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Prevalence, factors and inequalities in chronic disease multimorbidity among older adults in India: analysis of cross-sectional data from the nationally representative Longitudinal Aging Study in India (LASI)

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ABSTRACT

Objective This study examines the prevalence, patterns and factors of chronic disease-related multimorbidity. Also, this study examines the inequality in the prevalence of multimorbidity among older adults in India.

Design Cross-sectional study; large nationally representative survey data.

Setting and participants We have used the first wave of a Longitudinal Ageing Study in India conducted in 2017–2018 across all the 35 states (excluded Sikkim) and union territories in India. This study used information from 31 373 older people aged 60+years in India.

Primary and secondary outcome measures The outcome variable for this study is multimorbidity. The study used multinomial logistic regression to examine the risk factors for multimorbidity among older adults. To measure the inequality in multimorbidity, the slope of index inequality and relative index of inequality have been used to understand the ranked-based inequality.

Results Almost one-fourth (24.1%) reported multimorbidity. The relative risk ratio (RRR) of multimorbidity (RRR=2.12; 95% CI=1.49 to 3.04) was higher among higher educated older adults than uneducated older adults. Furthermore, the RRR of multimorbidity (RRR=2.35; 95% CI=2.02 to 2.74) was higher among urban older adults than their rural counterparts. Older adults in the richest wealth quintile were more likely to report multimorbidities (RRR=2.86; 95% CI=2.29 to 3.55) than the poorest older adults. Good self-rated health and no activities of daily living disability were associated with a lower risk of multimorbidities.

Conclusions This study contributes to the comprehensive knowledge of the prevalence, factors and inequality of the chronic disease-related multimorbidity among older adults in India. Considering India's ageing population and high prevalence of multimorbidity, the older adults must be preferred in disease prevention and health programmes, however, without compromising other subpopulations in the country. There is a need to develop geriatric healthcare services in India. Additionally, there is a need to disseminate awareness and management of multimorbidity among urban and highly educated older adults.

Strengths and limitations of this study

- ► This is a comprehensive study examining the prevalence, patterns, factors and inequality in the prevalence of multimorbidity among older adults in India.
- ► To create the variable of multimorbidity, only nine chronic diseases were considered.
- ► The cross-sectional nature of data limits our understanding of the causal relationship.
- ► The study is based on country-representative data, and therefore findings can be generalised.
- ► The study is based on recently released data, therefore providing current estimates.

INTRODUCTION

Chronic disease is a worldwide phenomenon, and more number of older adults than ever are suffering from chronic diseases. In the last few decades, the combination of improved living conditions, better prevention and management of infectious diseases, ever-improving healthcare infrastructure and rising trends of an ageing population have considerably increased the prevalence of chronic diseases.[1] Inevitably, multimorbidity is frequently observed in individuals and can be regarded as an emerging health problem.[2] Multimorbidity, defined as two or more co-occurring chronic diseases, is frequent among older adults, highly disabling and costly.[3–5] Multimorbidity has become widely prevalent and is characterised by a decline in mortality rates resulting from improved healthcare systems worldwide, combined with an ageing population.[5]

Increased life expectancy and decline in fertility rates have increased the population of older adults.[6] Moreover, old age is associated with several chronic conditions.[7] It is already noted that the share of the older

population is estimated to be higher in developing countries with an increased disease burden.[8] There were around 104 million older persons in India during the count of the 2011 Census, which roughly translates into 8% of India's total population.[9] With this demographic transition, the disease burden of the population is shifting towards chronic conditions.[10] The growing concern of population ageing in India confronts many challenges, including multimorbidity among older people.[11]

If persist for a longer duration, chronic diseases can affect the ability of a person to function normally. Subsequently, multimorbidity aggravates the situation to the extent that it induces profound adverse effects on quality of life and well-being.[12 13] Several risk factors predispose older people towards multimorbidity, including increasing age,[14–17] poor socioeconomic conditions,[14 16 18 19] educational status,[16 17] place of residence, gender,[14–16 18] levels of physical activity[19] and poor self-rated health.[15] A few recent studies in different community settings in India reported an increasing prevalence of multimorbidity and suggested that older people are more prone to multimorbidity.[7 20 21]

Developing countries are undergoing an epidemiological transition, resulting from a decline in infectious diseases and a constant increase in non-communicable diseases or chronic diseases.[22] In recent years, increased longevity in life expectancy in India has increased the prevalence of chronic conditions among older adults.[7] Despite a rising concern of chronic diseases in India, the issue of multimorbidity has yet to be explored extensively in India.[7] A growing body of research substantiates the effects of multimorbidity on health outcomes beyond risk attributable to individual disease[23] and pinned down specific factors of multimorbidities.[7] However, minimal research is available examining the inequalities in multimorbidities by socioeconomic, health and lifestyle characteristics of older adults.

Furthermore, the increasing prevalence of multimorbidity has secured growth in research on the epidemiology of multimorbidity in many developed countries[24–26]; however, the same has been relatively a new concept in developing countries, including India.[7 22 27] Multimorbidity still is an under-researched entity in India, constituting a critical knowledge impasse for a country experiencing an unparalleled high rise of chronic diseases.[10] Therefore, this study examines the prevalence, patterns and factors of chronic disease-related multimorbidity. Also, this study examines the inequality in the prevalence of multimorbidity among older adults in India.

METHODS

Data

We have used the first wave of a Longitudinal Ageing Study in India (LASI) conducted in 2017–2018 across all the 35 states (excluded Sikkim) and union territories (UTs) in India. The LASI has designed comprehensive and internationally comparable national survey data on health, economic, social and psychological aspects of the ageing process. The survey was funded by the Ministry of Health and Family Welfare, the Government of India, the National Institute on Aging and the United Nations Population Fund, India. The LASI has been coordinated by three partnering institutions: the International Institute for Population Sciences, Harvard T.H. Chain School of Public Health and the University of Southern California.

LASI is the world's biggest and India's first-ever longitudinal study which evaluates the scientific evidence based on demographics, household economic status, chronic health conditions, symptom-based health conditions, functional health, mental health (cognition and depression), biomarkers, health insurance and healthcare utilisation, family and social networks, social welfare programmes, work and employment, retirement, satisfaction and life expectations for men and women age 45 years and above.

The survey intends to follow a representative sample of the population of older adults for every 2 years for the next 25 years with a revised sample size for attrition due to death, migration, non-reachable and non-response. The LASI covered 72 250 older people aged 45 years and above in the first follow-up, including 31 464 older adults, aged 60 and above and 6749 oldest–old persons aged 75 and above across all the states and UTs. Although, our study concerned older adults with 60 years and above age group. This study used information from 31 373 older people aged 60+ years.

Indian Council of Medical Research extended the ethical approval required to carry out the LASI survey. The interviewer sought the informed consent of each respondent before undertaking the LASI survey. Furthermore, the authors involved in this study do not require any ethical approval for the present analysis because the analysis is based on the existing secondary data available to everyone on request.

Study variables

Outcome variables

The outcome variable for this study is multimorbidity. The multimorbidity condition was measured through the following health conditions: Hypertension or high blood pressure, diabetes or high blood sugar, cancer or a malignant tumour, chronic lung diseases such as asthma, chronic obstructive pulmonary disease/chronic bronchitis or other chronic lung problems, chronic heart diseases such as coronary heart disease (heart attack or myocardial infarction), congestive heart failure, or other chronic heart problems, stroke, arthritis or rheumatism, osteoporosis or other bone/joint diseases, any neurological, or psychiatric problems such as depression, alzheimer's/dementia, unipolar/bipolar disorders, convulsions, Parkinson's and high cholesterol. The specific question asked in relation to chronic morbidity was: Has any health professional ever diagnosed you with the following chronic conditions or diseases? All the chronic diseases have been asked in dichotomous form as 'yes' and 'no'. Further, these morbidity conditions have

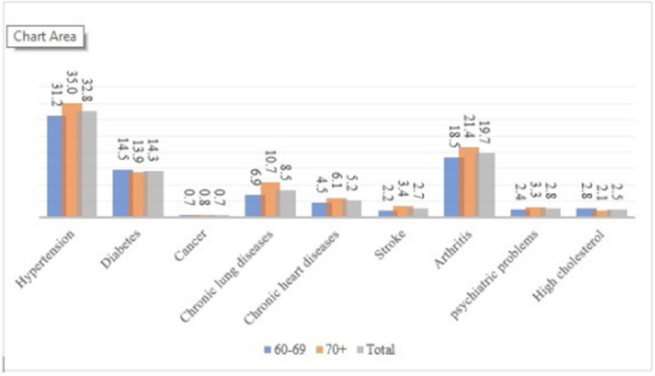

Figure 1 Prevalence of chronic morbidities among elderly by age groups.

been classified into three categories as 'no morbidity', 'one morbidity' and 'multimorbidity'.

Explanatory variables

Explanatory variables for this study are sex (male and female); age (60–69 and 70 years and above); marital status (currently married, never married, divorced/separated/deserted/widowhood); education (no education, below primary, primary, secondary and higher); living arrangements (living alone, with spouse and with others); place of residence (rural and urban); currently working (yes and no); wealth index (poorest, poorer, middle, richer and richest); self-rated health (poor and good); tobacco use (no and yes); alcohol use (yes and no); activities of daily living (ADL) disability (severe, moderate and no ADL disability) and independent ADL (IADL) disability (severe, moderate and no IADL disability).

Statistical measures

The bivariate analysis had been adopted to understand the proportion of morbidity conditions among older adults. Furthermore, the study used multinomial logistic regression to examine the risk factors for multimorbidity among older adults. To measure the inequality in multimorbidity, the slope of index inequality (SII) and relative index of inequality (RII) have been used to understand the ranked-based inequality by sociodemographic and health characterises. Both the SII and RII are regression-based measures that show outcomes with the relative position of social groups. The formula for the SII is given by:

$$SII = \frac{\sum_{i=1}^{n} w_i(y_i - \bar{y}_w)(x_i - x_w)}{\sum_{i=1}^{n} w_i(x_i - x_w)^2}$$

Where xi is the ridit, y_i the mortality rate and w_i the frequency of each class i={1, …, n}, and x_w and y_w the frequency-weighted averages of xi and y_i.[28]

The RII can be obtained by extrapolating the regression line towards the extreme position of the x-axis. It explains the ratio of the value at the bottom of the social hierarchy to the value at the top of the hierarchy (Renard *et al*). The equation for RII is given by:

$$RII = \frac{Intercept}{Intercept + slope}$$

Where RII is the relative slope of the index, all the analysis has been done using the Stata V.16.

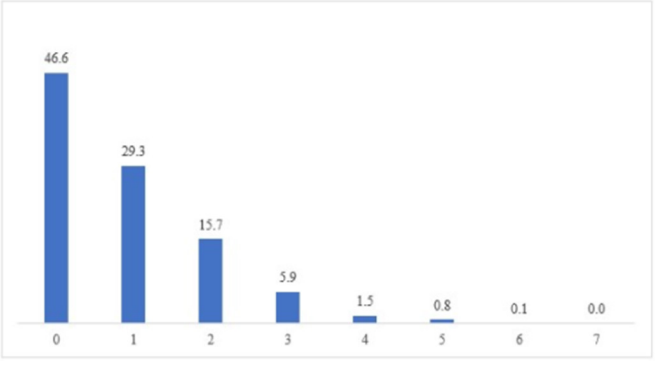

Figure 2 Proportion of elderly by number of chronic disease.

Patient and public involvement

No patient was involved in this study. This study is based on a secondary data source and therefore, patients were not involved in any way.

RESULTS

Figure 1 depicts the prevalence of chronic morbidities among older adults in India. The results found that the prevalence of hypertension (35% vs 31.2%), cancer (0.8% vs 0.7%), chronic lung diseases (10.7% vs 6.9%), chronic heart diseases (6.1% vs 4.5%), stroke (3.4% vs 2.2%) and arthritis (21.4% vs 18.5%) was higher among older adults aged 70+ than older people belonging to 60–69 years age group. Almost one-third (32.8%) of the older adults reported hypertension, one-fifth (19.7%) reported arthritis and around 14% older adults reported diabetes.

Figure 2 depicts the proportion of older adults by the number of chronic diseases. Results found that less than half of the older adults (46.6%) reported no chronic disease. Almost 30% of the older adults reported suffering from at least one chronic disease. Around 16% of the older adults reported suffering from at least two chronic diseases, and 6% reported suffering from at least three chronic diseases. Almost 2.4% of the older adults reported four and more chronic diseases.

Table 1 depicts the prevalence of multimorbidity among older adults by sociodemographic and health behaviours and lifestyle characteristics. A higher percentage of females (25.5% vs 22.5%) reported multimorbidity than their male counterparts. Similarly, multimorbidity was higher among older adults aged 70+ years, divorced/separated/deserted older adults, older adults with secondary and higher educated and older adults living in urban areas than their respective counterparts. Currently, working older adults had a lower prevalence of multimorbidity (13.6% vs 27.3%) than non-working older adults. Furthermore, the prevalence of multimorbidity increases with an increase in status related to the household wealth index. Almost one-third (35.9%) of the

Table 1 Prevalence of multimorbidity among older adults by sociodemographic and health parameters

	No morbidity	One morbidity	Multimorbidity	Total (N)
Sex				
Male	49.1	28.4	22.5	14808
Female	44.4	30.2	25.5	16565
Age				
60–69	49.1	28.1	22.8	18426
70+	43.2	31.1	25.8	12947
Marital status				
Currently married	47.8	28.8	23.4	19425
Never married	54.3	29.8	16.0	225
Divorced/separated/deserted	44.5	30.2	25.3	11723
Education				
No education	52.8	28.8	18.4	17808
Below primary	41.5	32.2	26.4	3602
Primary	39.7	30.1	30.2	3525
Secondary	37.1	27.9	35.0	5161
Higher	32.3	33.0	34.7	1277
Living arrangements				
Living alone	44.7	31.9	23.5	1792
With spouse	47.9	28.8	23.3	19063
With others	44.6	29.9	25.5	10518
Place of residence				
Rural	52.6	28.2	19.1	22233
Urban	32.0	32.0	36.0	9140
Currently working				
Yes	60.1	26.3	13.6	9501
No	41.2	31.5	27.3	13105
Wealth index				
Poorest	55.1	28.3	16.7	6835
Poorer	49.9	29.8	20.3	6832
Middle	47.6	29.7	22.7	6474
Richer	41.5	30.6	27.9	6053
Richest	35.9	28.2	35.9	5180
Self-rated health				
Poor	29.6	30.3	40.2	4627
Good	50.0	29.0	21.0	26164
Tobacco use				
No	43.1	30.0	26.9	18654
Yes	52.0	28.4	19.6	12531
Alcohol use				
Yes	52.7	27.5	19.9	4553
No	45.6	29.7	24.7	26638
ADL disability				
Severe ADL	28.3	28.9	42.8	999
Moderate ADL	37.5	30.4	32.1	6044
No ADL	49.6	29.1	21.3	24276

Continued

Table 1 Continued

	No morbidity	One morbidity	Multimorbidity	Total (N)
IADL disability				
Severe IADL	38.1	28.3	33.7	1858
Moderate IADL	41.5	30.5	28.0	13272
No IADL	51.8	28.5	19.7	16157
Total	**46.6**	**29.3**	**24.1**	31373

ADL, activities of daily living; IADL, independent ADL.

richest older adults reported multimorbidity, and only one-sixth (16.7%) of the poorest older adults reported multimorbidity. Multimorbidity was higher among those who reported poor self-rated health (40.2% vs 21%) than those who reported good self-rated health. Similarly, the prevalence of multimorbidity was higher among those with severe ADL (42.8% vs 21.3%) and severe IADL (33.7% vs 19.7%) than those without ADL and IADL, respectively.

Table 2 depicts the results of multinomial odds regression for multimorbidity among older adults. In the analysis, no morbidity was considered as the base outcome. Occurrence of one morbidity and multimorbidity was considered for relative risk ratio (RRR) with respect to no morbidity as the reference category. Results found that the occurrence of multimorbidity (RRR=0.43; 95% CI=0.20 to 0.90) was lower among never-married older adults than currently married older adults. The RRR of one morbidity and multimorbidity was higher among higher educated older adults than their uneducated counterparts. The RRR of one morbidity (RRR=1.57; 95% CI=1.16 to 2.13) and multimorbidity (RRR=2.12; 95% CI=1.49 to 3.04) was higher among higher educated older adults than uneducated older adults. Furthermore, the RRR of one morbidity (RRR=1.60; 95% CI=1.38 to 1.86) and multimorbidity (RRR=2.35; 95% CI=2.02 to 2.74) was higher among urban older adults than their rural counterparts. Higher wealth was associated with a higher risk of multimorbidity. The older adults in the richest wealth quintile were more likely to report multimorbidities (RRR=2.86; 95% CI=2.29 to 3.55) than the poorest older adults. Good self-rated health and no ADL disability were associated with a lower risk of multimorbidities among older adults.

Table 3 depicts the absolute and relative inequality in chronic diseases among older adults by their sociodemographic and health characteristics. The SII (column 2; table 3) depicts the absolute inequality in the prevalence of multimorbidity (chronic diseases) among older adults. If there is no inequality, the coefficient takes the value zero. Greater absolute values indicate higher levels of inequality. On the lines of the above interpretation, the higher absolute inequality was explained by female gender, 60–69 age group, divorced older adults, educated older adults, living with others, currently not working, good self-rated health and ADL and IADL disabilities. Similarly, the RII (column 4, table 3) depicts the relative contribution in the prevalence of multimorbidity (chronic diseases) among older adults. If there is no inequality, the coefficient of RII takes the value one. RII takes only positive values, where higher values (values above 1) are associated with the concentration of inequality in the subpopulation, and lower values (lower than 1) indicate the inequality concentration in the disadvantaged subgroups. The highest inequality in the prevalence of chronic disease multimorbidity was explained by ADL and IADL disability. Female gender, divorced, 60–69 age group, higher education, living with others were other significant predictors of inequality in the prevalence of chronic disease-related multimorbidity.

DISCUSSION

The findings from this study show a higher prevalence of chronic diseases multimorbidity among older adults in India, where almost one-fourth (24.1%) of the older adults reported multimorbidity. Another 29.3% older adults reported at least one chronic disease-related morbidity. The prevalence of one morbidity in this study was higher than previous studies conducted in Brazil[29] and China.[30] However, the prevalence of multimorbidities reported in this study was much lower than previous studies conducted in China,[31] Brazil,[29] South Africa.[31] Few community-based studies in India also reported a higher prevalence of chronic multimorbidity among older adults.[21 32 33] A multicountry study conducted for high-income countries reported a higher prevalence of multimorbidity.[24] Another study conducted in six low-income and middle-income countries also reported a higher prevalence of multimorbidity among older adults.[27] However, it is not advised to compare the prevalence of multimorbidity from different studies due to differences in the definitions of multimorbidity, demographic characteristics of the sample and difference in methodologies.[12 34 35] In agreement with previous studies, hypertension, diabetes and arthritis were the most common diseases.[32 36–40]

The results found that the risk of one morbidity and multimorbidity was higher among female older adults than male older adults; however, results for multimorbidity were not significant. This finding is consistent with several previous studies.[4 41–43] The higher prevalence of multimorbidity among older women can be attributed to the fact that women generally use healthcare services

Table 2 Multinomial logistic regression of multimorbidity among older adults by sociodemographic and health parameters

	One morbidity		Multimorbidity	
	RRR	95% CI	RRR	95% CI
Sex				
Male				
Female	1.17**	1.03 to 1.34	1.06	0.89 to 1.24
Age				
60–69				
70+	1.11	0.99 to 1.24	0.94	0.82 to 1.07
Marital status				
Currently married				
Never married	1.00	0.50 to 1.98	0.43**	0.20 to 0.90
Divorced/separated/deserted	1.18	0.72 to 1.90	0.69	0.44 to 1.07
Education				
No education				
Below primary	1.40***	1.18 to 1.66	1.74***	1.40 to 2.15
Primary	1.43***	1.20 to 1.71	2.04***	1.67 to 2.48
Secondary	1.49***	1.26 to 1.76	2.26***	1.88 to 2.70
Higher	1.57***	1.16 to 2.13	2.12***	1.49 to 3.04
Living arrangements				
Living alone				
With spouse	1.14	0.68 to 1.89	0.63	0.38 to 1.02
With others	0.86	0.69 to 1.07	0.78	0.59 to 1.03
Place of residence				
Rural				
Urban	1.60***	1.38 to 1.86	2.35***	2.02 to 2.74
Currently working				
Yes				
No	1.47***	1.31 to 1.64	2.18***	1.90 to 2.51
Wealth index				
Poorest				
Poorer	1.24***	1.07 to 1.44	1.53***	1.26 to 1.85
Middle	1.32***	1.13 to 1.55	1.79***	1.47 to 2.18
Richer	1.50***	1.26 to 1.78	2.06***	1.71 to 2.48
Richest	1.48***	1.23 to 1.78	2.86***	2.29 to 3.55
Self-rated health				
Poor				
Good	0.60***	0.51 to 0.70	0.33***	0.28 to 0.39
Tobacco use				
No				
Yes	0.93	0.82 to 1.04	0.76***	0.67 to 0.87
Alcohol use				
Yes				
No	1.04	0.90 to 1.18	1.02	0.88 to 1.19
ADL disability				
Severe ADL				
Moderate ADL	0.73	0.46 to 1.13	0.68	0.42 to 1.09

Continued

Table 2 Continued

	One morbidity		Multimorbidity	
	RRR	95% CI	RRR	95% CI
No ADL	0.61**	0.39 to 0.96	0.43***	0.27 to 0.70
IADL disability				
Severe IADL				
Moderate IADL	1.41**	1.03 to 1.93	1.59**	1.10 to 2.28
No IADL	1.07	0.77 to 1.47	1.00	0.68 to 1.45

***if p<0.01; ** if p<0.05; *if p<0.1.
*No morbidity is considered as the base outcome.
ADL, activities of daily living; IADL, independent ADL; RRR, relative risk ratio.

more frequently than men.[44] Moreover, studies have noted that women were more vulnerable to co-occurring diseases than their men counterparts, which might explain a higher risk of multimorbidity among them.[14 41 45] Moreover, treating women as socially inferior predicts a higher multimorbidity than their male counterparts.[7] Gender inequalities in resource allocation, including income, healthcare and nutrition, are associated with poor health and reduced well-being among the female gender.[46]

Results noted a higher risk of multimorbidity among higher educated older adults. Several previous studies agree with this finding.[21 32 43 45 47] However, few studies failed to notice any significant association between education and multimorbidity.[42 48] A study in a community setting in India has noticed a lower risk of multimorbidity; however, the study was conducted among adults.[39] Higher education can be linked to better socioeconomic status,[49] further linked to multimorbidity among older adults.[50] An increase in education can further be linked to health-related knowledge, affecting lifestyle behaviours and further lowering the risk of multimorbidity.[41]

In corroboration with previous studies,[19 43 44 51–54] this study noted a high risk of multimorbidity among richest older adults than their poor counterparts. Wealthier persons use healthcare services more than poorer people, leading to definitive diagnoses of chronic diseases.[55] People with high income may experience unhealthy behaviours such as lack of exercise, which could further be attributed to the high risk of multimorbidity.[48]

The risk of multimorbidity was higher among the urban older adults than their rural counterparts. Several previous studies have highlighted the high risk of multimorbidity among urban residents.[7 56 57] The possible explanation of the high risk of multimorbidity among urban residents includes the low physical activity due to developed infrastructure and dependence on processed food.[58 59] Another study also noted a change in dietary habits and low physical activity as a probable reason for higher risk of multimorbidity among urban older adults.[60] The higher risk of chronic diseases in urban areas has been attributed to inadequate physical exercise, high levels of alcohol consumption and poor lifestyle-related factors.[61 62]

In line with previous findings,[42 63–65] the findings from this study significantly noticed the high risk of multimorbidity among working older adults than their non-working counterparts. Older adults currently working might be less engaged in physical activity due to their work profile which could be a plausible reason for higher multimorbidity. Physical activity has widely been correlated as a measure of multimorbidity, and working at an older age might be associated with lower physical activity, thereby leading to multimorbidity among older adults. A study noted that working status could be related to high work-related physical activity, accompanied by poorer health outcomes.[66] It largely depends on the kind of work older adults are engaged in; working as unskilled labour might initiate multimorbidity among them. Those working at an older age might be poor and engaged in unskilled work, which could be attributed to a higher risk of multimorbidity among the working older adults.[65] The high risk of multimorbidity among working older adults could also be attributed to occupation-related physical inactivity, higher sitting time and dietary factors.[64] Good self-rated health and no ADL were associated with a lower risk of multimorbidity among older adults. The findings agree with several previous studies.[67–70] Severe ADL would be positively associated with physical inactivity, further undermining the multimorbidity among older adults with severe ADL.[7]

Limitations and strengths of the study

This study has certain noteworthy limitations. The chronic diseases included in the current study were not comprehensive since only nine chronic conditions were included in the survey. In addition, the data on multimorbidity was based on self-reporting, which may have introduced some bias.[30] The causality could not be appropriately inferred as the data were cross-sectional. Despite the above limitations, the study has a few strengths too. This study is based on a nationally representative sample of the Indian older adults' population and study findings can be generalised at national level. The data helps estimate the current prevalence of multimorbidity among older adults as the data were released in the year 2021.

Table 3 Absolute (slope index of inequality (SII)) and relative (relative index of inequality (RII)) inequalities in chronic diseases among older adults by sociodemographic and health clusters

	SII		RII	
	Coefficient	95% CI	Coefficient	95% CI
Sex				
Male	0.21***	(0.15 to 0.27)	2.52***	(1.91 to 3.13)
Female	0.22***	(0.16 to 0.29)	2.60***	(1.89 to 3.30)
Age				
60–69	0.23***	(0.18 to 0.27)	2.83***	(2.32 to 3.34)
70+	0.20***	(0.12 to 0.28)	2.25***	(1.59 to 2.91)
Marital status				
Currently married	0.20***	(0.16 to 0.24)	2.45***	(2.05 to 2.84)
Never married	–0.08	(–0.33 to 0.17)	0.60***	(–0.33 to 1.53)
Divorced/separated/deserted	0.25***	(0.16 to 0.35)	2.85***	(1.90 to 3.81)
Education				
No education	0.12***	(0.08 to 0.15)	1.93***	(1.57 to 2.28)
Below primary	0.12***	(0.03 to 0.20)	1.60***	(1.08 to 2.13)
Primary	0.28***	(0.18 to 0.38)	2.62***	(1.73 to 3.51)
Secondary	0.32***	(0.18 to 0.46)	2.63***	(1.64 to 3.61)
Higher	0.24*	(0.06 to 0.41)	2.03***	(0.813 to 26)
Living arrangements				
Living alone	0.13**	(0.01 to 0.24)	1.76***	(0.84 to 2.68)
With spouse	0.20***	(0.16 to 0.24)	2.45***	(2.05 to 2.86)
With others	0.27***	(0.17 to 0.38)	3.06***	(1.94 to 4.18)
Place of residence				
Rural	0.17***	(0.14 to 0.20)	2.48***	(2.08 to 2.89)
Urban	0.33***	(0.23 to 0.42)	2.60***	(1.91 to 3.29)
Currently working				
Yes	0.13***	(0.10 to 0.17)	2.77***	(2.02 to 3.51)
No	0.20***	(0.15 to 0.24)	2.14***	(1.77 to 2.51)
Self-rated health				
Poor	0.10*	(0.03 to 0.18)	1.31***	(1.05 to 1.57)
Good	0.23***	(0.19 to 0.28)	3.22***	(2.53 to 3.19)
Tobacco use				
No	0.24***	(0.18 to 0.30)	2.52***	(1.98 to 3.06)
Yes	0.16***	(0.12 to 0.20)	2.38***	(1.89 to 2.88)
Alcohol use				
Yes	0.23***	(0.17 to 0.29)	3.33***	(2.27 to 4.39)
No	0.21***	(0.16 to 0.26)	2.45***	(2.00 to 2.90)
ADL disability				
Severe ADL	0.15	(–0.03 to 0.34)	1.44***	(0.79 to 2.10)
Moderate ADL	0.12***	(0.05 to 0.20)	1.49***	(1.14 to 1.83)
No ADL	0.25***	(0.20 to 0.30)	3.46***	(2.71 to 4.20)
IADL disability				
Severe IADL	0.18*	(0.04 to 0.31)	1.72***	(0.99 to 2.44)
Moderate IADL	0.23***	(0.14 to 0.31)	2.33***	(1.69 to 2.96)
No IADL	0.22***	(0.19 to 0.26)	3.29***	(2.65 to 3.92)

ADL, activities of daily living; IADL, independent ADL.

CONCLUSION

Despite the increasing prevalence of multimorbidity, there are no specific diagnoses and treatment proposals. This study contributes to the comprehensive knowledge of the prevalence, factors and inequality of the chronic disease-related multimorbidity among older adults in India. Considering India's ageing population and high prevalence of multimorbidity, the older adults must be preferred in disease prevention and health programmes, however, without compromising other subpopulations in the country. Results noticed that almost one-fourth of the older adults reported multimorbidity. Given the increasing prevalence of multimorbidity, understanding the socioeconomic differentials in multimorbidity is important to address the issues among older adults in India. Results from multinomial logistic regression show that education, residence, current working status, wealth index, self-rated health and ADL disability were the most important predictors of multimorbidity. Developing countries like India are least prepared to meet the challenges of ageing societies. Therefore, there is a need to establish geriatric healthcare services in India on an urgent basis. Additionally, there is a need to disseminate awareness and management of multimorbidity among working, urban and highly educated older adults.

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