DJ, Subramanyam MA, Davey Smith G. Jumping the gun: The problematic discourse on socioeconomic status and cardiovascular health in India. Int J Epidemiol. 2009;38(5):1410–22.
13. Vlahov D, Galea S, Freudenberg N, Proietti F. Urban health: Toward an urban health advantage. J Urban Health. 2007;84(1 Suppl):i16–i29.
14. World Health Organization. Active ageing: A policy framework. Geneva: WHO; 2002.
15. Mendola P, Hyder ML, Cox C, Berkman LF. Marital status and mortality: The role of health. Soc Sci Med. 2011;73(7):1083–9.