Prevalence and Determinants of Communicable, Non-Communicable, and Dual Disease Burden among Older Adults in India: Evidence from LASI Wave I

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Abstract: Most existing studies on the double burden of communicable (CDs) and non-communicable diseases (NCDs) among older adults in India report these conditions separately, often leading to overlapping categories and obscuring their true distribution. This study, analyzed the distinct contribution of CDs alone, NCDs alone, and their coexistence, along with the associated determinants, which are essential for health planning. This study used nationally representative data from Wave I of the Longitudinal Aging Study in India (2017–18), including 31,347 adults aged ≥60 years. Respondents were classified into three mutually exclusive categories: only CDs (OCD), only NCDs (ONCD), and both (ONCD & OCD). Chi-square tests and piecewise binary logistic regression were used to examine associations with socio-demographic, lifestyle, and regional factors. Prevalence of OCD, ONCD, and ONCD & OCD was 11.8%, 39.3%, and 15.1%, respectively; overall, 66.2% of older adults had at least one communicable disease, at least one non-communicable disease, or the coexistence of both. Females and overweight individuals were more likely to experience ONCD and ONCD & OCD, whereas underweight individuals had higher odds of OCD. Urban residents showed higher odds of ONCD but lower odds of OCD. Substantial state-level variation was observed, with the highest prevalence of ONCD & OCD in Haryana (29%), ONCD in Kerala (68%), and OCD in Chhattisgarh (33%). These non-overlapping estimates provide important insights into the disease profile of India's elderly and emphasize the need for integrated, elderly-focused interventions addressing both communicable and non-communicable disease risks.

Keywords: Communicable diseases, dual burden, elderly, India, non-communicable diseases.

INTRODUCTION

The global age distribution has shifted markedly in recent decades as life expectancy has increased. Most people worldwide can now expect to live into their 60s and beyond [1]. This demographic change stems largely from reduced mortality in early life, improved maternal and child survival, and declining infectious diseases in low- and middle-income countries [2]. In high-income countries, gains are further supported by reduced mortality in later life [3]. Consequently, both developed and developing countries are experiencing population aging, creating new challenges for healthcare, labor markets, and social systems [4]. By 2030, one in six people globally will be aged ≥60, and the population aged ≥80 is projected to triple between 2020 and 2050, reaching 426 million [5].

South Asia, while still characterized by young populations, is already facing aging-related health challenges [6, 7]. In India, with 8% or more of the population now aged ≥60 [6, 8-10], the health system confronts a "double burden" of disease: infectious diseases (CDs), which remain prevalent, and rapidly rising non-communicable diseases (NCDs) [11]. Historically, CDs such as tuberculosis, diarrheal diseases, and respiratory infections dominated India's mortality profile. Today, chronic conditions including hypertension, diabetes, and cardiovascular disease have surged, driven by demographic aging, sedentary lifestyles, and dietary changes. For older adults, this combined exposure is particularly concerning, as declining physiological resilience and reduced social support heighten vulnerability. Once considered diseases of affluence, NCDs are now widespread in low- and middle-income countries [6,12]. According to India's National Health Mission, NCDs account for 71% of global deaths annually (41 million), and one in four Indians is at risk of dying from an NCD before age 70 [4,13].

The co-occurrence of CDs and NCDs poses a mounting threat for health systems [14]. India's epidemiological transition, marked by the persistence of CDs alongside increasing NCDs [15], underscores the need for integrated healthcare strategies [7,16]. Several studies have assessed the prevalence of chronic diseases among older adults and identified socio-demographic and lifestyle determinants [17-18]. For instance, hypertension was the most prevalent condition among Indians aged ≥50, with up to 35.9% prevalence and high levels of under-diagnosis and under-treatment [17]. According to LASI Wave-I, hypertension affected 26.9% of older adults, with 7.8% reporting co-morbidity with diabetes [18]. Among those aged ≥60, prevalence was 26.7% for CDs and 53.1% for NCDs [6].

Despite such estimates, a critical gap remains: most studies assess CDs and NCDs separately, often producing overlapping prevalence that obscures the unique burden of each and their coexistence. For example, reported prevalence of NCDs often includes individuals who also suffer from CDs, and vice versa,

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complicating understanding of disease-specific burdens. Disaggregating these groups is essential to inform health system preparedness and targeted interventions for the elderly.

The present study addresses this gap by classifying individuals in LASI Wave-I into four mutually exclusive categories: (i) only communicable diseases (OCD), (ii) only non-communicable diseases (ONCD), (iii) coexistence of both (ONCD & OCD), and (iv) neither condition. This classification allows more precise estimates of CDs, NCDs, their coexistence, and conditional prevalence. By analyzing socio-demographic, anthropometric, and lifestyle correlates, this study offers new insights into the distribution of single and dual disease burdens among India's elderly, a perspective critical for designing integrated infectious and chronic disease interventions.

DATA AND METHODOLOGY

Data

We used data from the Longitudinal Ageing Study in India (LASI) Wave-I, conducted in 2017–18. LASI is a nationally representative, multidisciplinary, and internationally harmonized panel survey including 72,250 individuals aged ≥45 years and their spouses, covering all Indian states and union territories except Sikkim. The survey was conducted by the International Institute for Population Sciences (IIPS), in collaboration with the University of Southern California (USC) and the Harvard T.H. Chan School of Public Health (HSPH) [19]. A multistage stratified area probability cluster sampling design was employed, with household, individual, biomarker, and community schedules.

Sample and Measures

Of 72,250 participants, 31,464 respondents aged ≥60 were eligible. Because the study focuses on elderly health risks, individuals <60 were excluded. Participants self-reported diagnosis of NCDs (hypertension, diabetes, cancer, chronic lung disease, heart disease, stroke, bone/joint disorders, neurological/psychiatric issues, high cholesterol) as binary responses (Yes = 1, No = 0). Communicable diseases (jaundice/hepatitis, tuberculosis, malaria, diarrhea/gastroenteritis, typhoid, urinary tract infection, anemia, chikungunya, dengue) were assessed for the past 2 years, also binary. Responses were aggregated to classify disease burden into four categories: ONCD (NCDs only), OCD (CDs only), ONCD & OCD (both), and None (neither). After excluding 117 cases with missing data, the final sample comprised 31,347 elderly individuals (Supplementary Figure **S1**).

Analytical Approach

To assess correlates of disease burden, we considered 15 risk factors. Socio-demographic factors included age (60–64, 65–69, ≥70), residence (rural/urban), gender, schooling (ever/never), religion (Hindu/other), marital status (in union/not in union), living arrangement (with spouse/children v/s not), and life satisfaction. Anthropometric factors included waist-hip ratio (low/moderate/high), body mass index (underweight ≤18.5, normal 18.5–24.9, overweight ≥25), and activities of daily living (dependent/independent). Socioeconomic and lifestyle variables included housing type (pucca /not), MPCE quintile, tobacco/alcohol use, and present work status (currently working, previously worked but not currently working, and never worked). Selection was informed by prior studies using SAGE [17], LASI [18], and other sources highlighting the roles of education, wealth, residence, obesity, tobacco/alcohol use, religion, and waist-hip ratio in disease risk [20-23]. Where necessary, categories were collapsed to meet analytical requirements for regression modeling.

Statistical Analysis

To estimate prevalence, the analytical sample of 31,347 elderly individuals aged 60 years and above was classified into four mutually exclusive categories: ONCD & OCD (diagnosed with at least one non-communicable and one communicable disease), ONCD (at least one NCD only), OCD (at least one CD only), and None (neither NCD nor CD). The distribution was as follows: ONCD & OCD (4,719), ONCD (12,307), OCD (3,705), and None (10,616). To further assess disease burden, conditional prevalence was calculated by comparing ONCD & OCD with ONCD (for NCDs) and ONCD & OCD with OCD (for CDs). Given that both the dependent and independent variables were categorical, chi-square tests were first applied to examine bivariate associations between disease categories and selected risk factors. However, chi-square tests only indicate association without adjusting for confounders. To overcome this, binary logistic regression models were employed. Although multinomial logistic regression is commonly recommended for outcomes with multiple unordered categories [24], preliminary examination of the data revealed substantial sparsity across several predictor–outcome combinations, resulting in unstable cell distributions. Such sparse data may lead to unreliable parameter estimates and convergence issues in multinomial logistic regression [25]. Therefore, a piecewise binary logistic regression approach was adopted, in which three separate models were fitted comparing ONCD versus None, OCD versus None, and ONCD & OCD versus None. This approach

provided stable and easily interpretable estimates for each disease category. All statistical analyses were performed using SPSS version 30.

RESULTS

Based on the analytical sample of 31,347 elderly individuals, the estimated prevalence of ONCD & OCD, ONCD, and OCD is presented in Figure **1a**. Specifically, the prevalence of ONCD was 39.3%, OCD was 11.8%, and ONCD & OCD was 15.1%. These estimates further revealed that prevalence of NCDs as 54.4%, CDs as 26.9% and at least one of these as 66.2% among elderly groups respectively.

Further, Figures **1a**, **1b** and **1c** display the conditional prevalence of diseases. The number of individuals in each group was 12,307 (ONCD), 4,719 (ONCD & OCD), and 3,705 (OCD).

Table **1** shows the prevalence of specific non-communicable and communicable diseases. Hypertension emerged as the most prevalent NCD among the elderly, particularly within the ONCD group, followed by the ONCD & OCD group. Chronic bone/joint disease (17.8%) was the second most prevalent, followed by diabetes (15.48%). For each NCD, prevalence was generally more than twice as high in the ONCD group compared to ONCD & OCD, except for chronic lung disease.

Among CDs, diarrhea/gastroenteritis had the highest prevalence (13.4%), followed by malaria (7.61%), typhoid (4.89%), and anemia (3.98%). Interestingly, diarrhea/gastroenteritis was more common in the ONCD & OCD group (7.14%) compared to the OCD group (6.26%), indicating that individuals with both NCDs and CDs might be at higher

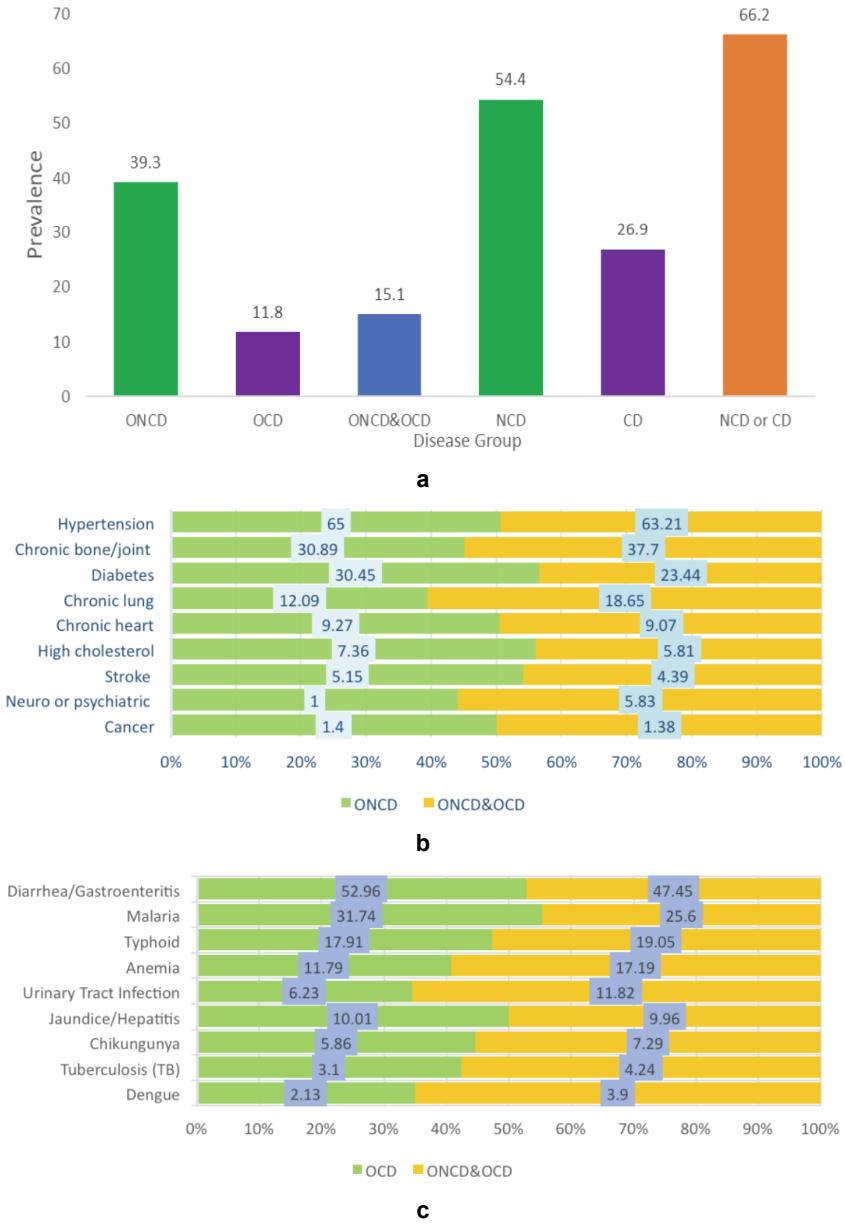

Figure 1: a. Prevalence of OCD & ONCD, ONCD, OCD in Indi. **b.** Conditional prevalence of specific NCD in ONCD and ONCD & OCD groups. **c.** Conditional prevalence of specific communicable diseases in ONCD and ONCD & OCD.

Table 1: Prevalence of Non-Communicable and Communicable Diseases among Elderly

Ever diagnosed with NCDs	ONCD & OCD	ONCD	Total	Had acute CDs in past two years	ONCD& OCD	OCD	Total
Hypertension	9.52%	25.52%	35.03%	Diarrhea/gastroenteritis	7.14%	6.26%	13.4%
Cancer	0.21%	0.55%	0.76%	Malaria	3.86%	3.75%	7.61%
Chronic lung disease	2.81%	4.75%	7.55%	Typhoid	2.87%	2.02%	4.89%
Chronic heart diseases	1.37%	3.64%	5.01%	Anemia	2.59%	1.39%	3.98%
Stroke	0.66%	2.02%	2.68%	Jaundice/hepatitis	1.5%	1.18%	2.68%
Chronic bone/joint diseases	5.68%	12.13%	17.8%	Urinary tract infection	1.78%	0.74%	2.52%
high cholesterol	0.87%	2.89%	3.76%	Chikungunya	1.1%	0.69%	1.79%
Neurological or psychiatric problems	0.88%	1.81%	2.69%	Tuberculosis (TB)	0.64%	0.37%	1%
Diabetes	3.53%	11.96%	15.48%	Dengue	0.59%	0.25%	0.84%

Note: Percentages are not mutually exclusive because participants may report more than one communicable or non-communicable disease. Therefore, the percentages within each disease category do not sum to 100%.

risk for some infections. To better understand disease burden, conditional prevalence was also calculated.

Figure **2a** displays the increase in diseases specific conditional prevalence of NCDs among ONCD & OCD compared to ONCD. A positive increase indicates a higher burden in ONCD & OCD (co-morbid group).

Chronic lung disease (35.17%), neurological/psychiatric problems (20.93%), and chronic bone/joint disease (18.06%) were more prevalent in the ONCD & OCD group, suggesting that these age-related NCDs are more common among those also suffering from CDs. In contrast, lifestyle-related NCDs such as diabetes, high cholesterol, stroke, hypertension, heart disease, and cancer were more prevalent in the ONCD group, generating a hypothesis that age-related NCDs may co-occur with CDs, whereas lifestyle-related NCDs may occur independently. Figure **2b** examines a similar comparison for CDs between ONCD & OCD and OCD groups. Higher prevalence of urinary tract infections (47.29%), dengue (45.38%), anemia (31.41%), tuberculosis (26.89%), Chikungunya (19.62%), and typhoid (10.29%) was observed in the ONCD & OCD group. Conversely, malaria, diarrhea/gastroenteritis, and jaundice/hepatitis had higher prevalence among the OCD group, as indicated by negative increase rates.

Table **2** shows the prevalence of ONCD, OCD, and ONCD & OCD by Indian states and union territories, stratified by rural and urban residence.

Figures **3a**, **3b**, and **3c** illustrates the spatial distribution of disease prevalence.

For ONCD & OCD (overall prevalence 15.1%), the rural prevalence was slightly higher (15.5%) than urban (14.2%).

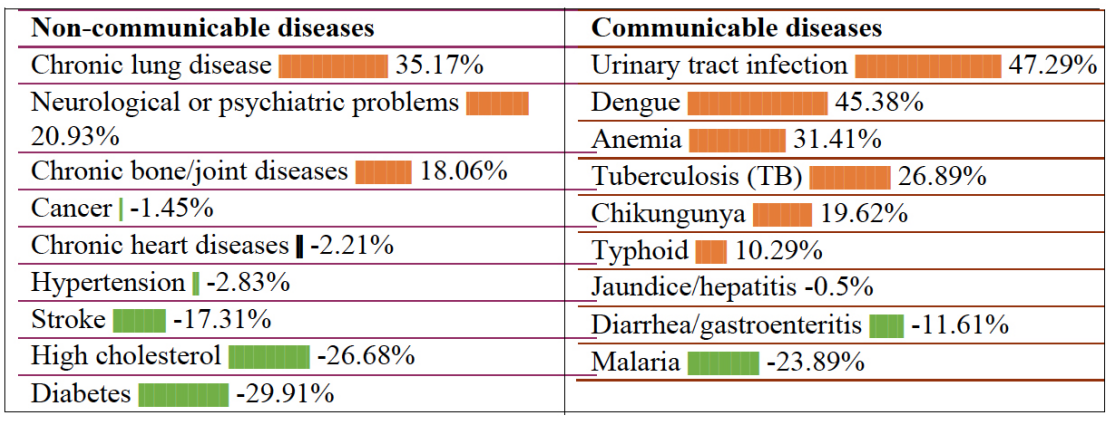

Figure 2: a. Increase percent of disease specific prevalence among co-morbid (ONCD & OCD) than ONCD elderly. **b.** Increase percent of disease specific prevalence among co-morbid (ONCD & OCD) than OCD elderly.

Table 2: State Wise Distribution of Elderly with Morbidity of ONCD & OCD, ONCD and OCD

State	Total elderly	ONCD & OCD (%)			ONCD (%)			OCD (%)		
		Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
J& K[1]	730	11.9	11.9	11.9	49.7	61.1	52.7	6	2.1	4.9
Himachal Pradesh	617	23.3	20.3	23	31.4	37.3	31.9	12.7	6.8	12.2
Punjab	1002	22.1	21.8	22.1	42.2	47.3	43.6	10.2	10.9	10.4
Chandigarh	387	0	17.8	17.6	75	49.6	49.9	0	4.4	4.4
Uttarakhand	641	12.6	15.4	13.3	35.6	49	38.7	8.5	6	8
Haryana	847	26	36.4	29	27.8	33.2	29.4	16.7	15.8	16.4
Delhi	495	37.5	23.4	23.6	25	37.8	37.6	0	12.3	12.1
Rajasthan	1076	28.7	27.4	28.4	21.3	34.5	24.1	22.2	11.7	20
Uttar Pradesh	2166	18.8	24.5	19.9	17.7	27.3	19.6	25	14.5	22.9
Bihar	1805	21.7	20.4	21.6	21.2	35.9	22.7	22.5	19.9	22.3
Arunachal Pradesh	318	11.3	9.1	11	21.5	31.8	23	18.6	15.9	18.2
Nagaland	603	1.1	3.2	1.7	15.4	24.4	17.7	3.6	3.2	3.5
Manipur	605	9.7	13.8	11.1	27.6	39.9	31.7	14.4	14.8	14.5
Mizoram	531	19.9	23.1	21.5	24	28.5	26.2	24.7	19.6	22.2
Tripura	459	10.2	14.7	11.1	34.3	60	39.7	7.1	4.2	6.5
Meghalaya	411	6.9	4.8	6.6	27.2	50	30.7	8.3	1.6	7.3
Assam	811	8.8	4.3	8.1	36.3	58.6	39.5	7.9	7.8	7.9
West Bengal	1540	15.1	10.5	12.8	44.3	65	54.7	4.3	1.4	2.9
Jharkhand	1166	11.2	13.8	11.7	20.9	49	26.7	21.5	5	18.1
Odisha	1233	10.7	12.6	10.9	31.7	51.3	34.7	11.3	4.7	10.3
Chhattisgarh	779	15.4	23.8	16.9	11.9	34.3	16	36.9	16.8	33.2
Madhya Pradesh	1312	19	23.4	20.1	13.8	31.6	18.3	31.7	12.2	26.8
Gujarat	980	19.6	17.9	18.9	29.2	43.5	35.1	19.6	9	15.2
Daman & Diu	428	17.2	15.5	16.1	44.4	52	49.3	13.9	6.9	9.3
Dadra & Nagar Haveli	448	19.5	27.3	22.1	12.1	30	18.1	35.6	19.3	30.1
Maharashtra	1782	13.8	9.4	11.7	42.4	62.9	52	7.7	3	5.5
Andhra Pradesh	1097	9.8	7.3	9.2	52.5	65	55.6	3.9	1.5	3.3
Karnataka	1000	13.1	14.1	13.4	35	55.6	41.1	10.8	3	8.5
Goa	633	12.2	5.4	8.1	56.9	70.3	65.1	3.7	0.5	1.7
Lakshadweep	500	9.1	3.2	4.4	62.6	66.1	65.4	2	0.7	1
Kerala	1206	12.3	8.3	10.4	65.6	70.8	68.1	0.8	1.2	1
Tamil Nadu	1530	9.5	6.9	8	50.5	62.1	57.1	4.4	2.9	3.5
Puducherry	638	7.9	7.2	7.4	53.7	68.1	64.1	4	0.4	1.4
Andaman & Nicobar	521	22	20.7	21.5	38.7	50.8	43.2	6.4	6.2	6.3
Telangana	1050	10.1	12.2	10.8	50.7	65.5	55.3	4.6	2.1	3.8
Total	**31347**	**15.5**	**14.2**	**15.1**	**32.3**	**52.7**	**39.3**	**14.7**	**6.3**	**11.8**

[1]Jammu and Kashmir.

The highest prevalence was reported in Haryana (29%), followed by Rajasthan (28%), Delhi (24%), and Himachal Pradesh (23%). Nagaland reported the lowest (2%). In 15 states/UTs, the prevalence of ONCD & OCD exceeded the national average. For ONCD (overall prevalence 39.3%), rural prevalence was 32.3%, while urban prevalence was substantially higher at 52.7%. Kerala (68.1%), Lakshadweep (65.4%), Goa (65.1%), and Puducherry (64.1%) reported the highest ONCD rates. The lowest was in Chhattisgarh (16%). ONCD prevalence was higher than the national average in 17 states/UTs. For OCD

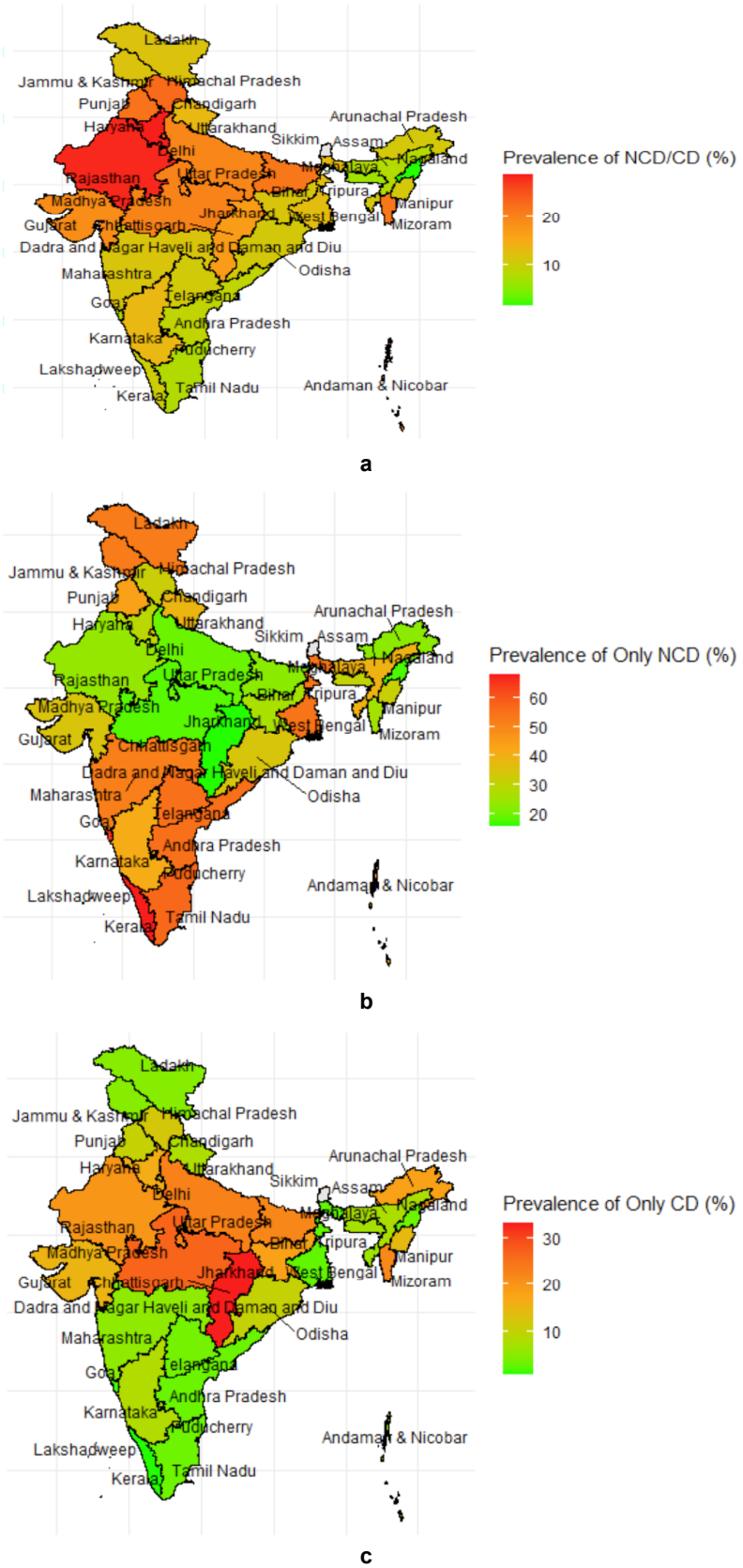

Figure 3: a. State/ UTs wise prevalence of ONCD & OCD in India. **b.** State/ UTs wise prevalence of ONCD in India. **c.** State/ UTs wise prevalence of OCD in India.

(overall prevalence 11.8%), rural prevalence (14.7%) was more than double the urban (6.3%). Chhattisgarh (33.2%), Dadra & Nagar Haveli (30.1%), Madhya Pradesh (26.8%), and Uttar Pradesh (22.9%) reported the highest OCD rates, while Lakshadweep had the lowest (1%). Spatial patterns reveal regional clustering. ONCD was most prevalent in coastal states, OCD in central Indian states with lower human development indices, and ONCD & OCD in northwestern regions. These patterns underscore the

Table 3: Prevalence of Disease Burden in Various Risk Factors in India

Characteristics	N (%)	None N (%)	ONCD N (%)	OCD N (%)	ONCD & OCD N (%)	NCD%	CD%
India	31347	10616 (33.9)	12307 (39.3)	3705 (11.8)	4719 (15.1)	54.40	26.90
Age *							
60-64	10091 (32.19)	3730 (36.96)	3559 (35.27)	1363 (13.51)	1439 (14.26)	49.53	27.77
65-69	8817 (28.13)	2938 (33.32)	3551 (40.27)	1019 (11.56)	1309 (14.85)	55.12	26.40
70+	12439 (39.68)	3948 (31.74)	5197 (41.78)	1323 (10.64)	1971 (15.85)	57.63	26.48
Sex *							
Male	15025 (47.93)	5444 (36.23)	5724 (38.1)	1783 (11.87)	2074 (13.8)	51.90	25.67
Female	16322 (52.07)	5172 (31.69)	6583 (40.33)	1922 (11.78)	2645 (16.21)	56.54	27.98
Residence *							
Rural	20669 (65.94)	7750 (37.5)	6677 (32.3)	3035 (14.68)	3207 (15.52)	47.82	30.20
Urban	10678 (34.06)	2866 (26.84)	5630 (52.73)	670 (6.27)	1512 (14.16)	66.89	20.43
Religion *							
Hindu	22954 (73.73)	7725 (33.65)	8773 (38.22)	2926 (12.75)	3530 (15.38)	53.60	28.13
Other	8177 (26.27)	2782 (34.02)	3471 (42.45)	749 (9.16)	1175 (14.37)	56.82	23.53
Ever attended school *							
Yes	14506 (46.28)	4378 (30.18)	6842 (47.17)	1247 (8.6)	2039 (14.06)	61.22	22.65
No	16841 (53.72)	6238 (37.04)	5465 (32.45)	2458 (14.6)	2680 (15.91)	48.36	30.51
Marital Status*							
In union	19845 (63.31)	6886 (34.7)	7628 (38.44)	2398 (12.08)	2933 (14.78)	53.22	26.86
Not in union	11502 (36.69)	3730 (32.43)	4679 (40.68)	1307 (11.36)	1786 (15.53)	56.21	26.89
Present work status *							
Working & worked previously	9275 (29.59)	4035 (43.5)	2550 (27.49)	1507 (16.25)	1183 (12.75)	40.25	29
Worked previously	13315 (42.48)	3981 (29.9)	5815 (43.67)	1390 (10.44)	2129 (15.99)	59.66	26.43
Never worked	8753 (27.93)	2598 (29.68)	3940 (45.01)	808 (9.23)	1407 (16.07)	61.09	25.31
MPCE *							
Poorest	6458 (20.6)	2673 (41.39)	2055 (31.82)	933 (14.45)	797 (12.34)	44.16	26.79
Poorer	6448 (20.57)	2302 (35.7)	2284 (35.42)	913 (14.16)	949 (14.72)	50.14	28.88
Middle	6392 (20.39)	2197 (34.37)	2529 (39.57)	732 (11.45)	934 (14.61)	54.18	26.06
Richer	6151 (19.62)	1899 (30.87)	2632 (42.79)	621 (10.1)	999 (16.24)	59.03	26.34
Richest	5898 (18.82)	1545 (26.2)	2807 (47.59)	506 (8.58)	1040 (17.63)	65.23	26.21
Type of house *							
Pucca	16349 (53.38)	4696 (28.72)	7637 (46.71)	1458 (8.92)	2558 (15.65)	62.36	24.56
Not pucca	14280 (46.62)	5702 (39.93)	4356 (30.5)	2171 (15.2)	2051 (14.36)	44.87	29.57
Living Arrangement *							
living with spouse and children	13457 (42.93)	4669 (34.7)	5058 (37.59)	1695 (12.6)	2035 (15.12)	52.71	27.72
Not living with spouse and children	17890 (57.07)	5947 (33.24)	7249 (40.52)	2010 (11.24)	2684 (15)	55.52	26.24
Life satisfaction*							
Much or fully satisfied	15014 (50.04)	5287 (35.21)	5975 (39.8)	1668 (11.11)	2084 (13.88)	53.68	24.99
Little or not satisfied	14988 (49.96)	4961 (33.1)	5805 (38.73)	1875 (12.51)	2347 (15.66)	54.39	28.17

(Table 3). Continued.

Characteristics	N (%)	None N (%)	ONCD N (%)	OCD N (%)	ONCD & OCD N (%)	NCD%	CD%
History of tobacco/alcohol use *							
Yes	13462 (43.18)	4867 (36.15)	4550 (33.8)	1968 (14.62)	2077 (15.43)	49.23	30.05
No	17716 (56.82)	5691 (32.12)	7692 (43.42)	1719 (9.7)	2614 (14.76)	58.17	24.46
Body mass index (BMI)*							
Normal	14706 (52.46)	5318 (36.16)	5455 (37.09)	1811 (12.31)	2122 (14.43)	51.52	26.74
Underweight	6496 (23.17)	2755 (42.41)	1563 (24.06)	1220 (18.78)	958 (14.75)	38.81	33.53
Overweight	6830 (24.37)	1476 (21.61)	3850 (56.37)	366 (5.36)	1138 (16.66)	73.03	22.02
Waist Hip Ratio (WHR) *							
Low risk	3962 (14.42)	1740 (43.92)	1001 (25.27)	683 (17.24)	538 (13.58)	38.84	30.82
Moderate risk	6764 (24.62)	2601 (38.45)	2373 (35.08)	880 (13.01)	910 (13.45)	48.54	26.46
High risk	16747 (60.96)	4991 (29.8)	7325 (43.74)	1729 (10.32)	2702 (16.13)	59.87	26.46
Activities of Daily Life (ADL)*							
Dependent	9155 (29.27)	2286 (24.97)	3806 (41.57)	1110 (12.12)	1953 (21.33)	62.91	33.46
Independent	22122 (70.73)	8300 (37.52)	8487 (38.36)	2579 (11.66)	2756 (12.46)	50.82	24.12%

*P-value <=0.05 for 5% level of significance.

influence of regional, socioeconomic, and environmental factors in disease burden.

Table **3** presents the distribution and association of disease burden by selected socio-demographic, anthropometric, and socio-economic variables for 31,347 eligible elderly participants. A significant association was observed by chi-square tests at the 5% level.

Table **4** presents the adjusted odds ratios (AORs) and 95% confidence intervals (CIs) from three piecewise logistic regression models examining risk factors associated with the prevalence of three groups of diseases burden. The assumption of multi-collinearity was checked in on the basis of variance information criterion value and it was well below 10 for each predictor in each model.

The model fit was assured by Hosmer and Lemeshow test under each modeling situations. The significance values indicated that the logistic regression model provides an adequate fit to the observed data, and there is no statistical evidence of poor fit.

Older age (65–69 and 70+) was significantly associated with higher odds of ONCD but lower odds of OCD, with no significant association with co-occurring conditions. Elderly aged 70+ had a 31% higher likelihood of ONCD (AOR=1.309, 95% CI: 1.223–1.402), but a 23% lower chance of OCD (AOR=0.770, CI: 0.697–0.850), suggesting a differential age pattern in chronic versus infectious disease risk among older adults, consistent with prior findings from LASI and similar aging studies [26]. Females had significantly lower odds of ONCD but higher odds of OCD (AOR=1.310, CI: 1.165–1.473), indicating a gender disparity that may stem from differential healthcare-seeking behaviors or biological susceptibility [27]. Urban residence strongly increased the risk of ONCD (AOR=1.524) while being protective against OCD and co-occurrence, highlighting the dual burden of urban lifestyles higher chronic disease risk but better infection control.

Education and higher wealth quintiles were positively associated with ONCD and co-occurrence, but negatively associated with OCD. Educated elderly were 45% more likely to have ONCD (AOR=1.447), whereas they were 25% less likely to have OCD (AOR=0.748), reflecting the socioeconomic gradient in disease profiles [28]. A graded increase in ONCD and ONCD & OCD was evident across wealth quintiles, with the richest showing the highest odds (AOR=1.614 for ONCD & OCD), while OCD declined with wealth. Respondents living in non- pucca houses and those not living with spouse and children were more vulnerable to OCD and less likely to have ONCD, underscoring the importance of housing quality and social support. Dissatisfaction with life also showed a positive association with ONCD and co-occurrence (AOR=1.206 and 1.108, respectively), in line with literature linking psychosocial stress and chronic illness [29]. Substance use was inversely associated with ONCD but increased the odds of OCD (AOR=1.299) and ONCD & OCD (AOR=1.143). Underweight status was significantly associated with

Table 4: Results of Piecewise Logistic Regression

Characteristics	ONCD	OCD	ONCD & OCD
Age (Ref. 60- 64)			
65-69	1.241 (1.158-1.329) *	0.845 (0.767-0.932) *	0.994 (0.908-1.087)
70+	1.309 (1.223-1.402) *	0.77 (0.697-0.85) *	0.987 (0.903-1.08)
Sex (Ref. Male)			
Female	0.897 (0.828-0.973) *	1.31 (1.165-1.473) *	1.056 (0.951-1.173)
Residence(Ref. Rural)			
Urban	1.524 (1.434-1.62) *	0.613 (0.552-0.681) *	0.892 (0.821-0.97) *
Religion (Ref. Hindu)			
Other	1.123 (1.057-1.192) *	0.733 (0.666-0.807) *	0.922 (0.851-1) *
Ever Attended School (Ref. No)			
Yes	1.447 (1.361-1.539) *	0.748 (0.682-0.82) *	0.918 (0.846-0.996) *
Marital Status (Ref. In Union)			
Not in union	1.008 (0.933-1.09)	1.026 (0.914-1.152)	0.983 (0.887-1.089)
Present work status (Ref. Currently working)			
Previously worked (not currently working)	1.61 (1.503-1.724) *	0.729 (0.663-0.801) *	1.119 (1.022-1.224) *
Never Worked	1.534 (1.411-1.667) *	0.689 (0.614-0.775) *	1.131 (1.015-1.26) *
MPCE (Ref. Poorest)			
Poorer	1.106 (1.016-1.206) *	1.025 (0.917-1.146)	1.263 (1.126-1.417) *
Middle	1.234 (1.133-1.345) *	0.856 (0.761-0.963) *	1.282 (1.142-1.439) *
Richer	1.323 (1.213-1.444) *	0.817 (0.722-0.925) *	1.46 (1.3-1.639) *
Richest	1.422 (1.299-1.556) *	0.775 (0.677-0.886) *	1.614 (1.433-1.819) *
Type Of House (Ref. Pucca)			
Not pucca	0.769 (0.725-0.816) *	1.209 (1.11-1.316) *	0.9 (0.833-0.973) *
Living Arrangement (Ref. Living with spouse and children)			
Not living with spouse and children	1.093 (1.017-1.175) *	0.856 (0.769-0.952) *	0.872 (0.793-0.96) *
Life Satisfaction (Ref. Much or Fully Satisfied)			
Little or not satisfied	1.206 (1.142-1.274) *	0.952 (0.88-1.031)	1.108 (1.032-1.189) *
History of tobacco/alcohol use (Ref. No)			
Yes	0.893 (0.842-0.948) *	1.299 (1.192-1.416) *	1.143 (1.057-1.236) *
BMI (Ref. Normal weight)			
Overweight	1.684 (1.578-1.797) *	0.536 (0.473-0.608) *	1.13 (1.036-1.233) *
Underweight	0.658 (0.61-0.71) *	1.32 (1.204-1.447) *	0.996 (0.907-1.095)
WHR (Ref. Low risk)			
Moderate risk	1.153 (1.047-1.27) *	0.956 (0.85-1.076)	1.001 (0.885-1.132)
High risk	1.39 (1.263-1.529) *	0.835 (0.738-0.944) *	1.119 (0.991-1.264)
ADL (Ref. Independent)			
Dependent	1.127 (1.058-1.2) *	1.087 (0.993-1.19)	1.841 (1.704-1.988) *

*P-value <=0.05 for 5% level of significance.

higher OCD risk (AOR=1.320), while overweight increased ONCD risk (AOR=1.684), reflecting the divergent nutritional pathways of disease. High waist-hip ratio was also significantly related to ONCD (AOR=1.390), consistent with metabolic syndrome literature [30]. Functional disability (ADL dependence) was significantly associated with ONCD and showed the strongest association with co-occurring ONCD & OCD (AOR = 1.841, 95% CI: 1.704–1.988), whereas no statistically significant association was observed for OCD alone. This finding is consistent with previous studies reporting an association between

multimorbidity and functional decline among older adults [31].

DISCUSSION AND LIMITATIONS

This study underscores the growing burden of both non-communicable diseases (NCDs) and communicable diseases (CDs) among older adults in India, with a noteworthy proportion of the population experiencing co-occurrence of both types. A piecewise binary logistic regression approach was adopted to address sparse data across outcome categories and to facilitate stable estimation of associations for each disease category. The findings demonstrated a higher prevalence of NCDs (39.3%) compared to CDs (11.8%), with 15.1% experiencing both. This pattern mirrors the ongoing epidemiological transition in India, where lifestyle-related chronic conditions are increasingly prevalent among older adults, especially in urban and economically advantaged areas [26]. Hypertension and diabetes remain the most frequently reported NCDs, consistent with other aging surveys in South Asia [32].

Socioeconomic and demographic factors emerged as critical determinants of disease patterns. Higher age, education, wealth, and urban residence were consistently associated with increased odds of ONCD, possibly reflecting lifestyle transitions and improved disease detection. In contrast, OCD was more common among individuals with lower education, rural residence, and under nutrition, highlighting the continued presence of infectious diseases in disadvantaged populations. These dual patterns indicate the need for differentiated health system responses.

Interestingly, the risk of co-occurrence (ONCD & OCD) appeared most elevated among those with poor functional health (measured via ADLs), low nutritional status, and those living in poor housing conditions. Functional dependency showed its strongest association with the co-occurrence of communicable and non-communicable diseases, whereas no statistically significant association was observed for communicable diseases alone [31]. The role of psychosocial factors was also evident, life dissatisfaction and social isolation (e.g., not living with spouse/children) were associated with higher odds of chronic illness, highlighting the importance of emotional well-being among older adults [29].

State-wise variation in disease profiles was observed, with ONCD appearing more common in several urbanized coastal states, OCD in some central states, and the co-occurrence of communicable and non-communicable diseases in parts of the northwestern region. These findings are descriptive and reflect differences in disease prevalence across states; however, no formal spatial statistical analyses were performed. Similar regional variations have been reported in previous LASI-based studies [33-34]. Overall, the findings suggest that older adults in India experience a dual burden of disease, highlighting the need for integrated public health strategies that address both epidemiological transition and persistent health inequalities. This study has several limitations that should be acknowledged. First, communicable diseases were identified using self-reported information on diagnoses occurring within the previous two years, which may be subject to recall bias and misclassification, particularly for mild or self-limiting infections. Second, the cross-sectional nature of LASI Wave-I precludes causal inference between the identified risk factors and disease burden. Furthermore, BMI and disease status were measured simultaneously in this cross-sectional survey. Therefore, the observed association between overweight and ONCD should not be interpreted as causal. Reverse causality is possible, particularly for chronic conditions such as cancer and chronic lung disease that may influence body weight. Longitudinal studies are needed to establish the temporal relationship between BMI and disease burden. Third, although piecewise binary logistic regression provided stable estimates under the observed data structure, future studies may explore alternative modelling approaches using penalized multinomial methods where appropriate. Finally, although LASI employs a complex multistage sampling design, the regression analyses did not explicitly account for clustering and stratification. Therefore, the estimated standard errors may have been underestimated and should be interpreted with caution. Future studies should validate these findings using survey-weighted regression models that fully account for the complex survey design.

India's aging population is confronting a complex health landscape where traditional infectious diseases persist alongside a surge in chronic non-communicable diseases. This study, drawing from a nationally representative LASI dataset, highlights the magnitude and risk factors of this dual burden. While NCDs dominate, a significant portion of older adults experience both disease types simultaneously, complicating diagnosis, treatment, and management. Health interventions for the elderly must therefore move beyond vertical programs focused on a single disease type. Instead a more integrated and context-specific approach is needed, that addresses multimorbidity, social determinants of health, functional capacity, and region-specific challenges.

Strengthening primary care, improving geriatric services, investing in preventive screening, and enhancing nutrition and social support systems are urgent priorities. Without such systemic changes, India risks facing a growing crisis of elderly health with serious implications for health expenditure, family caregiving, and quality of life in older age.

SUPPLEMENTARY FIGURE

The supplementary figure can be downloaded from the journal website along with the article.

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