IMPACT OF MULTIPLE MORBIDITIES AMONG ELDERS IN KERALA, INDIA

A. ANJANA[1]

Introduction

The impact of multiple morbidities among elders is a pressing concern in healthcare systems globally. As individuals age, they often contend with various health conditions concurrently, leading to compounding challenges in managing their overall well-being. These morbidities not only diminish the quality of life for elders but also pose significant complexities for healthcare professionals in treatment planning and delivery. Moreover, the presence of multiple health issues can exacerbate each other, leading to increased healthcare utilization, reduced functional independence, and heightened mortality rates among this vulnerable population. Understanding and addressing the complexities of multiple morbidities are paramount in ensuring comprehensive and effective elder care. The well-being of elderly individuals, both physically and psychologically, is greatly influenced by their health conditions. Due to extended life expectancy and the growing prevalence of chronic non-communicable diseases (NCDs), the global public health landscape is increasingly prioritizing the issue of multimorbidity, commonly referred to as "multiple long-term conditions. Multimorbidity, occurring in 62.6 percent of cases, appears to be significantly more prevalent than single morbidity, which accounts for only 18.8 percent among middle-aged and older adults in India aged 45 years and above (Khan et al., 2022). Studies indicate that nearly one in four individuals in India have reported experiencing multimorbidity, while 3.3 percent have been diagnosed with depressive disorders (Pati et al., 2015). As per findings from the Global Burden of Disease Study, individuals with multimorbidity face an elevated risk of developing depressive symptoms when compared to those without any morbidity (Read et al., 2017).

The intersection of multiple morbidities and mental well-being among elders is a multifaceted issue with profound implications. As individuals age, they are more likely to experience not only physical ailments but also mental health challenges, such as depression, anxiety, and cognitive decline. The presence of multiple morbidities can exacerbate these mental health conditions, leading to increased distress, reduced coping abilities, and diminished overall quality of life. Depression is defined as an extended period (at least two weeks) in which a person experiences a depressed mood or loss of interest or pleasure in activities that were once enjoyed (Gururaj et al., 2016). Conversely, mental health issues can also complicate the management and treatment of physical illnesses, creating a complex interplay between physical and psychological well-being.

[1] Assistant Professor, Department of Demography, University of Kerala, India

Addressing both the physical and mental health needs of elders with multiple morbidities is essential for promoting holistic and effective care strategies that optimize their overall health outcomes and quality of life. Previous research indicates that individuals with significant chronic physical conditions tend to experience higher levels of depression, with hypertension sufferers exhibiting the highest prevalence of depression (Rubio-Guerra et al., 2013). Patients with cardiovascular diseases are at an elevated risk of experiencing depression compared to the general population (Hare et al., 2014). Similarly, diabetes, kidney disease, cancer, and lung disease represent significant risk factors for depression (Krebber et al., 2014; Olvera et al., 2016; Palmer et al., 2013).

The coexistence of multiple morbidities significantly impacts the physical well-being of elders, presenting a host of challenges to their overall health. As individuals age, they are more susceptible to developing multiple chronic conditions, ranging from cardiovascular diseases to arthritis, diabetes, and beyond. These conditions often interact, leading to complex health management needs and exacerbating symptoms. The cumulative burden of multiple morbidities can result in reduced mobility, increased functional limitations, and a higher risk of disability among older adults. Moreover, managing various treatments and medications for these conditions can lead to adverse drug interactions and treatment complexities, further compromising physical well-being. Addressing the holistic health needs of elders with multiple morbidities requires comprehensive care approaches that prioritize prevention, coordination, and tailored interventions to optimize physical well-being and enhance their overall quality of life. A recent study focusing on older adults in India has discovered a notable positive correlation between the rise in pre-existing chronic conditions and functional limitations (Sharma et al., 2021). Depression often brings about significant distress and can result in decreased ability to carry out daily activities. When compared to individuals with ongoing medical conditions, older adults experiencing depressive symptoms generally exhibit lower levels of functioning (WHO, 2017).

Multiple morbidities among elders represent a significant healthcare challenge with far-reaching implications. As individuals age, they often confront a multitude of chronic conditions simultaneously, ranging from cardiovascular diseases and diabetes to arthritis and cognitive impairment. The coexistence of these conditions complicates medical management, leading to increased healthcare utilization, polypharmacy, and a higher risk of adverse health outcomes. Elders with multiple morbidities often experience reduced functional independence, diminished quality of life, and heightened vulnerability to further health complications. Addressing the complex needs of this population requires a holistic and multidisciplinary approach that emphasizes preventive care, care coordination, and patient-centred interventions tailored to individual needs. By recognizing and effectively managing multiple morbidities among elders, healthcare systems can strive to improve outcomes and enhance the well-being of this growing demographic.

In Kerala, the ageing population is rapidly increasing. The State of Kerala is relatively in an advanced stage of epidemiological transition. Non-communicable diseases are becoming the most significant health challenge of the State. With the increasing burden of non-communicable diseases, older adults in Kerala are at a greater risk for multimorbidities. Hence, a study like this is very relevant in this situation.

Objectives

This study aims to investigate the impact of multiple morbidities among elderly individuals in Kerala, utilizing data from the Longitudinal Aging Study in India (LASI). With a growing ageing population, understanding the prevalence and consequences of multiple health conditions is crucial for designing effective healthcare strategies and policies. Our analysis focuses on identifying the patterns of co-occurring morbidities and their prevalence. Also, we assess the influence of multiple morbidities on key health outcomes, such as mental health and physical functioning among elders in Kerala. Additionally, we examined whether any differentials exist in healthy life expectancy among older people regarding each chronic condition and multimorbidities by gender.

Data

This study was based on a cross-sectional design of the data from the first wave of the Longitudinal Ageing Study in India (LASI) conducted during 2017-18, a nationally representative longitudinal study involving people aged 45 and above in India. Households with at least one member aged 45 and above were taken as the eventual observation unit. The baseline survey, including 72,250 older adults aged 45 and above, represents all the states (except Sikkim) and Union Territories (UTs) across the country. The LASI data provides valuable insights into India's prevalence and burden of chronic diseases. According to the survey, the most common chronic diseases reported by the respondents were Hypertension, diabetes, and chronic lung diseases. The survey also highlighted the disparities in the burden of chronic diseases across different socioeconomic groups. The present study utilized data from people aged 60 and above in Kerala. The LASI data provides a unique opportunity to explore the interplay of various morbidities among elders in this region. For the present study, a sample of 1,209 people aged above 60 in Kerala was selected to investigate the research objectives further.

Outcome variables

a) ***Depressive symptoms****:* In this study, one of the primary outcome variables was depressive symptoms. It was assessed using the Centre for Epidemiologic Studies Depression Scale (CES-D), designed as a screening tool for depressive symptoms in the general population (Radloff, 1977). The CES-D scale is a 20-item scale, while a shortened 10-item scale with four scale option categories was used in the LASI. The ten items included seven negative symptoms (trouble concentrating, feeling depressed, low energy, fear of something, feeling alone, bothered by things, and everything is an effort) and three positive symptoms (feeling happy, hopeful, and satisfied). Response options included rarely or never (< 1 day), sometimes (1 or 2 days), often (3 or 4 days), and most or all of the time (5-7 days) in a week prior to the interview. 17 for negative symptoms, rarely or never (< 1 day) and sometimes (1 or 2 days) were scored zero, and often (3 or 4 days) and most or all of the time (5-7 days) categories were scored one. Scoring was reversed for positive symptoms. The overall score ranges from zero to 10, and a score of four or more is used to calculate the prevalence of depressive symptoms.

b) ***Functional limitation:*** Functional limitations in this study were assessed based on respondents' need for assistance with activities of daily living (ADL). For ADL, participants were asked about difficulties with tasks such as dressing, walking across the room, bathing, eating, getting in or out of bed, and using the toilet. Those who reported limitations in at least one of these activities were considered to have a functional disability.

Exposure variable

Multimorbidity: The LASI survey covered different chronic illnesses: 1) Diabetes, 2) Hypertension, 3) Stroke, 4) any chronic lung disease, 5) chronic heart disease, 6) cancer or malignant tumor, 7) any bone/joint disease, 8) any neurological/psychiatric disease and 9) high cholesterol. Multimorbidity is defined as an individual who has been diagnosed with two or more chronic illnesses.

Covariates

The following variables are used.

- Age of the respondents (60-69, 70-79 and 80+years)
- Sex (male and female)
- Residential place (Rural and Urban)
- Education (No schooling, up to primary, up to secondary, higher secondary, above)
- Marital status (currently married, widowed)
- Religion (Hindu, Christian, Muslim, and others)

- Caste (SC, ST, OBC, General)
- MPCE Quintile (Poorest, Poorer, Middle, Richer, Richest)
- Activities of Daily Living (ADL): For ADL, participants For ADL, participants were asked if they had experienced limitations in any of the following everyday activities: difficulty with dressing, walking across the room, bathing, eating, getting in or out of bed, and using the toilet. Two separate dichotomous variables were created, with a code of "1" given if the participants reported any of the limitations and "0" if the participants reported no limitations.
- Instrumental Activities of Daily Living (IADL): For IADL, participants were asked if they had any difficulty doing any of the following activities: preparing a hot meal, shopping for groceries, making a telephone call, taking medications, doing work around the house or garden, managing money (such as paying bills and keeping track of expenses), and getting around or finding an address in an unfamiliar place. Two separate dichotomous variables were created, with a code of "1" given if the participants reported any of the limitations and "0" if the participants reported no limitations.
- Poor sleep (Poor sleep was assessed using three questions from prior studies: "How often do you have trouble falling asleep?"; "How often did you wake up during the night and have trouble getting back to sleep?" and "How often did you wake up too early in the morning and were not able to fall asleep again?". Individual questions are grouped into four different responses to measure the frequency of each of these, such as never, rarely (1–2 nights per week), occasionally (3–4 nights per week), and frequently (5 or more nights per week). Poor sleep was coded as 1 "Yes" if participants responded "sometimes (3–4 nights/week)" or "often (5 or more nights/week)" and if they said "Never" or "Rarely (1–2 nights/week)" was coded as 0 "No").
- Pain (Pain was defined by asking a question to the participants whether they are often troubled with Pain. Pain was coded as one if they said "Yes," and as 0 if they said "No")
- Current smoking (Smoking status was measured by asking the question: "Do you currently smoke any tobacco products (cigarettes, bidis, cigars, hookah, cheroot, etc.)?". Participants who reported smoking currently were classified as "1" yes, whereas those who had never smoked or discontinued smoking were classified as "0" no).
- Alcohol use (Alcohol use was measured based on whether participants consumed alcohol in the previous three months. A dummy-coded variable was created with 0 (representing never consumed alcohol or any alcohol use in the last three months) and 1 (representing alcohol consumption in the previous three months)).

Age-specific death Rates (ASDR) for constructing life tables are from the Sample Registration System (SRS) 2018 report. The Sample Registration System (SRS) is a large-scale demographic survey that provides reliable annual estimates of infant mortality rate, birth rate, death rate, and other fertility and mortality indicators at the national and sub-national levels.

Methods

Descriptive statistics, bivariate techniques, and life table techniques were used.

Multivariable binary logistic regressions were used to evaluate the association between multimorbidity and depression and find the association between multimorbidity and functional limitation among older people. We, therefore, performed regressions stratified by gender to investigate the gender differentials in the association further. Three different separate models for the overall sample, older men and women, were run to quantify the association between multimorbidity and depression: an unadjusted model, an adjusted model that only controlled the socio-demographic variables, and an adjusted model that controlled functional and health behaviour characteristics, as well as the socio-demographic characteristics. The results of the regression models are presented as the odds ratios (ORs) with 95 percent confidence intervals (CIs).

Life expectancy and healthy life expectancy

Life expectancy alone does not serve the purpose of measuring health status anymore for the ageing population with the increasing prevalence of chronic diseases. Healthy life expectancy combines information on mortality and morbidity to indicate the health of a particular population. Healthy life expectancy is analysed using the Sullivan method (Sullivan, 1971).

Life tables with broader age groups, such as 5 or 10 years, called abridged life tables, are found to be adequate and proper for most of the situations confronted in demographic analysis. The steps in the construction of an abridged life table are the following.

While constructing an abridged life table, there are seven columns, which are as follows:

Column 1, x to x+n: The period of lifetime between two exact ages between x and x+n.

Column 2, nqx: The probability that a person alive at the beginning of the indicated age interval at x will die before reaching the end (x+n) of the age interval.

$$ {}_nq_x = \frac{2 * n * {}_nm_x}{2 + n * {}_nm_x} $$

Column 3, lx: The number alive at the beginning of the indicated age interval. Constructing a life table usually starts with an arbitrary number of newborns, such as 100,000. This starting number is called the radix of the table.

Column 4, ndx: The number of persons who die within the indicated age interval x to x+n.

$$_nd_x = l_x * {}_nq_x$$

Column 5, nLx: The number of years of life a person lives within the indicated age interval x to x+n.

$$_nL_x = n * (\frac{l_x + l_{x+n}}{2})$$

Column 6, Tx: The total number of years remaining for a person after surviving till the beginning of the indicated age interval x to x+n.

$$_nT_x = {}_nL_x + T_{x+n}$$

Column 7, e0x: The average number of years of life remaining for a person after reaching the beginning of the age interval indicated.

$$e_x^0 = \frac{Tx}{lx}$$

To find a healthy life expectancy, we need the nLx values of the ordinary life table. Then, the prevalence rate (PR) of multimorbidity is calculated using LASI data.

$$HnLx = nLx.PR$$

In an ordinary life table, the Lx column is multiplied by PR to generate the H nLx column. Then, calculate HnTx. The healthy life expectancy Hex is then obtained by dividing the cumulative healthy person-years (H nTx) by the lx column. That is,

$$HnTx = \Sigma H\ nLx$$

Then

$$He_x = H\ nTx/lx$$

Results

Profile of the sample

Table 1: Background characteristics of sample population in Kerala, LASI

Variables	Categories	Male Percentage	Female Percentage	Total
Age	60-69	55.4	56.9	56.2
	70-79	32.5	29.8	31.0
	80+	12.1	13.3	12.7
Place of residence	Urban	47.0	47.1	47.1
	Rural	53.0	52.9	52.9
Education completed	No education	9.9	20.3	15.6
	Upto Primary	45.4	47.2	46.4
	Middle/Secondary	31.2	24.9	27.7
	Higher Secondary above	13.6	7.6	10.3
Marital status	Married	89.6	44.4	64.5
	Widowed	7.2	51.7	31.9
	Others	3.2	3.9	3.6
Religion	Hindu	55.4	59.8	57.8
	Muslim	19.7	17.4	18.4
	Christian	24.9	22.7	23.7
Caste	General	39	41.6	40.4
	SC	5.4	7.3	6.5
	ST	1.7	1.6	1.7
	OBC	53.9	49.5	51.4
Wealth	Poorest	16.9	18.8	17.9
	Poorer	19.9	19.8	19.9
	Middle	17.3	18.3	17.9
	Richer	20.1	20	20
	Richest	25.8	23.1	24.3
	Total	538 (44.5)	671 (55.5)	1209 (100)

Table 1 shows the socio-demographic profile of individuals aged 60 years and above in the sample study; about 45 percent are men, and the remaining are women. More than half of the elders (56 percent) are 60-69. Nearly 57 percent of women are in the age group 60-69 years, while their representation declines to 13 percent in age 80 years and above. Approximately 53 percent of the individuals were from a rural area.

About 16 percent of older people had no educational status, and the proportion of women in this category was higher than that of men. Only 10 percent of the older people had higher secondary and above education. A significantly higher percentage of men (90 percent) were in a union than women (44 percent). More than half of the older people belong to the Hindu religion (58 percent), followed by Christians (24 percent) and Muslims (18 percent). About half of the elders belonged to backward categories. Most of the elders were in the rich category.

Elders and chronic conditions

In the sample studied, 24 percent of respondents have no chronic issues. About 24 percent of the sample have single chronic conditions. Around 52 percent have multiple chronic conditions. Female elders have multiple chronic conditions compared to males (Table 2).

Table 2: Gender-wise distribution of elders by chronic conditions

Chronic Condition	Male	Female	Total
No	28.1	20.7	24
Single	22.7	25.8	24.4
Multiple issues	49.3	53.5	51.6
Total	538	671	1209

Table 3 shows the socio-demographic profile of individuals aged 60 years and above who have multiple morbidities. In the total sample of 1209 elders, 624 older persons have multiple morbidities.

Table 3: Background characteristics of respondents who had multiple morbidities in Kerala, LASI

Variables	Categories	Percentage of Respondents Having Multiple Morbidities
Age	60-69	47.8
	70-79	57.6
	80+	53.9
Sex	Male	49.3
	Female	53.5
Place of residence	Rural	51.4
	Urban	51.8

Table 3 continued from the previous page

Variables	Categories	Percentage of Respondents Having Multiple Morbidities
Education completed	No education	46.0
	Upto Primary	51.0
	Middle/Secondary	55.8
	Higher Secondary above	51.6
Marital status	Married	49.4
	Widowed	57.5
	Others	39.5
Religion	Hindu	47.8
	Muslim	51.6
	Christian	60.8
Caste	General	53.4
	SC	39.7
	ST	30.3
	OBC	52.4
Wealth	Poorest	47.9
	Poorer	45.0
	Middle	50.0
	Richer	57.0
	Richest	56.5
	Total	1209

More than half of the elders above the age of 70 years have multiple morbidities. Multiple morbidities are more common among females than males. Nearly 54 percent of women have multiple morbidities. The prevalence of multiple morbidities does not vary much by place of residence. Approximately 51 percent of the individuals in rural areas and urban areas have multiple morbidities. In the sample studied, multiple morbidities were more common among educated elders than illiterate ones. About 58 percent of widowed elders have multiple morbidities. Multiple morbidities were more common among Christians (61 percent), followed by Muslims (52 percent). Multiple morbidities were more among general and backward categories than Scheduled Caste /Scheduled Tribe. Elders in the rich category have more multiple morbidities than the poor.

Table 4 shows the combinations of various chronic issues among elders in Kerala. Diabetes and Hypertension is the most predominant chronic condition, constituting 25 percent of elders. Its prevalence is higher among male elders than females. CVD (Hypertension, stroke, and chronic heart diseases) with diabetes are prevalent among 26 percent of elders. Seven percent of elders have diabetes and heart disease.

About 12 percent of elders have diabetes, Hypertension, and cholesterol. Multiple morbidities are found to be more common among males than females.

Table 4: Gender-wise distribution of elders with various combinations of chronic conditions

Chronic Conditions	Male	Female	Total
Diabetes & hypertension	25.8	23.8	24.7
Diabetes & CVD	27.5	24.9	26.1
Diabetes and heart disease	8.9	4.5	6.5
Diabetes & stroke & hypertension	1.9	0.9	1.3
Diabetes & hypertension & cholesterol	12.3	10.9	11.5
Hypertension & cholesterol & stroke	1.1	0.7	0.9
Total	538	671	1209

Multiple morbidity and depression

Living with multiple morbidities can impact an individual's psychosocial well-being, contributing to feelings of stress, depression, and social isolation. The association between multiple morbidity and depression among elders is given in Table 5.

Table 5: Association between multiple morbidity and depression among elders

	Depression		
Multiple Morbidity	Yes	No	Total
Male	68 (25.7)	197 (74.3)	265
Female	131(36.5)	228 (63.5)	359
Total	199(31.9)	425 (68.1)	624

Among the elders with various morbidities, 32 percent have depression. Among the male elders with multiple morbidities, 26 percent have depression. Among the female elders with multiple morbidities, 37 percent have depression. Depression is found to be more among female elders with multiple morbidities than among males.

Table 6 provides insight into the prevalence of various symptoms among older people, highlighting potential gender differences in experiences.

Table 6: Distribution of elders who had multiple morbidities by depression symptoms

Symptoms	Percentage of Elders		
	Male	Female	Total
Trouble concentration	10.2	17.1	14.1
Feeling depressed	57.7	76.3	70.6
Low energy	93.3	95.6	95
Fear of something	100	86	89.5
Feeling alone	85.7	89.5	85.7
Bothered by things	71.4	72.1	71.9
Everything is an effort	92.9	88.1	89.3
Not feeling satisfied	42.9	59.5	55.4
Not Feeling hopeful	42.9	61.9	57.1
Not Feeling happy	71.4	74.4	73.7

About 14 percent of elders experience trouble concentrating, with a higher prevalence among females (17 percent) than males (10 percent). The feeling of depression, low energy, feeling alone, and not feeling satisfied and hopeful is found to be significantly higher among females compared to males. The symptoms of fear of something and everything as an effort were more prevalent among males than females.

Multiple morbidity and functional limitation

As people age, they may experience an increased risk of functional limitations due to age-related changes in health, chronic conditions, or disabilities. These limitations can significantly impact an individual's ability to carry out tasks necessary for independent living and may affect various aspects of their life.

Table 7: Association between multiple morbidity and ADL among elders

	ADL		
Multiple Morbidity	Yes	No	Total
Male	71 (26.8)	194 (73.2)	265
Female	121(33.7)	238 (66.3)	359
Total	192 (30.8)	432 (69.2)	624

In Kerala, 31 percent of elders with multiple morbidities have limitations in activities of daily living. About 27 percent of male elders with multiple morbidities have limitations in activities of daily living. About 34 percent of female elders with multiple morbidities have limitations in activities of daily living.

Functional limitation is found to be more among female elders with multiple morbidities than males. About 23 percent of elders with multiple morbidities found difficulty in using the toilet. About 17 percent of elders found difficulty in getting in and out of bed. About 14 percent of elders found difficulty in bathing. About 13 percent of elders found trouble in eating. About 12 percent found difficulty in dressing and walking (Table 8).

Table 8: Distribution of elders who had multiple morbidities by limitation in various activities

ADL	Percentage of Elders		
	Male	Female	Total
Dressing	9.8	13.4	11.9
Walking	9.8	12.5	11.4
Bathing	12.5	14.5	13.6
Eating	10.9	13.6	12.5
Getting in and out of bed	12.8	20.6	17.3
Using the Toilet	20.8	24.5	22.9

Table 9 shows the results of multivariable binary logistic regression models. The table also reports the separate models for older women and men. In adjusted analysis (model1), we found that older adults with multimorbidity have a significantly higher probability of depression. At the same time, the odd ratio is considerably higher for older females than older males. After adjusting socio-demographic and economic variables (model 2) and adjusting model 2 with functional, sleep problems, pain, and behavioural factors (model 3), we found that multimorbidity is still a significantly higher probability of depression among older adults.

Table 9: Associations between multimorbidity and depression among elders in Kerala: logistic regression models

	Model 1			Model 2			Model 3		
Outcome: Depression	UOR	95% CI		AOR	95% CI		AOR	95% CI	
Main Model									
Multimorbidity	1.448***	1.442	1.453	1.548***	1.187	2.019	1.482**	1.122	1.958
Stratified Models									
Male: Multimorbidity	1.2	0.807	1.783	1.135	0.741	1.739	1.236	0.784	1.95
Female: Multimorbidity	1.915***	1.363	2.69	1.802***	1.267	2.563	0.609**	0.424	0.874
UOR : Unadjusted Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval									

Table 9 continued from the previous pages

Model 1: Unadjusted Model
Model 2: Adjusted for Age, Sex, Marital Status, Religion, Caste, Place of Residence, Education, MPCE Quintile
Model 3: Adjusted for Model 2, ADL, IADL, Sleep Problem, Plain, Currently Smoking, Alcohol Use (For males)
Model 3: Adjusted for Model 2, ADL, IADL, Sleep Problem, Plain (For females)
Gender–stratified models were not adjusted for gender.
***p<0.001 **p<0.05

Table 10 shows the results of multivariable binary logistic regression models. The table also reports the separate models for older women and men. In adjusted analysis (model1), we found that older adults with multimorbidity have a significantly higher probability of functional limitation. In contrast, the odd ratio is considerably higher for older males than females. After adjusting socio-demographic and economic variables (model 2), we found that multimorbidity is still a significantly higher probability of functional limitation among older adults. The odds of functional limitation are considerably higher for older men than women.

Table 10: Associations between multimorbidity and functional limitation among elders in Kerala: logistic regression models

	Model 1			Model 2		
Outcome: ADL	UOR	95% CI		UOR	95% CI	
Main Model						
Multimorbidity	2.0***	1.991	2.008	2.041***	1.526	2.732
Stratified Models						
Male: Multimorbidity	2.409***	1.546	3.755	2.552***	1.565	4.162
Female: Multimorbidity	1.824***	1.29	2.58	1.803**	1.245	2.611
UOR : Unadjusted Odds Ratio; AOR : Adjusted Odds Ratio; CI: Confidence Interval						
Model 1 : Unadjusted Model						
Model 2 : Adjusted for Age, Sex, Marital Status, Religion, Caste, Place of Residence, Education, MPCE Quintile						
Gender–stratified models were not adjusted for gender.						
***p<0.001 **p<0.05						

The number of people living with multiple chronic conditions is increasing, but the impact of multimorbidity on life expectancy is discussed in Table 11. The results show that healthy life expectancy varies according to various chronic conditions. A male aged 60 years in Kerala is expected to live 17 years, and among these years, 11 years without diabetes and six years with diabetes.

A female aged 60 years in Kerala is expected to live 21 years, and among these years, 14 years without diabetes and seven years with diabetes. A male aged 60 years in Kerala is expected to live 17 years, and, among these years, nine years without multiple morbidities and 8years with multiple morbidities. A female aged 60 years in Kerala is expected to live 21 years and, among these years, ten years without multiple morbidities and 11 years with multiple morbidities. In Kerala, elderly males spend more time in a healthy state than elderly females.

Table 11: Life expectancy and healthy life expectancy at age 60 in Kerala

Kerala				Male			Female
	LE	HLE	UHLE	LE	HLE	UHLE	
Diabetic	17	11	6	21	14	7	
Hypertension	17	9	8	21	9	12	
Cholesterol	17	13	4	21	16	5	
Stroke	17	16	1	21	20	1	
Chronic lung disease	17	15	2	21	18	3	
Heart diseases	17	15	2	21	19	2	
CVD	17	8	9	21	9	12	
Multiple morbidities	17	9	8	21	10	11	

LE – Life Expectancy
HLE – Healthy Life Expectancy
UHLE – UHealthy Life Expectancy

Discussion

Kerala, a state with one of the best health indicators in India, has a high prevalence of chronic issues. Kerala had the highest rate of multimorbidity (30 percent), followed by Punjab (22.4 percent) (Arokiasamy et al., 2015). The study's findings show that the prevalence of chronic issues was higher among older adults aged 60 and above. It is well-documented that multimorbidity becomes increasingly prevalent as individuals age (Mini & Thankappan, 2017). About fifty-two percent of elders in Kerala suffer from more than two chronic issues. Among the elders in Kerala, multiple chronic problems were more common among females than males, and it was found that prevalence was similar in both rural and urban areas, similar to previous findings of Alimohammadian et al. (2017). Our study shows that among the elders with multiple morbidities, 32 percent have depression. In alignment with our findings, You et al. (2019) have similarly observed that older adults with three or more chronic diseases faced an increased likelihood of experiencing depressive symptoms. About 31 percent have limitations in activities of daily living. A 2019 review Calderón-Larrañaga et al., (2019) illustrates an interaction among different diseases in individuals, leading to physical and cognitive decline.

The findings of our study show that multiple morbidities have a significant effect on the mental health and physical health of elders. The study by Read et al. (2017) also establishes the fact that the likelihood of experiencing depressive symptoms in adults is notably linked to having multiple health conditions. In Kerala, elderly males spend more time in a healthy state than elderly females. Our results show that healthy life expectancy varies according to chronic conditions and multimorbidities. Life expectancy varies considerably by comorbidity status among elders by gender. These results agree with a study by DuGoff et al. (2014).

Conclusion

The results of this study, conducted on a population basis, indicate that older individuals with multimorbidity are at an increased risk of experiencing depressive symptoms, underscoring the necessity for enhanced chronic disease management and further research. These findings suggest that clinicians should prioritize various aspects of functional health and health behaviours when addressing multimorbidity and depression in older adults. Additionally, the study identified a gender disparity in the relationship between geriatric depression and multimorbidity in Kerala. As the elderly population continues to rise globally, understanding the intricate dynamics of multiple morbidities becomes increasingly imperative for promoting healthy aging and enhancing the overall well-being of older adults. Furthermore, the management of multiple morbidities faces many challenges in Kerala, including the rising prevalence, lifestyle alterations, delayed diagnosis, low degree of awareness, and expensive treatment costs.

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