MULTIMORBIDITY AMONG OLDER ADULTS:
A COMPERATIVE STUDY OF KERALA AND UTTAR PRADESH

Dissertation submitted to Jawaharlal Nehru University in partial fulfillment of the requirement for the award of the degree of

MASTER OF PHILOSOPHY

VIPUL YADAV

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMEMT
SCHOOL OF SOCIAL SCIENCES
JAWAHAR LAL NEHRU UNIVERSITY
NEW DELHI -110067
INDIA
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जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

DATE: 26.12.2022

DECLARATION

I, **Vipul Yadav**, hereby declare that the dissertation entitled "**MULTIMORBIDITY AMONG OLDER ADULTS: A COMPERATIVE STUDY OF KERALA AND UTTAR PRADESH**" submitted by me for the award of the degree of **MASTER OF PHILOSOPHY** is my bona fide work and that it has not been submitted so far in part or in full, for any degree or diploma of this university or any other university.

Vipulyadav
(VIPUL YADAV)

CERTIFICATE

It is hereby recommended that the dissertation may be placed before the examiners for evaluation.

Bhaswati Das
Dr. Bhaswati Das
(Supervisor)

Centre for the Study of Reg. Dev.
School of Social Sciences
Jawaharlal Nehru University
New Delhi - 110067

Milap Punia
Prof. Milap Punia
(Chairperson)

Chairperson
Centre for the Study of Reg. Dev.
School of Social Sciences
Jawaharlal Nehru University
New Delhi - 110067

Office Tel: 26704466.........26704463... Office E-mail: csrd.jnu@gmail.com

DEDICATED TO

MY

BELOVED ELDER BROTHER

LATE. AJAY KUMAR YADAV

(ASSISTANT TEACHER IN BASIC EDUCATION)

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Place: NEW DELHI   *VIPUL YADAV*

Date: 26/12/2022   *Master of Philosophy in Population studies*

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CHAPTER-1
INTRODUCTION TO THE STUDY

1.1: Introduction to the concept of ageing

Ageing of the population is one of the important components of demographic transition until recently; Population Ageing was seen as a phenomenon occurring mainly in the developed countries of Europe and North America. It is now recognized that while both developed and developing countries are experiencing growing proportions of elderly. Currently, developing countries are ageing faster than developed countries. In India, according population Census 2001 the total number of older persons was approximately 70.6 million and in 2011, it has increased to 104 million including 53 million females and 51 million males. A report released by United Nations Population Fund and HelpAge India suggest that the number of elderly persons is expected to grow to 173 million by 2026.

Aging is a physiological phenomenon. Due to the shift of the disease pattern from communicable to non-communicable disease, easy availability of better health-care facilities, and increased disease prevention activities, and the longevity of human beings has increased throughout the globe including India (Smith, 2012). The United Nations Department of Economic and Social Affairs projected that the elderly population in India is going to rise from 8% in 2015 to 11.5% in 2025 and 19% in 2050 (World Population Prospects - 2017). They have also projected the old-age dependency ratio for India to increase from 9/100 (2015) to 11/100 (2025).

From the second half of last century, both absolute and as well as proportion of older populations have been increasing very rapidly. Most of the nations of developing countries have observed rapid change in the term of fertility, mortality and economic growth. This entire event has various effects on elderly population of the countries. The absolute population figure for elderly

have already reached 962 million in 2017, almost double compared to elderly population in 1980 when there were 382 million elderly in the world. The expected doubling time is almost 30 years. By 2050, world's elderly population will reach 2.1 billion (UN DESA). But the fact is that the growth rate of elderly population is population of developing region is growing much faster than in developed countries. It is expected that elderly population of Asia will double in number from 549 million (2017) to almost 1.3 billion (2050) within 30 years (World Population Prospects, 2017). China and India the two important population giants in the Asia are the major contributors of it (Rajan, 2003). These projected increase if elderly population in the developing countries is becoming the matter of concern for policymakers (Kinsella & Venkoff, 2001; Rajan, 2003).

1.2 Defining elderlies as per age

As per the "National policy on older person in India" elderly person is defined as one who comes with age of 60 years and above. Government of India announced 'NPOP' in 1999 to safeguard the rights and well-being of elderly population.

Census also identified those persons as old who is of age 60 or above than 60 years.

WHO defines elderly as a person who have attained age of 60 or above.

As per United Nations, 60 years is considered as the age of transition for elderly segment of population and is being divided as below:

1. From 60 years up to 75 years are called as young old
2. From 75 years to 85 years are called as old-old
3. From 85 years or more than this is called as very old

Numbers of scholars have mentioned the fact that India is largest country of elderly in terms of absolute number in the world (Gulati & Rajan, 1990; Rajan, Mishra & Sharma, 2000; Sengupta

& Agree, 2000). The census 2011 shows that India was home of 77 million elderly which in 2011 has reached to 104 million. Percentage share of 60 and above population to the total population of India has been increasing from second half of the twentieth century. The elderly population shares have increased from 5.6 percent (1961) to 8.6 percent in (2011) within the span of 50 years. It is projected by United Nations that the proportion will further increase to 34.1 percent by 2100 from 9.4 percent in 2017. Such a high increase in the elderly population warns that the society is going face several challenges.

Table 1.1 Projected populations of elderly in Indian from 2017-2100

	Percentage aged 60 years or over		
	2017	2050	2100
World	12.7	21.3	28.3
Asia	12.2	24.2	
India	9.4	19.1	34.1

Source- World Population Prospects 2017

1.3 Trends and pattern of elderly in India

The margin at which any person can be considered old cannot be demarcated by taking any particular age. The policies made by the government of India for welfare of elderlies nowhere defined ageing but it considered any people as old when he attains the age of 60 (Shankardass, 2004 cited in Nair 2014).

Figure 1.3 shows an increase in the share of older population can be noticed in the total population over decades. The population of India has increased from 361 million in 1951 to 1.21 billion in 2011. During the period, elderlies have increased from 19.6 million in 1951 to 103

million in 2011. As per UNFPA 2012, the portion of the elderly is likely to increase to 19% of the total population in India, by 2050.

Percentage share of Elderly population in total population over decades
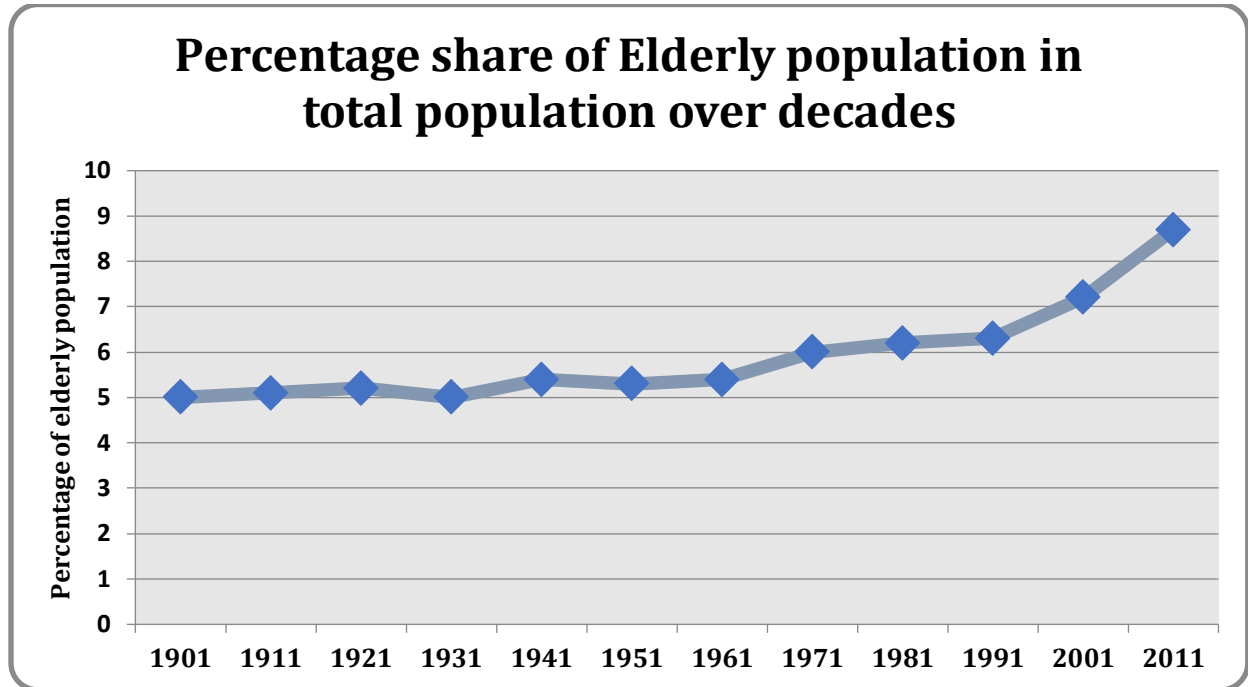
Figure 1.1: Trend of elderly population of India 1901-2011

Population of age 60 years and above is on rise in India as it has increased from 12.1 million (5%) in 1901 to 9% in 2011. However, rise is more prominent among females than their counterparts, as it rises from 5.8% to 7.8% from 1961 to 2001. One more crucial fact is that older citizens are more in rural areas than in urban areas and usually females live longer than males, thus sex ratio of elderly population is more favorable for females. Old dependency ratio of India is increasing, it has increased from 122 in 1991 to 142 in 2011, and this is rising due to higher life expectancy at birth (Census of India, 2011). In India, it is inherited from our culture and tradition to look after elderlies at home mainly and son has remained as the primary care giver. With the migration of younger member (mainly son) of the family for livelihood along with changing societal norms of nuclear family, elderly care by the son has declined. Government

concern for the aged population as a significant part of our society commenced only after presence of our country in Vienna congress of 1982 and India adopted united Nation plan of action. In the plan the emphasis was given on government's willingness to tackle properly with the need of elderly population by giving them security and the help as per the changing socio-economic situations for the society (Shankardass, 2004 cited in Singh, 2013). Ageing of population implies a move from high mortality/high fertility to low mortality and low fertility regime. This result in a rising share of elderlies in any country's total population (Prakas, 1999).
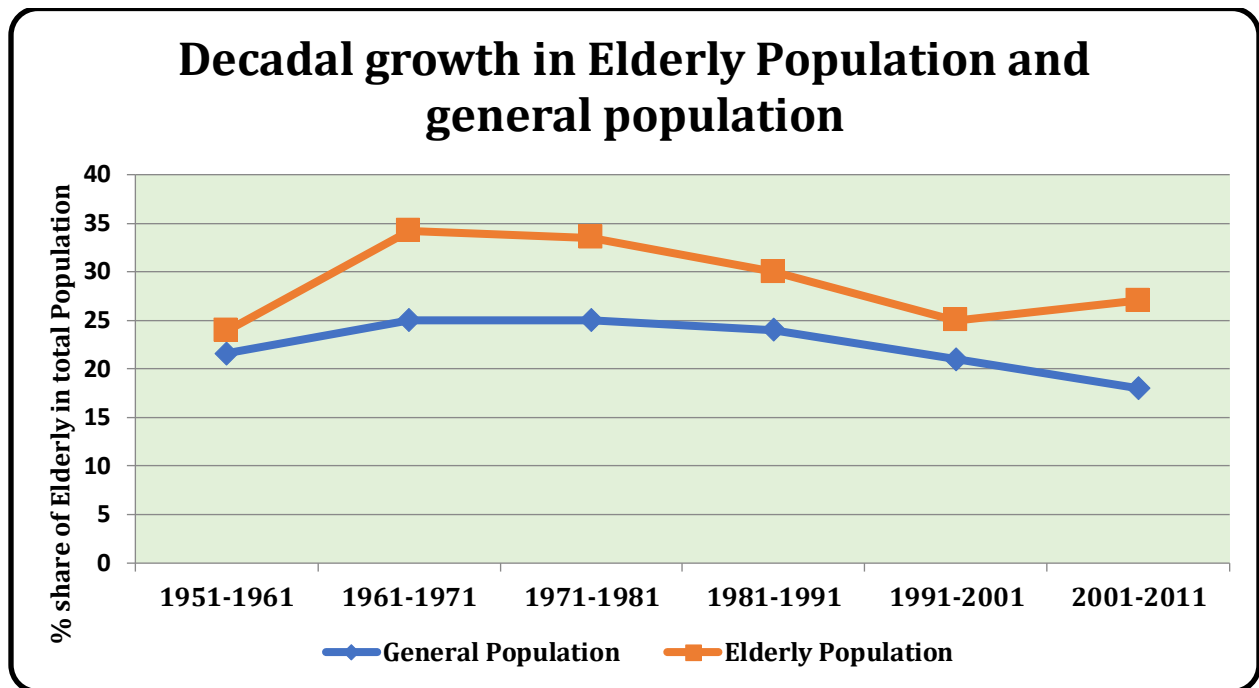
Figure-1.2: Trends in decadal growth rate of elderly population in India

Growth rate of the elderly population has always been more than the population of the remaining age group that is of the general population. However, only during the decade of 1951-61 the difference was not much between the two shares of population. For elderly the growth was 23% while for the rest age groups it was 21.6%. Moreover, since 1961 a gradual growth in the elderly population has been noticed. This growth has been steep as compared to the growth rate of

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general population all through the decades after 1951. This growth was more rapid during the period of 1961 to 1981. Almost more than 10% increase was evidenced from 1951-61 (23%) to 1971-81 (33%). While for the general population the increase was only of 5% that is from 20% during 1951-61 decade to 25% during 1971-81. Another fact that can be noticed from the figure 1.4 is that a steady decline in the elderly population has occurred since 1971-81 till 1991-2001. Again after 2001-11 a slight increase from 25% to 28% has been noticed. Nevertheless, growth rate of elderly population has always been more than that of general population.
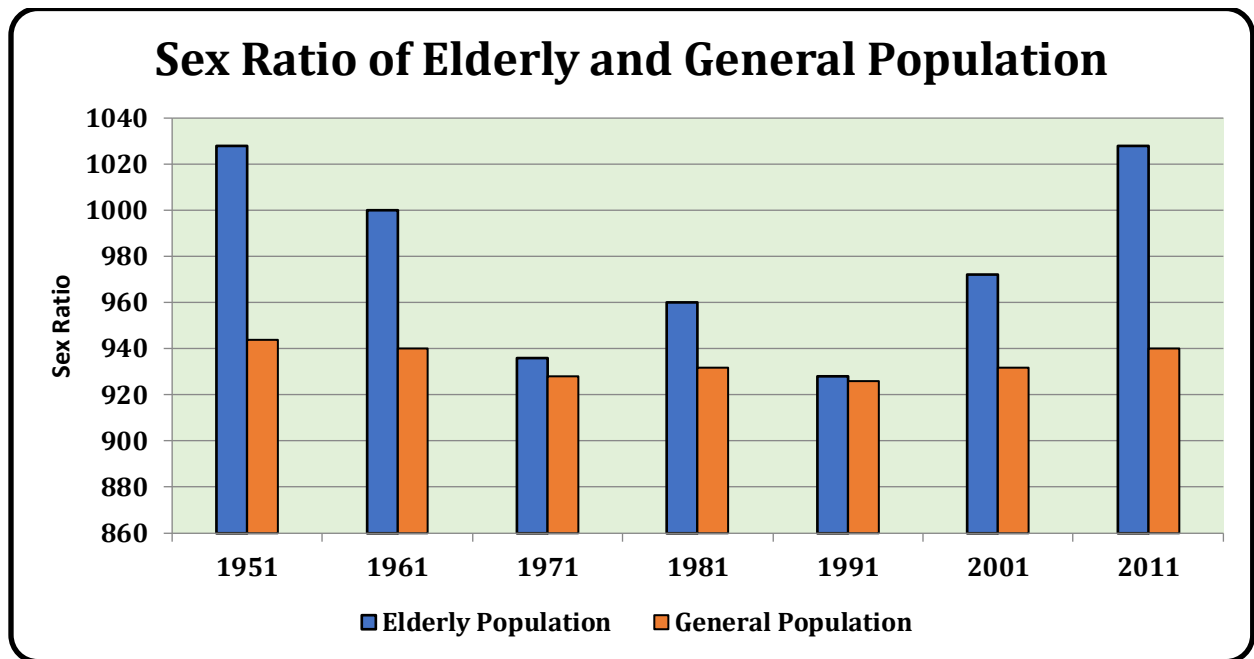
Figure 1.3: Trends in the sex ratio of elderly population and General population (India)

Sex ratio of elderly population always had been higher than that the general population indicating the women lives longer than their counter parts as they grow old. From 1951 to 1961, women declined for both the age groups. However the decline was more for elderly group that is of 28 points and for remaining age group the decline was only of 3 points. This decline continued till the decade 1971 for elderly and non-elderly age groups. Rise in the sex ratio was noticed in

the decade 1971-1981 but again the sex ratio declined from 1981 to 1991. From the last two decades continuous increment has been recorded. This increase in the sex ratio was unprecedented as the number was highest for elderly sex ratio. Increasing sex ratio does not indicate good condition of elderly women whereas this indicates more problems from women after the death of their spouse. If husband gets respect from the other members of family then in that case women also gets respect. As the husband dies the respect given to women by the family declines and problem increases for old aged women for fulfillment of her everyday needs. Half of the Indian elderly are dependents, often due to widowhood, divorce or separation, and a majority of the elderly having bad health are women (Rajan, 2001). Elderly women in India face various socio-economic, environmental, psychological and health related issues due to their increased vulnerability as they are more likely to be widowed and have income security, lower educational attainment, less labor force experience and more caregiving responsibilities (WHO, 2002).

Another worth mentioning point is that life expectancy at birth has increased since 1950 by almost 20 years to present number of sixty-six years (Zelenev, 2006). It becomes imperative to give more thrust on the concept of ageing with the view of increasing chunk of elderly world-wide and particularly and India which has both young and old population on increasing mode. Since youth are traditionally being linked with the future and progress of country, the strength of elderly as a potential for any country could be turned into widely accepted reality if direction could be determined.

As per the elderly population is rising world-wide, it is predicted that by the year 2020 around 70% of old population will be residing in the developing countries. Safeguarding the life's worth of an exceptionally enormous ageing population and significant to this is health as health is

considered as the greatest wealth in almost all the societies. Good health is considered as key enabler for real contribution in the society (UN, 1999).

Figure 1.4 shows the state share of elderly population of India as per census 2011. Southern states record higher share of elderly population than northern states and north-eastern states except in Punjab, Himachal Pradesh and Uttarakhand, southern states shows better socio-economic condition than the rest of the states of India. Kerala has the highest elderly population in the country with 12% of elderly residing there followed by Goa.

1.4 Area of the study

In India **Kerala** is situated in southern part and located at the Malabar Coast of India. It is bordered by Karnataka to the north and northeast. Tamil Nadu to the east and south and Lakshadweep Sea to the west. Kerala is home to 2.8% of India's population; with a density of 859 persons per km^2, its land is nearly three times as densely settled as the national average of 370 persons per km^2.As of 2011, Thiruvananthapuram is the most populous city in Kerala. In the state, the rate of population growth is India's lowest, and the decadal growth of 4.9% in 2011 is less than one third of the all-India average of 17.6%. Kerala's population more than doubled between 1951 and 1991 by adding 15.6 million people to reach 29.1 million residents in 1991; the population stood at 33.3 million by 2011. Kerala's coastal regions are the most densely settled with population of 2022 persons per km^2, 2.5 times the overall population density of the state, 859 persons per km^2, leaving the eastern hills and mountains comparatively sparsely populated. Kerala is the second-most urbanized major state in the country with 47.7% urban population according to the 2011 Census of India. Around 31.8 million Keralites are predominantly Malayali The state's 321,000 indigenous tribal Adivasis 1.1% of the population, are concentrated in the east.

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Uttar Pradesh is the fourth largest state in the term of area. The state is bordered by Rajasthan to the west, Haryana, Himachal Pradesh and Delhi to northwest, Uttarakhand and an international border with Nepal to the north, Bihar to the east, Madhya Pradesh to the south, and touches states of Jharkhand and Chhattisgarh to the southeast. It covers 240,928km square equal to 7.3% of the total area of the India.

Uttar Pradesh constitutes large population and a high population growth rate. From 1991 to 2001 its population increased by over 26%. Uttar Pradesh is the most populous state in India with 199,581,477 people on 1 march 2011. The state contributes to 16.2% of India's population. Population density is 828 people per square kilometer, resulting it one of the most densely populated states in the country. Uttar Pradesh has the largest scheduled caste population whereas scheduled tribe population is less than 1 percent of the total population. The sex ratio in 2011, at 912 women to 1000 men, was lower than the national figure of 943. The state's 2001-2011 decennial growth rates was 20.1%. Literacy rate of the state at the 2011 census was 67.7% which is below the national average of 74%. The literacy rate of men is 79% and for the women 59%. Crude birth rate of Uttar Pradesh was 27.8 births per 1000 inhabitants. As per report of NFHS-5 total fertility rate of Uttar Pradesh is 2.5. As per 2011 census, there are 15.44 million elderly in Uttar Pradesh (UP), out of which 12.44 million are living in rural areas.

Brief comparisons on the basis of demographic profile of the state could be seen from the table given below. Share of elderly population is more in Kerala (12.6) than Uttar Pradesh (7.7%).

Figure 1.4 State's share of elderly population in 2011

Share of Elderly Population in India 2011

Shares in Percentage

- less than 4.70
- 4.70 - 7.10
- 7.10 - 8.70
- 8.70 - 10.30
- 10.30 and Above

0 145 290   580   870   1,160
Kilometers
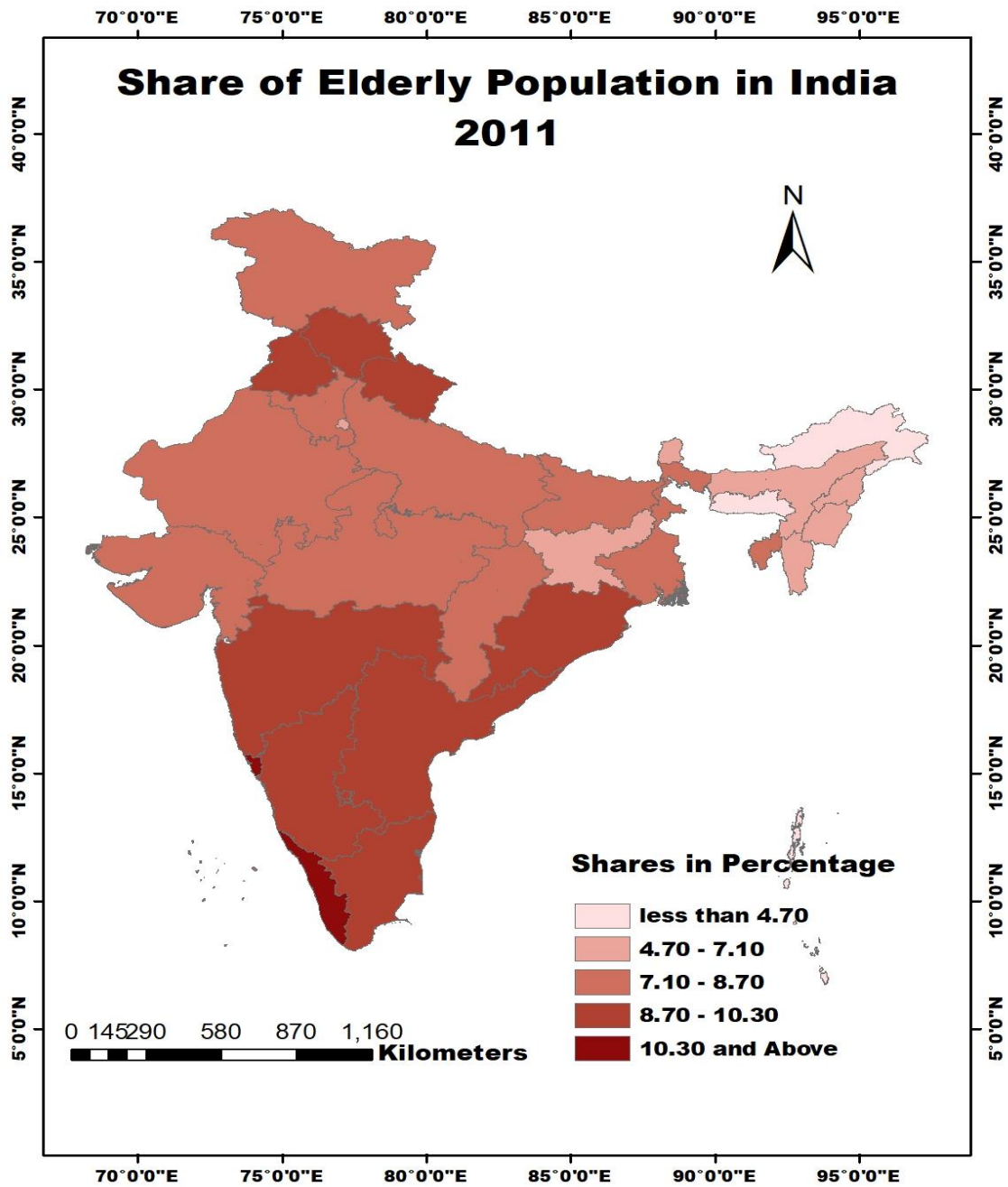
General Indicators of Kerala and Uttar Pradesh

GENERAL INDICATORS	KERALA	UTTAR PRADESH
Area	1.18%	7.30%
Total Population	2.76%	16.20%
Sex Ratio	1084	912
Share of Elderly population	12.60%	7.75
Literacy Rate	94.00%	67.70%
Male Literacy Rate	96.11%	79%
Female Literacy	92.07%	59%
Rural Population	53.30%	77.70%
Urban Population	47.70%	22.30%
Density per square km	860	829
MMR	66	292
IMR	6	71
Population Growth Rate (Decadal)	4.90%	20.10%

Source- Census of India, 2011

1.5 Concept of Multi-morbidity

Multi-morbidity which means the presence of multiple chronic health condition in one person is continuously rising from recent decades. Multi-morbidity is a common problem in the elderly and becomes more common with age. Multi-morbidity is significantly associated with result of increased mortality, increased disability, decreased functional status and decreased quality of life. It also leads to higher access to health care (Gijsen et. 2001). Various studies on multimorbidity have shown that its prevalence has increased worldwide over the past decade. India's steady demographic change has resulted into a period of rapid aging of population. The population having aged of 60 and above has increased from 19.6 million in 1951 (5% of total population) to 98 million in 2011 (9% of total population). The 60 and above population is projected to achieve 11% by 2025 and 19% by 20250 (United Nations, 2012).

Many people living with chronic conditions have multiple chronic conditions. Multimorbidity is defined here as the co-existence of two or more chronic conditions, where one is not necessarily more central than the others. Multimorbidity affects quality of life, ability to work and employability, disability and mortality. Currently, clinicians have limited guidance or evidence as to how to approach care decisions for such patients. Understanding how to best care and design the health system for patients with multimorbidity may lead to improvements in quality of life, utilization of healthcare, safety, morbidity and mortality.

In India, more than half of the non-communicable disease burden and 25% of the total disease burden occur in the 45+ age group (Chatterji et al., 2008). By 2030, more than 45% of the total burden of disease is projected to be borne by people aged 45 and above. With increasing life expectancy, multiple morbidities and comorbidities are becoming increasingly common in the elderly population.

Understanding the role of risk factors begins with two key assumptions. First, that comorbidity as observed in many epidemiological studies and reports does not necessarily reflect a causal association between diseases, as it may result from chance and bias (Valderas et al., 2009). If chance and prejudice can be removed, the different determinants (from shared heredity to environment and disease to disease) should be taken into consideration. Second, how biological ageing by itself influences the development of chronic diseases is far from clear and the concept of healthy ageing is a useful one (Kuh et al., 2014).

In addition to aging, many other important risk factors are associated with the development of chronic diseases. These include habits such as tobacco smoking and alcohol consumption, over- and under-nutrition, inactivity, and occupational stress. Many of these factors can lead to multiple diseases. For example, smoking causes chronic diseases such as COPD, cardiovascular disease, and stroke, while overeating causes diabetes and cardiovascular disease.

Life expectancy is expected to increase globally, and as life expectancy increases, it comes with greater chance of diseases for an individual. Facing with the global challenges of an aging population and an increasing prevalence of several chronic diseases (WHO, 2011), a paradigm shift by governments and health care systems is essential in the management of limited resources and increasing medical expenditures. For population with multi-morbidity, broadly defined as the same person suffering from two or more chronic diseases at the same time, single-disease approach to health care delivery is often inefficient and duplicative (Wolff et al., 2002).

Chronic disease management has been identified as a major concern for healthcare systems in developed countries given the increasing prevalence and burden of chronic disease. According to the World Health Organization, chronic diseases have reached epidemic proportions and constitute the leading causes of death in the world (Starfield, 2011). Improving survival and

aging populations are two of the main reasons that the prevalence of chronic disease and the likelihood of living with more than one condition are expected to continue to rise for the near future (Fortin et al. 6 2012; Saliva, 2013). In addition, several lifestyle factors, including tobacco use, physical inactivity, harmful use of alcohol and unhealthy diet have been identified as important contributors to the incidence of chronic diseases and multimorbidity (Fortin et al., 2005; Starfield, 2011). In their study, Fortin et al. found that the likelihood of multimorbidity was associated with the number of unhealthy lifestyle factors (2005). Empirical studies based on surveys and clinic records show that multi-morbidity is prevalent and the norm, especially among the elderly, who are known to be the largest users of the health care system. (Fortin et al., 2012; Surive, 2013).

Medical practices are becoming increasingly specialized in both hospitals and general medicine. For example, many clinics now offer management clinics for chronic diseases such as diabetes. This approach of treating each condition in isolation has serious limitations. It is important to recognize that many people have multiple concurrent chronic conditions (Valderas et al., 2009). People with multiple chronic diseases are likely to have complex medical needs and represent a high proportion of the medical workload. A better understanding of epidemiology and the impact of multiple-morbidity is necessary to inform the way healthcare is organized and delivered.

Current health care models and clinical guidelines can pose unrealistic expectations in terms of the burden of self-management for people with multi-morbidity; who may be prescribed multiple doses of multiple medications each day, and who may also be undertaking several non-pharmacological activities such as exercise, or attending support groups, rehabilitation services or health care services in any given time (Boyd et al., 2005).

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To address multimorbidity from a public health perspective, previous studies have underlined the importance of integrating multimorbidity into clinical guidelines, providing self-care management strategies, prioritizing the prevention of chronic conditions and avoiding fragmented care (AGS, 2012; Boyd & Fortin, 2010; Kadam, 2012). However, further evidence of multimorbidity patterns is needed to make any real progress. The epidemiology of multiple chronic diseases is poorly understood, with most studies assessing a single disease or a couple of comorbidities associated with a single index disease (Boyd & Fortin, 2010; Fultz et al., 2003). Therefore, recent efforts have been made to describe the complete pattern of co-occurring diseases within a population in order to get a complete picture of the distribution of chronic diseases (Prados-Torres et al., 2014).

From a biological perspective, the need to study disease interactions is emphasized as a first step towards better understanding the medical needs of populations. From the patient's perspective, burden (self-care, behavior change, therapy, clinic visit management) and ability to cope with that burden are fundamental issues in dealing with multi-morbidity (Oni et al., 2014). Minimally disrupted healthcare should provide holistic generalist care aimed at avoiding fragmentation, improving capacity and care, and reducing the workload of medical staff. From the community perspective, activities such as adherence clubs and monitoring systems have also been recommended. The goal would be a care continuum with prevention of chronic conditions as one of the pillars of that care.

CHAPTER-2
REVIEW OF THE LITERATURE
&
OBJECTIVE

CHAPTER-2

REVIEW OF THE LITERATURE

"Years have been added to life now we must add life to years" – WHO

2.1 Introduction

There are many concepts linked with ageing like that of "healthy ageing" (WHO, 1990), productive ageing (Bulter and Gleason, 1985), successful ageing (Rowe and kahn, 1987; Baltes and Baltes, 1990) "active ageing" (WHO, 2002) and Ageing With confidence"

The population of 60 years and more on 2005 was 673 million and it is predicted to increase to 2 billion by 2050, which is about more than three times increase and if this number continue to rising then the first quarter of 21st century will be called "the age of ageing" (Shettar, 2013). In today's world the outlook for considering any individual as old is changing gradually, as any person is assumed as old not only by his level of physical fitness, but most strong base for judging any individual as old is based on his working condition, his engagement in work. If the individual is unproductive and is not contributing to the society, then in such situation that person is called as old. Some mainly the time at which individual becomes old is only when he is stops working (Shirolkar, 1995).

Studies of comorbidity or multimorbidity reveal that there is no consensus about how the co-occurrence of diseases should be measured (Guralnik, 1996). Researchers have used mainly four basic approaches to the study of multimorbidity. A common approach is to count the number of diseases (Guralnik et al., 1989; Verbrugge et al., 1991). As Guralnik and colleagues (1989) pointed out (Guralnik et al., 1989), the number of chronic conditions considered influences the prevalence of comorbidity estimated by this measure.

Comorbidity is seen in patients of all ages. Half of people above 65 years of age have at least three or four coexisting chronic conditions. One in five has five or more. Although the share of patients having comorbidities increases in older age groups, the largest numbers of patients having multiple comorbidities are under 65. More than half of patients attending primary care in the UK have multiple chronic conditions, and such patients take up an even greater proportion of consultations (Barnett et al., 2012; Salisbury et al., 2011). In a study of Medicare beneficiaries, the proportion of patients with more than five treated conditions increased from 31% to 50% from 1987 to 2002 (Thorpe & Howard, 2006).

It is estimated that 30%–50% of community-dwelling older adults in Western countries live with multimorbidity (Barnett et al., 2012; Holzer et al., 2017). A study from China showed that 30% of Chinese older adults have two or more chronic diseases (Wu et al., 2013). The prevalence can reach between 3% and 98% depending on the setting, data sources and sample characteristics such as age (Fortin et al., 2005; Fortin, Dubois, et al., 2007; Fortin et al., 2010; Fried et al., 1999; Glynn et al., 2011; O'Kelly et al., 2011; Uijen & van de Lisdonk, 2008; Van den Akker et al., 1998; Wolff et al., 2002).

Several studies in high income countries have demonstrated the magnitude of multimorbidity to be emerging; with the prevalence varying from 25 to 60% in health care and community settings (Adebusoye et al., 2011; Brett et al., 2013; Marengoni et al., 2008; Schäfer et al., 2012). In contrast, the condition of multimorbidity in low and middle-income countries (LMICs) is unclear. Amongst lowe middile income countries, India the second largest demography in the world, is witnessing a rapid upward shift in life expectancy, with various non-communicable diseases (NCDs) replacing infectious illnesses as the dominant contributors to morbidity and mortality (Chatterji et al., 2008; Patel et al., 2011). Despite the growing burden of chronic

conditions, there is very limited knowledge on the occurrence multimorbidity until date principally owing to lack of basic epidemiologic data. Our recent systematic review on multimorbidity indicated the research on this topic to be in its infancy in India with most of the studies restricted to the elderly population and no reports available from primary care settings (Pati, Swain, Hussain, Van Den Akker, et al., 2015). The available studies on multimorbidity are mostly from developed countries, using databases from primary care (Pati, Swain, Hussain, Van Den Akker, et al., 2015). However, very little research on this topic has been undertaken in LMICs, where 80% of the burden of NCDs falls (Pati, Swain, Hussain, Van Den Akker, et al., 2015).

Few recently published works on multimorbidity in LMICs are either community based or restricted to a limited number of public facilities, which does not capture the true extent of multimorbidity and a clear picture from private health care facilities is lacking. Data on multimorbidity in South Asia is limited. With the increases seen in aging populations in Asian countries, South Asia is experiencing more multimorbidity than ever before (Agrawal & Agrawal, 2016; Singh et al., 2019). The prevalence of comorbidity in South Asia varies from 4.5% to 83% (Pati, Swain, Hussain, Kadam, et al., 2015). The prevalence of multimorbidity in India, another South Asian country has been estimated to be 24%. The only study done in Sri Lanka to date on multimorbidity has found a prevalence of 25.4% for cardiometabolic multimorbidity (Feng et al., 2019). This has been conducted in rural Sri Lankan community setting. The prevalence of multimorbidity in an urban or a hospital setting in Sri Lanka has not been evaluated before. Previous small sample studies conducted in Bangladesh and India have identified a prevalence of multimorbidity of 53.8 and 77% in persons aged more than 60 years, respectively (Banjare & Pradhan, 2014; Khanam et al., 2011).

Presence of multimorbidity leads to frequent health care consultations, longer hospital stays, poorer health related quality of life, increased health care costs and higher mortality (Anjum et al., 2006; Bähler et al., 2015; Fortin et al., 2006; Glynn et al., 2011). Multimorbidity is increasingly being identified as one of the most pressing challenges for the health care system owing to its adverse health and economic implications and for health care workers, whose decision making is generally supported by single disease-specific guidelines (Fortin, Soubhi, et al., 2007; Salisbury et al., 2011). Multimorbidity is responsible for 65% of total health care expenditure in high-income countries due to the extensive use of health services (Parekh & Barton, 2010). The increasing trends in comorbidity may have considerable financial implications over the next few decades. Generally, older age, female gender, low education and low-income people were seen to be likelier to have multimorbidity (Al-Amer et al., 2011). The effect of multimorbidity on females, the elderly, the low income and the vulnerable population is greater thus mandating that health services delivery should work towards achieving greater clinical care equity and universal health coverage for addressing multimorbidity.

India, a rapidly urbanizing country is currently entangled with high burden of NCDs (Patel et al., 2011). As per the latest national survey, nearly half of the people in India avail private health care services in conjunction or parallel to public health care services for chronic diseases (Jain et al., 2015). The basis of primary care is that generalists manage all health problems commonly occurring in the population, identifying and referring those problems needing specialist care, and coordinating care for patients with complex health problems (Starfield, 1998). However, efforts to improve quality of care have fueled a move towards specialization within general practice, and an emphasis on improving access has led to a multiplicity of providers, with patients being less likely to consult the same professional on each occasion.

Empirical evidence suggests that loneliness has severe health related complications across life span (Caspi et al., 2006; Hawkley et al., 2006; Sorkin et al., 2002). Surprisingly, there is a lack 7 of research determining whether physical health could be a possible reason for the feeling of loneliness in older ages. Evidence suggested that individuals with two or more chronic illnesses are more likely to have limited social networks compared to individuals with one or less chronic conditions (Tisminetzky et al., 2016). However, compared to those without multimorbidity, those with multimorbidity have a higher chance of functional decline, poorer quality of life, and more often use of health-care services (Yarnall et al., 2017). Another similar study has shown that multimorbidity are considered to be older adults with complex healthcare needs, who have significantly higher healthcare needs, and pose a significant burden on the available health-care services (Buja et al., 2018). Parallel to this line, evidence from India shows that the prevalence of 1+ ADL limitation, poor self-rated health, and depression increased whereas quality of life declined markedly with an increase in number of diseases (Arokiasamy, Uttamacharya, & Jain, 2015). As results, older adults experiencing complications from physical illness and immobility are more likely to stay home rather than socialize, causing the feelings of loneliness (Petitte et al., 2015).

2.2 Need for the Study

Complications and concerns of older population is not being given severe thought because of the fact that in our country major proportions of the population is below 30, very few research on ageing has been tried in our country. To get the best of the demographic dividend, the emphasis is largely on the children and youth because they are considered as future of our country, if they are secured it means that nation's future is secure (Das, 2011). However the Indian society in its present form is now amalgamation of both old and culture and new globalization affected nation.

On one side we have traditional joint family system whereas on another side we have new emerging nuclear family system, in this milieu it becomes imperative for any nation to give social and economic security as well as health security to its elderly especially when their population is increasing continuously, because of opening of economy and of globalization and emerging prevalence of nuclear family set ups in our country, there is probability that elderlies may not get the due attention in the way they should be given. They may feel themselves insecure emotionally and mentally, financially and socially.

The decadal growth rate of elderly population has always been more than that of rest of the age group population, which indicates the growing share of elderly in India in total population of the country. To manage the increasing share of this age group population and to give them fair society which gives them respect and help them in maintaining their dignity and autonomy, there is a growing need that more research should be made in this direction so that their changing need could be given equal importance as similar to needs of other age groups population by the government or by the community in which they live. In our country gender disparity exist to a lager extent, even younger women are fighting for their empowerment and autonomy and the rights given to women are not universally application barring some exceptions. Therefore, it is not difficult to understand the pathetic condition of elderly dependent women and the urgent and very basic need to cover the needy elderly women in the policies of the government.

India is experiencing upward shift in life expectancy which cause in increase of older population. Increasing population of elderly are responsible for change in disease burden profile of country as change in chronic non-communicable disease. Multi-morbid condition will become more common and growing public health problem. Since, multi-morbidity has a high prevalence in elderly population. In age 45 year and older, more than half have currently at least two chronic

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condition and approximately one-third have three or more than three chronic conditions. With increasing age of population the chances of morbidity as well as multi-morbidity are also increasing. So, it is most important to understand the level of multi-morbidity among older population and try to put attention of government on their pathetic conditions.

2.3 Conceptual Framework

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                        ┌─────────────┐
                        │   Ageing    │
                        └─────────────┘
                         ╱           ╲
          ┌────────────────────┐   ┌────────────────────┐
          │  Single Morbidity  │   │   Multi-morbidity  │
          └────────────────────┘   └────────────────────┘
                                             │
                                             ▼
          ┌──────────────────────────────────────────────┐
          │  Socio-economic, Demographic and Other Risk   │
          └──────────────────────────────────────────────┘
                              ▲
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Socio-economic factors	Demographic factors	Other Risk Factors
• Caste • Religion • Place of Residence • Years of Schooling • Wealth Index • Working Status	• Age • Sex • Marital Status	• Tobacco Smoking • Alcohol Consumption • Self-rated health • Living arrangement
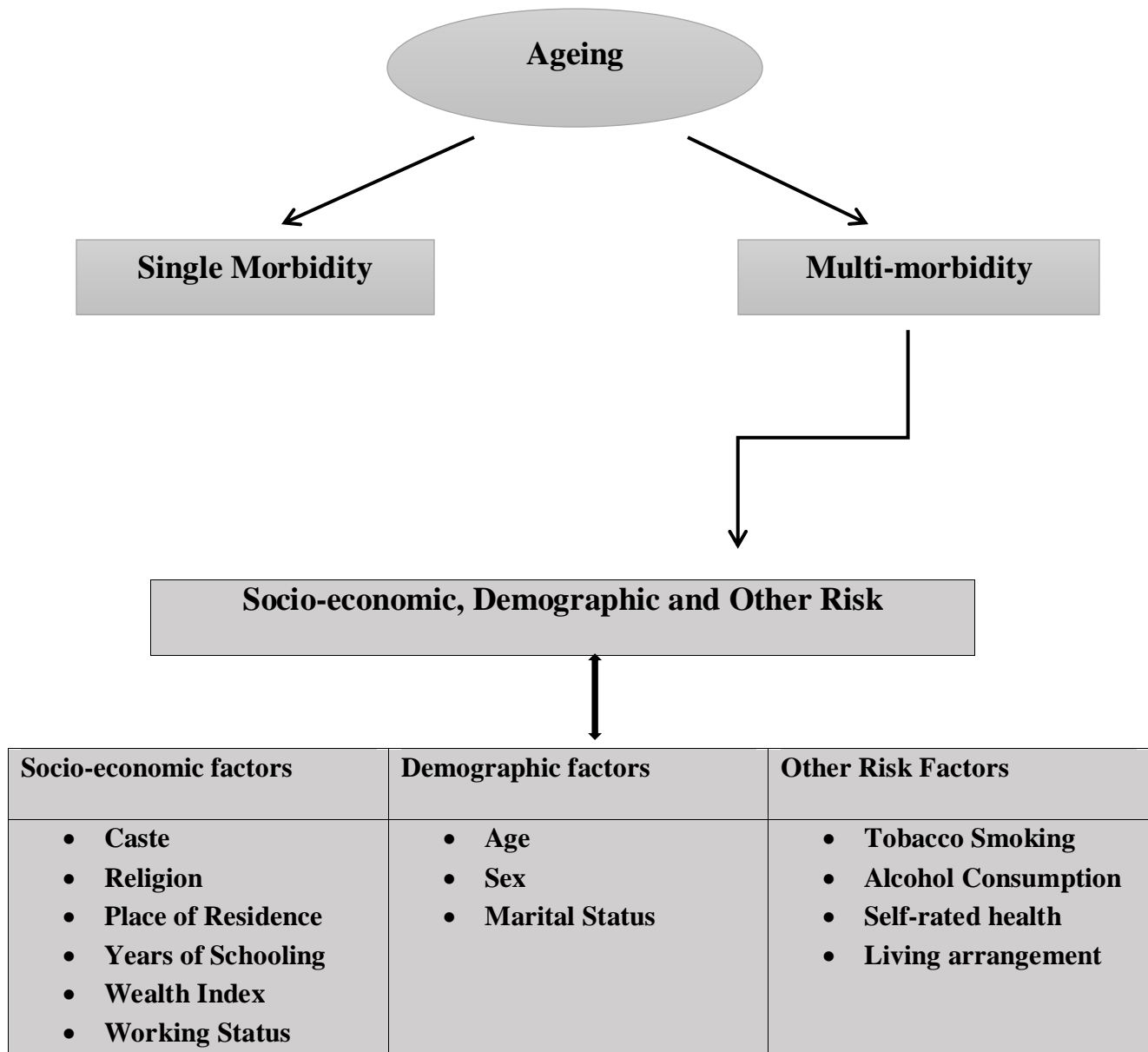
2.4 Research Questions

1. What is the prevalence of multi-morbidity among older adult age 60 year and above in India by various socio-economic factors?

2. Whether different socio-economic factors are responsible for multi-morbidity among older adult in Uttar Pradesh and Kerala?

3. By which Extent multi-morbidity is responsible for over utilization of health care utilization in India?

4. What is the level of association of multimorbidity with various socio-economic and demographic characteristics in older adults of Uttar Pradesh and Kerala?

2.5 Objectives

1. To examine the socio-demographic distribution of multi-morbidity among older population of Uttar Pradesh and Kerala

2. To identify the socio-demographic factors associated with multi-morbidity and healthcare utilization.

CHAPTER-3

DATA SOURCE AND METHODOLOGY

CHAPTER 3
DATA SOURCE AND METHEDOLOGY

This chapter discusses in detail the data sources and methodology used in this study.

3.1 Data Source

For this study, data from the first wave of Longitudinal Ageing Study in India (LASI WAVE 1, 2017-18) was used. Individual file was used for this study. LASI provides information for India and all of its states and union territories for demographics, health, family and social network, economic condition of the older adults in India. It is a longitudinal ageing and health study with national representative samples. It is the world's largest and India's first longitudinal ageing study. LASI is a multidisciplinary, internationally harmonized panel study of 72,250 older adults aged 45 and above including their spouses less than 45 years, representative to India and all of its states and union territories (excluding Sikkim).

LASI WAVE 1 data provides information on demographics, household economic status, chronic health conditions, symptom-based health conditions, functional health, mental health (cognition and depression) and other components such as), biomarkers, health insurance and healthcare utilization, family and social networks, social welfare programs, work and employment, retirement, satisfaction, and life expectations.

LASI project is conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India, coordinated by the International Institute for Population Sciences, Mumbai. It is a collaborative study of three partnering institutions: International Institute for Population Sciences (IIPS), Harvard T.H. Chan School of Public Health (HSPH), and University of Southern California (USC) and several other national and international institutions with the

major financial support from the Government of India, the National Institute of Ageing (USA) and the United Nations Population Fund (UNFPA)-India.

Multistage stratified area probability cluster sampling design was adopted in LASI Wave 1.

Three-stage sampling design and four-stage sampling design is used in rural and urban areas respectively. The first stage is selection of Primary Sampling Units (PSUs), i.e. sub-districts (Tehsils/Talukas), and then selection of villages in rural areas and wards in urban areas in the selected PSUs in second stage. In third stage, households were selected from selected villages in rural area while Census Enumeration Block (CEB) was randomly selected in each urban ward then households were selected from this CEB in Urban areas. Households with at least one member 45 years of age or above were defined as eligible household while individuals in these eligible households of 45 years and older and their spouses, regardless of age were defined as eligible individual.

3.2 Variables used in the Study

Main variable of interest was whether respondents had more than one illness.

Non communicable diseases: Hypertension or high blood pressure; Diabetes or high blood sugar; Cancer or a malignant tumor; Chronic lung disease 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 etc.; High cholesterol.

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Other NCDs: Thyroid disorder, Gastrointestinal problems (GERD, constipation, indigestion, piles, peptic Ulcer), Skin diseases and others.

Urogenital: Chronic Renal Failure, Incontinence, Kidney Stones, BPH (Benign Prostatic Hyperplasia).

Eyesight: Presbyopia, Cataract, Glaucoma, Myopia (Nearsightedness), Hypermetropia (Farsightedness).

Oral health conditions: Painful teeth, Ulcers lasting more than two weeks, Bleeding gums, swelling gums, welling gums, dental cavity/dental caries, Soreness or cracks in the corner of the mouth and others.

Data has been collected on the basis of respondents as having an illness if they answered affirmatively the following two questions: "Have you ever been told by a health professional that you have . . .? (For example, Diabetes or high blood sugar)", or "Have you ever been diagnosed with . . .?" We counted the number of health conditions for each respondent, and defined those with multimorbidity as the presence of two or more of the above listed conditions without a specific reference condition.

Respondents were asked about their utilization of outpatient and inpatient services; whether or not they had any outpatient visit, and number of outpatient visits in the past 12 months; or any overnight hospital stay in the past three years, and number of overnight stays in hospital in the past 12 months.

Two variables of multimorbidity multimorbid1 (No disease, 1 disease and more than 1 disease) multimorbid2 (Multimorbidity-No and Multimorbidity-Yes) have been created for the study.

The following covariates are used in the analyses:

Age at last birthday: Below 45 years, 46-60 years, 61-75 years, Above 75 years;

Gender: Male and Female;

Residence: Rural and Urban

Level of Education: No formal education, Primary school completed, Secondary/matriculation and above secondary;

Health Insurance Status: With insurance and without insurance;

MPCE Quintiles: Poorest, Poorer, Middle, Richer and Richest;

Caste Category: Scheduled caste, Scheduled tribe, other backward class and none of them; Religion: Hindu, Muslim and Others;

Currently working: No, Yes and never worked;

Current marital status: Currently married, Widowed, others;

3.3 Methodology

This study used frequencies, percentages and cross tabulations for prevalence of multimorbidity with respect to the social and demographic characteristics with 95% confidence interval.

Chi-square test of association ($\chi2$): The Chi-Square Test of Independence determines whether there is an association between categorical variables (i.e., whether the variables are independent or related). It is a nonparametric test. the chi-square test is used to see the association between multimorbidity and above listed variates.

Logistic Regression: Logistic regression analysis is used to examine the association of (categorical or continuous) independent variable(s) with one dichotomous dependent variable. This is in contrast to linear regression analysis in which the dependent variable is a continuous variable. We used multivariable logistic regression analysis to determine socioeconomic and demographic correlates of having multimorbidity. This study includes most of the demographic and socio-economic indicators as independent variable and single morbidity as well as multiple-morbidity as the dependent variable.

Negative Binomial Regression: Negative binomial regression is similar to regular multiple regression except that the dependent (Y) variable is an observed count that follows the negative binomial distribution. Thus, the possible values of Y are the nonnegative integers: 0, 1, 2, 3, and so on. Negative binomial regression is a generalization of Poisson regression, which loosens the restrictive assumption that the variance is equal to the mean made by the Poisson model. I used negative binomial regression to look at the association between health services utilization and multimorbidity. To show this relation healthcare facilities is used as independent variables and level of multimorbidity is used as dependent variables.

CHAPTER-4

PREVALENCE OF MULTIMORBIDITY

CHAPTER 4
PREVALENCE OF MULTIMORBIDITY

4.1 Introduction

This chapter discusses the health conditions in the term of prevalence of morbidity that means what are the multi-morbidity levels on the basis of socio-demographic parameters. This chapter consists explanation of multi-morbidity level in whole India (state-wise) and putting more focus on two states namely Kerala and Uttar Pradesh. Presence of multiple (more than one) diseases, commonly referred to as 'multi-morbidity'. It is a common phenomenon especially in older people. The prevalence of multi-morbidity increases with age, but is not just an issue for older adults. As a result of advances in medical care and public health, a growing proportion of people have multi-morbidity. In an Australian cohort study, more than 40 percent of the people with multi-morbidity were less than 60 years of age. The prevalence of multi-morbidity is striking in studies conducted in several countries in different parts of the world. While the prevalence varies, this partially depends on the source of the population studied (patients vs. population based samples), sources of data (e.g., surveys, chart reviews, administrative data), data collection methods, targeted age groups, diagnoses considered and study populations, making the comparability of prevalence estimates questionable. The presence of multi-morbidity also indicates higher risk of additional conditions; people with multi-morbidity are at a higher risk of being diagnosed with two or more new diseases than those with no disease.

Empirical studies based on surveys and physician practice records show that multi-morbidity is highly prevalent and is the norm, particularly for older adults who are known to be the highest users of the health care system. Multi-morbidity has been associated with

lower health related quality of life, higher utilization of health care services and prescribed medications, increased disability, and mortality.

4.2 Socio-demographic characteristics and Multimorbidity in India

The socio-economic and demographic characteristics of the study of elderly population help to understand the multi-morbidity conditions in old age population. Because socio-economic and demographic characteristics consists residence of target population, sex of that population age-group, level of education, caste and religion, working status and marital status of target population. On the basis of these parameters this chapter explains the multi-morbidity level Over India and comparative analysis among Uttar Pradesh and Kerala. If we go through over all India then we got following results.

The socio-economic and demographic characteristics of the study population by the number of diseases are presented in Table 1. The mean number of illnesses in the sample was 2.58 (SD=2.19) with 18.75% (95% CI = 18.16% - 19.36%) had 1 disease, and 62.68% (95% CI = 61.9% - 63.45%) had multimorbidity. The prevalence of multimorbidity increased substantially with age, from 44.69% (95% CI = 39.3% - 50.22%) in ≥ 40 year olds to 74.12% (95% CI = 70.43% - 77.5%) in those aged above 80 years, AOR = 39.2 (95% CI = 20.7- 74.0, for those aged 70 years and above compared to those aged 18–29 years). The crude prevalence of multimorbidity increased modestly with increasing household wealth, from 53.78% (95% CI = 52.32% - 55.23%) in the lowest wealth quintile to 71.97% (95% CI = 70.02% - 73.84%) in the highest wealth quintile. There is considerably higher prevalence of multimorbidity in urban areas with 69.59% (95% CI = 67.66% - 71.45%) against rural area with 59.48% (95% CI = 58.79% - 60.17%). There seems to be not much difference in

male **17** and female as far as multimorbidity is concern whereas widowed persons have higher prevalence of multimorbidity with 69.51% (95% CI = 67.98% - 71.00%) as compared to currently married with 60.92% (95% CI = 60.04% - 61.78%).

Figure 4.1 shows higher prevalence of multimorbidity in urban areas in comparision to rural areas. It makes a difference of around 10% point of multi-morbidity. There may be multiple reasons for this difference, because of climatic factors are more responsible for higher population level in urban area. Figure. 4.2 shows multi-morbidity level is higher in female than male. It shows that among the total targeted population female shares around 63% in the term of multi-morbidity. On the other side male shares around 20%. In such way it makes difference of 42% of multi-morbidity between male and females. Figure 4.3 show the multi-morbidity level on the basis of age group and it indicates increasing trend with increasing age from 45 to 75 years. Multi-morbidity is the highest in 75+ age group. It makes difference of about 40% of multi-morbidity between 45 years and 75 years. Fig 4.4 shows that the higher wealth group has higher percentage of multi-morbidity, 53.78% of the poorest group have multi-morbidity, whereas among richest group 71.97% of rich older population are affected with multi-morbidity. Upper caste has high prevalence of multiple diseases can be found through figure 4.6. it is found that scheduled caste who shares 60% and scheduled tribes about 50% shares in multi-morbidity level whereas upper caste shares 68.6% of multi-morbidity. Figure 4.7 shows Muslims have highest prevalence of multi-morbidity in compared to other religion, and figure 4.8 shows those who are currently not working have higher prevalence, on the other hand widowed has relatively higher prevalence multi-morbidity (figure 4.9) compare to currently married.

RESIDENCE

	RURAL	URBAN	OVERALL
■ NO disease	20.65	14.08	18.57
■ 1 disease	19.88	16.33	18.75
■ More than 1 disease	59.48	69.59	62.68

■ NO disease   ■ 1 disease   ■ More than 1 disease
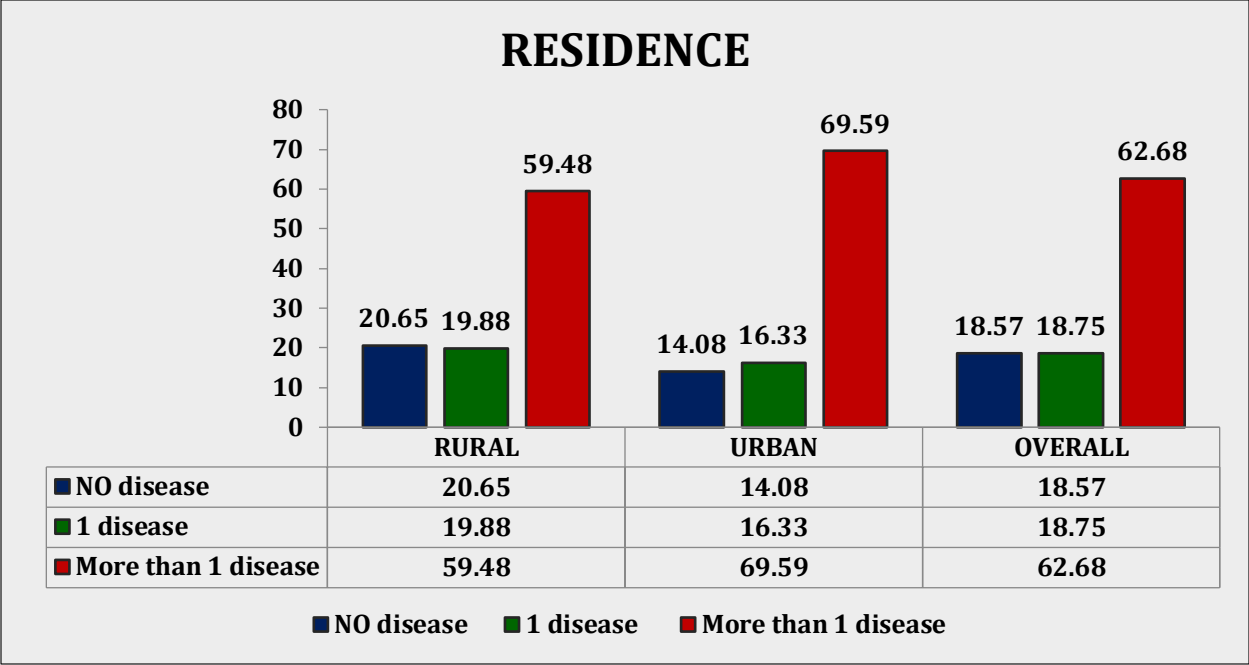
Figure 4.1: Number of Diseases by Place of Residence

SEX

	Male	Female	Overall
■ NO disease	18.3	18.76	18.5
■ 1 disease	19.4	18.29	18.75
■ More than 1 disease	62.3	62.95	62.68

■ NO disease   ■ 1 disease   ■ More than 1 disease
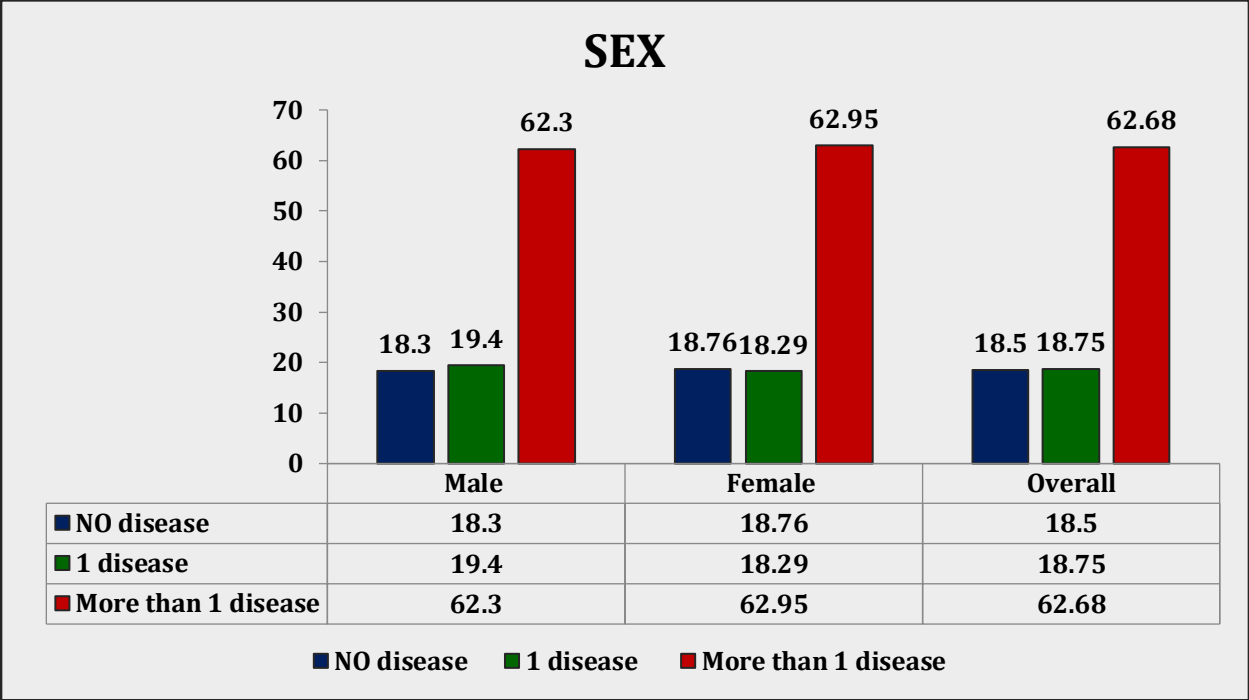
Figure 4.2: Number of diseases by Sex of the respondents

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Age Group

	> 45 years	46-60 years	61-75 years	Above 75 years	Overall
No disease	30.75	21.1	12.71	9.24	18.57
1 disease	20.95	19.67	17.11	16.9	18.75
More than 1 disease	48.31	59.24	70.18	73.86	62.68

■ No disease   ■ 1 disease   ■ More than 1 disease
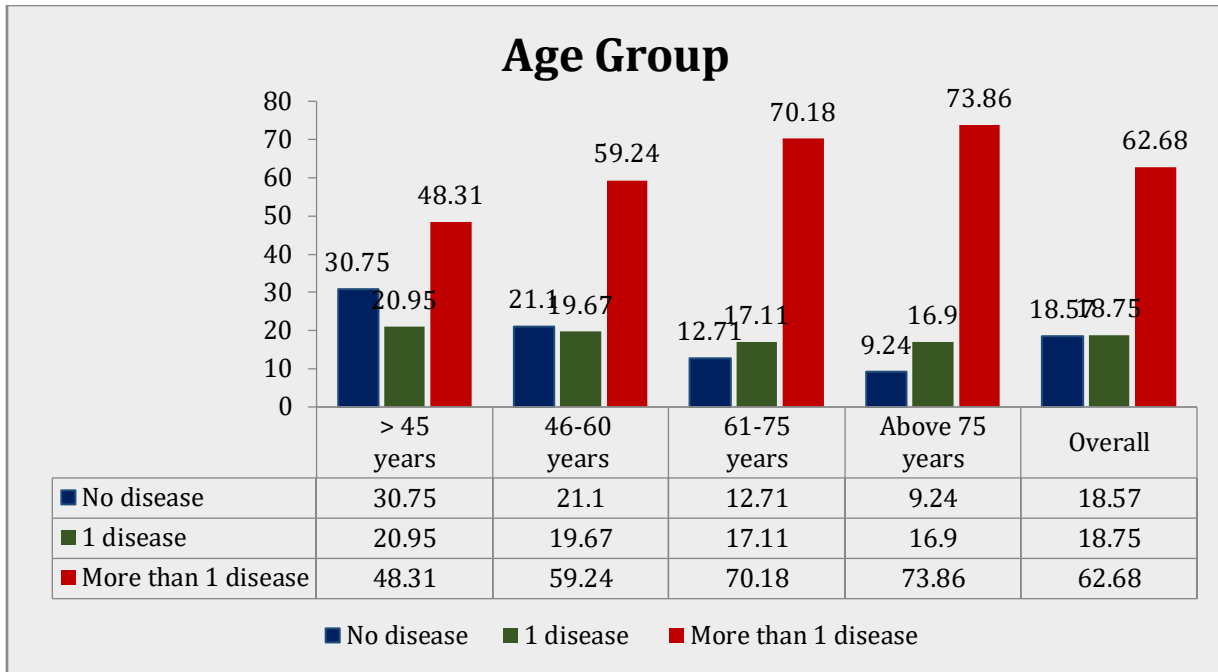
Figure 4.3: Number of diseases by Age group of the respondents

MCPE Quintile

	Poorest	poor	middle	Richer	Richest	Overall
NO disease	24.86	19.79	18.13	16.34	12.82	18.57
1 disease	21.36	19.33	19.68	17.68	15.21	18.75
More than 1 disease	53.78	60.87	62.19	65.99	71.97	62.68

■ NO disease   ■ 1 disease   ■ More than 1 disease
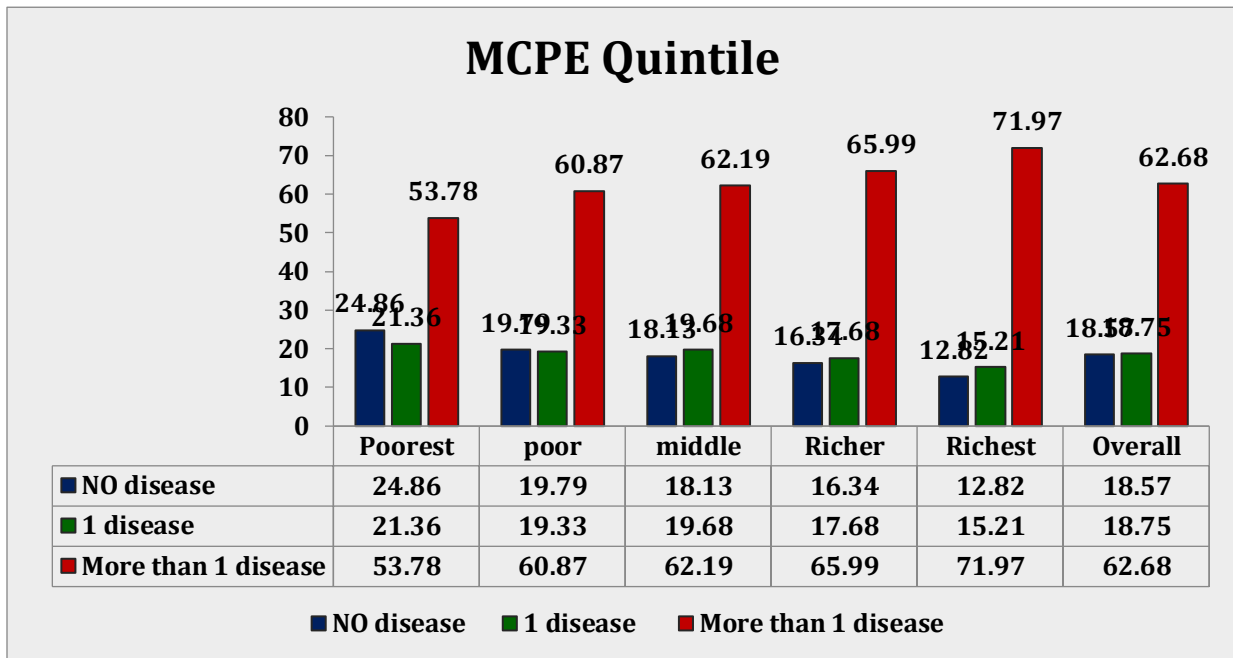
Figure 4.4: Number of diseases by MCPE quintiles

Level of Education

	Illitrate	Primary	Secondary/ Mtriculation	Above Secondary	Overall
NO disease	20.95	16.37	15.52	17.04	18.57
1 disease	19.71	17.47	18.19	17.98	18.75
More than 1 disease	59.34	66.17	66.29	64.99	62.68
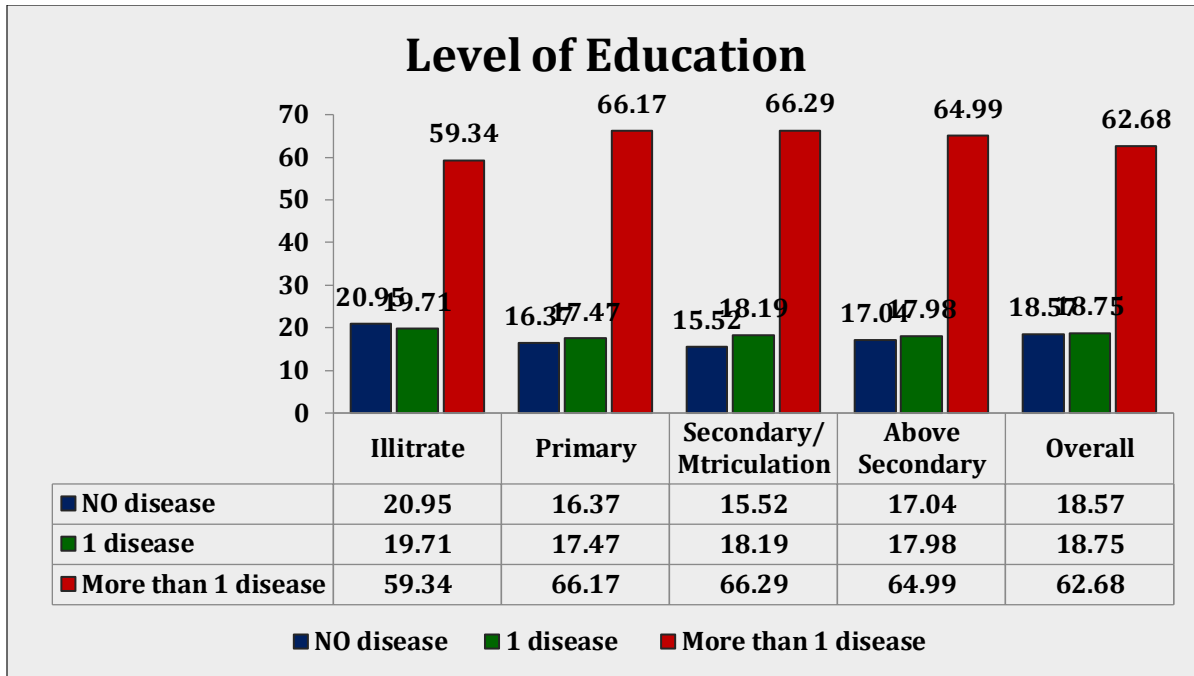
Figure 4.5: Number of diseases by Level of Education

CASTE CATEGORY

	Scheduled Caste	Scheduled Tribe	Other Backward class	None of them	Overall
NO disease	19.46	29.78	18.48	14.39	18.57
1 disease	20.24	20.65	18.84	17.01	18.75
More than 1 disease	60.3	49.58	62.68	68.6	62.68
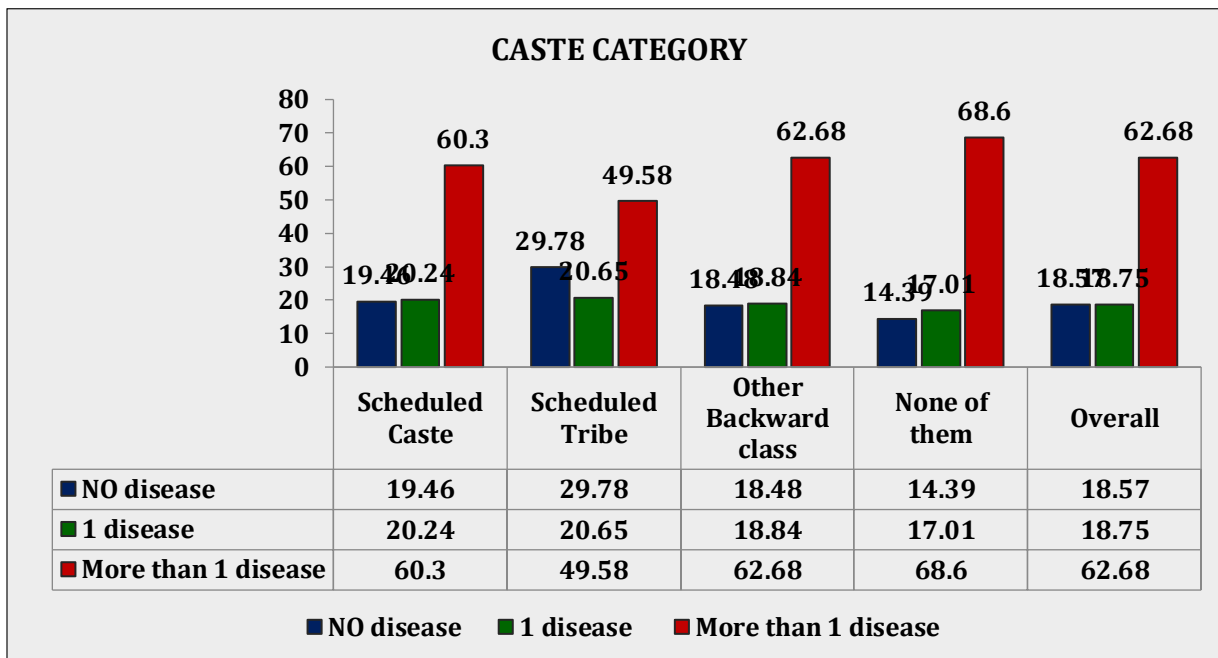
Figure 4.6: Number of diseases by Caste category

Religion

	Hindu	Muslim	Others	Overall
■ NO disease	19.13	15.59	16.77	18.57
■ 1 disease	19.12	16.88	17.42	18.75
■ More than 1 disease	61.75	67.53	65.81	62.68

■ NO disease   ■ 1 disease   ■ More than 1 disease
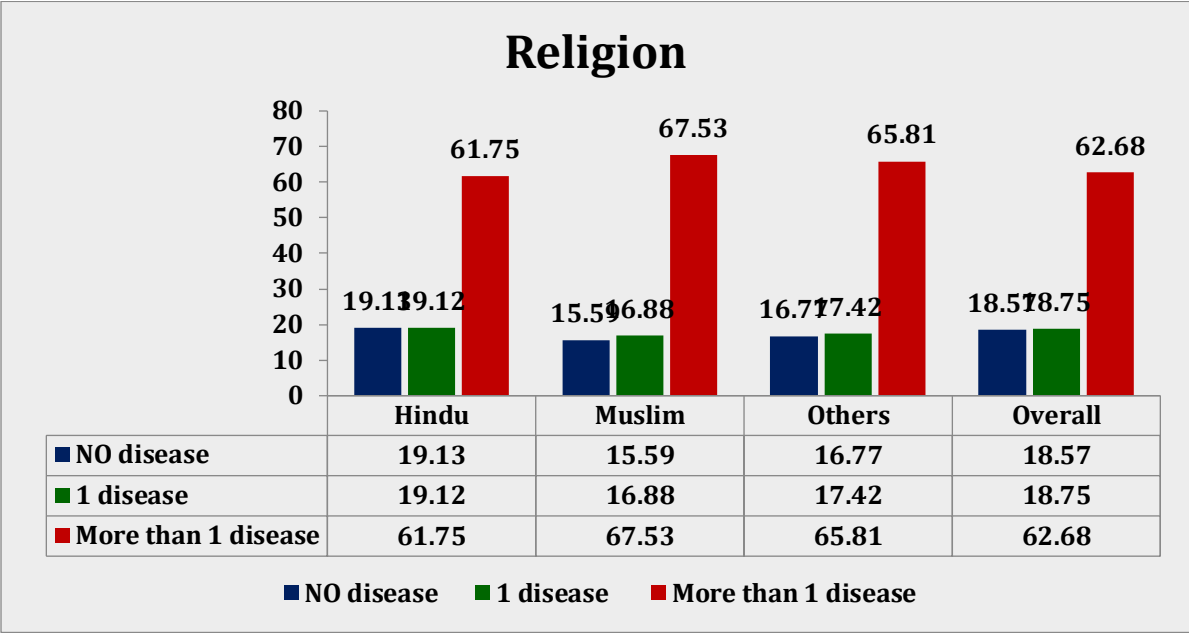
Figure 4.7: Number of diseases by Religion

Working Status

	Yes	No	Never Worked	Overall
■ NO disease	23.42	11.12	17.45	18.57
■ 1 disease	20.63	16.74	17.52	18.75
■ More than 1 disease	55.96	72.15	65.03	62.68

■ NO disease   ■ 1 disease   ■ More than 1 disease
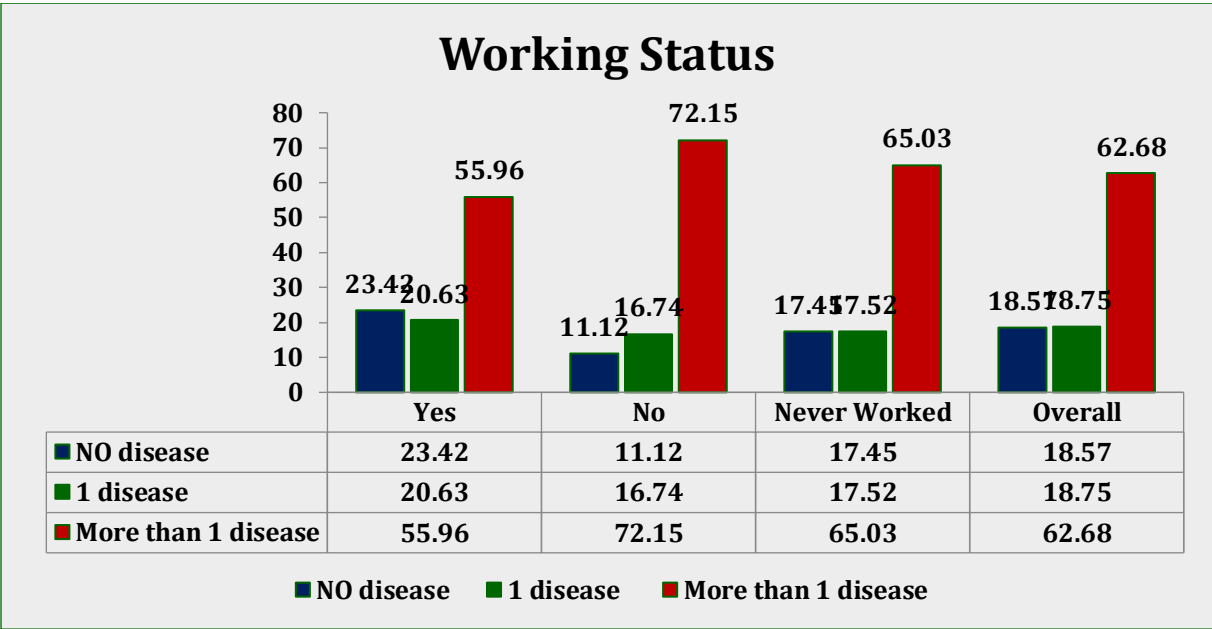
Figure 4.8: Number of diseases by Work Status

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Marital Status

	Currently Married	Widowed	others	Overall
■ NO disease	19.75	13.53	25.83	18.57
■ 1 disease	19.33	16.96	17.09	18.75
■ More than 1 disease	60.92	69.51	57.08	62.68

■ NO disease ■ 1 disease ■ More than 1 disease
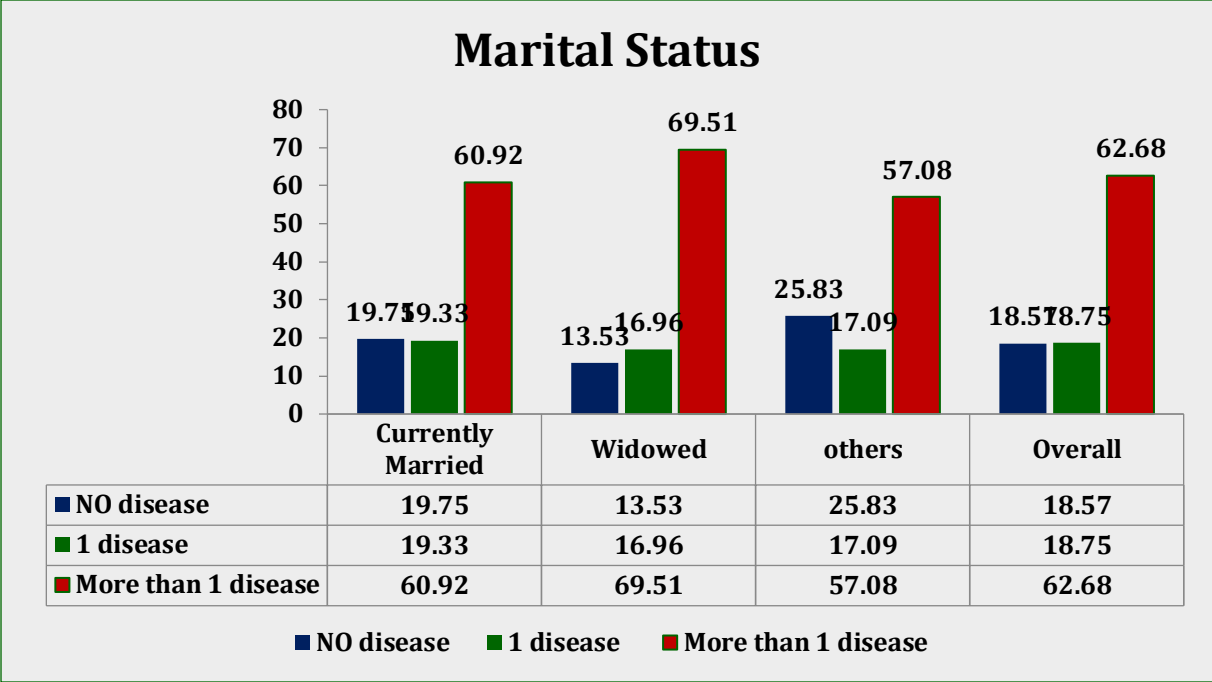
Figure 4.9: Number of diseases by Marital Status

Poorest are less susceptible for multiple disease because they do hard work in their field also living in rural area getting clean air and pure water. That makes less chance for multi-morbidity whereas richest old populations are living in urban areas not getting pure water and clean air. It makes difference in comorbidity level in richest and poorest older people. The people who come under working profile have less chance and lowest level of multi-morbidity. If we go through working status it shows that 72.15% of populations who are not participating in any type of work have more chance to affecting with multi-morbidity.

In the figure of marital status it shows that widowed has relatively higher prevalence of multi-morbidity compare to currently married people. Out of total identified married population for study having multi-morbidity, widowed shares highest that is 72.15%. Thus we can explain that multi-morbidity level varies on the basis of socio-demographic and economic profiles of elderly population.

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Table 4.1: Socio-demographic variables and multi-morbidity

	Mean number of diseases (SD)
Overall	2.58 (2.19)
Multimorbidity - No	0.50 (0.50)
Multimorbidity - Yes	3.79 (1.86)

4.3 State wise distribution level of morbidity

The following map shows the distribution of types of morbidity (no disease, one disease and more than one disease) among states. The state wise distribution of multi-morbidity indicates Kerala and Punjab have maximum level of multi-morbidity followed by Haryana, Himachal Pradesh, Andhra Pradesh and west Bengal. The states namely Uttar Pradesh, Rajasthan, Madhya Pradesh, Chhattisgarh and Bihar etc. comes under the group of lowest level of multi-morbidity.

For the comparative study two states namely Kerala and Uttar Pradesh have been taken and to justify this it is found that Kerala is most developed state of India in the term of Healthcare facilities, Employment and education. This shares maximum percentage of elderly Population in comparison to other states. Uttar Pradesh comes under the northern states and not more developed in comparison to Kerala. But this state has maximum population. After going through the demographic transition most of the population will enter into old age population. After comparative analysis the picture will come out in the term of multimorbidity and Uttar Pradesh will also plan to tackle various diseases for its elderly population. So, one state from developed region and one from less developed region will be better for comparison in the term of comorbidity.

State Wise Multimorbidity in Elderly Population

N

Multimorbidity in percent

	less than 55.5
	55.55 - 66.21
	66.21 - 73.38
	73.38 and Above

0 115 230   460   690   920
                                    Miles
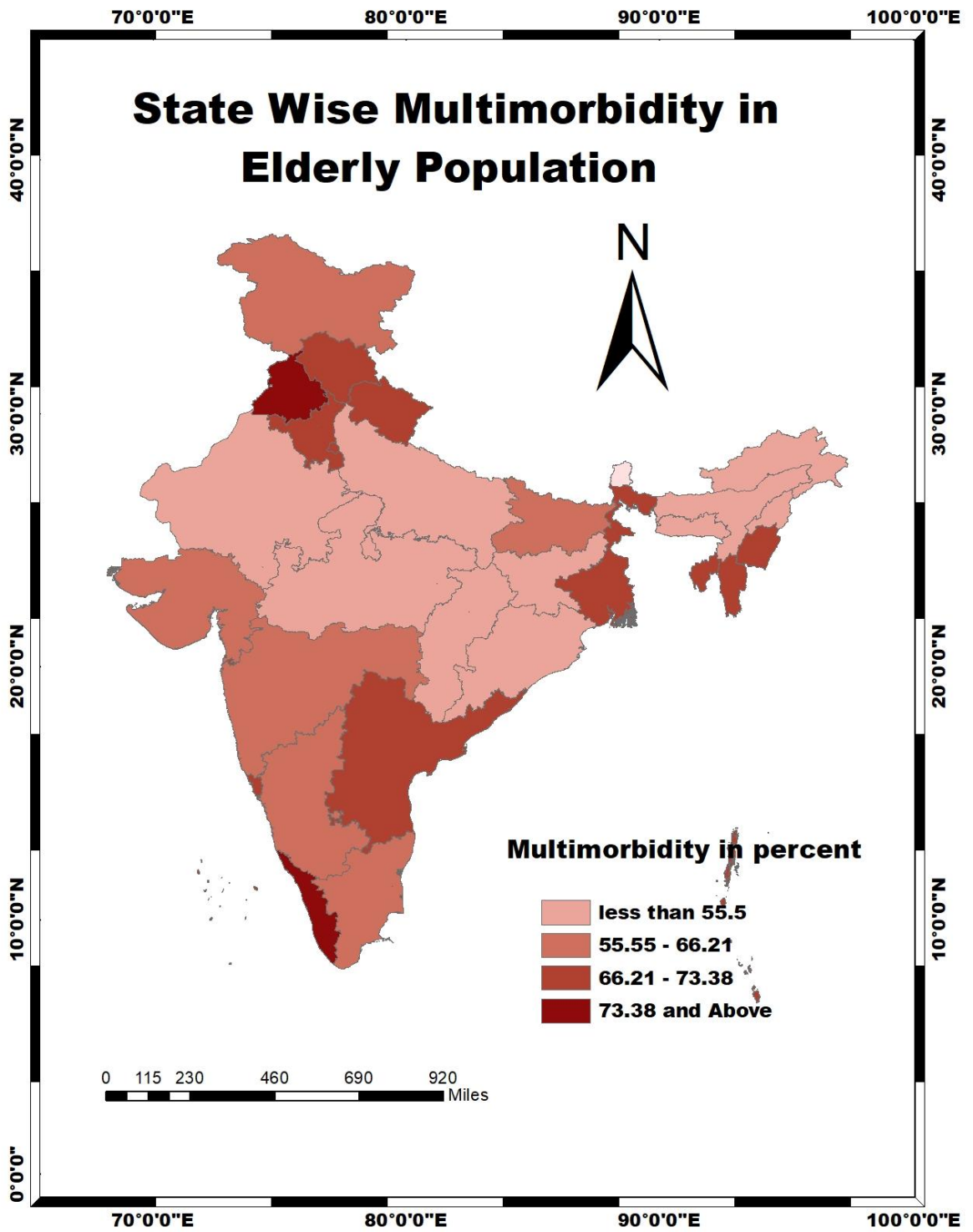
Table 4.2: State wise distribution of types of morbidity

State	No disease	1 disease	More than 1 diseases
Jammu & Kashmir	14.11	19.68	66.21
Himachal Pradesh	11.47	17.66	70.86
Punjab	6.11	10.93	82.95
Chandigarh	7.32	14.02	78.67
Uttarakhand	13.45	17.79	68.76
Haryana	10.4	18.23	71.37
Delhi	14.19	15.6	70.21
Rajasthan	22.96	21.55	55.49
Uttar Pradesh	23.58	20.87	55.55
Bihar	17.76	17.42	64.81
Arunachal Pradesh	30.68	14.34	54.98
Nagaland	35.49	21.91	42.6
Manipur	11.46	18.88	69.66
Mizoram	13.5	18.84	67.66
Tripura	14.7	17.84	67.46
Meghalaya	37.22	13.95	48.83
Assam	22.93	23.24	53.83
West Bengal	11.72	14.89	73.38

Jharkhand	27.33	21.21	51.47
Odisha	26.21	24.39	49.4
Chhattisgarh	32.4	22.97	44.62
Madhya Pradesh	27.06	18.43	54.5
Gujarat	17.46	17.36	65.18
Daman & Diu	11.82	18.53	69.65
Dadra & Nagar Haveli	16.77	14.47	68.76
Maharashtra	16.75	17.85	65.4
Andhra Pradesh	13.18	18.35	68.47
Karnataka	17.89	18.32	63.79
Goa	10.37	17.11	72.52
Lakshadweep	10.76	19.04	70.2
Kerala	8.64	13.37	77.99
Tamil Nadu	16.48	22.04	61.47
Puducherry	16.44	15.43	68.14
Andaman & Nicobar Island	13.55	14.34	72.11
Telangana	14.41	19.94	65.65

Source- Lasi-Wave 1 2017-18

4.4-Socio-demographic characteristics and Multi-morbidity Uttar Pradesh

The multi-morbidity comes into the elderly population through passing the age. Even going into the elderly group socio-economic factors also influenced the multi-morbidity level in old age population. Socio-economic and demographic indicators included the residence, where elderly population had lived, it may be rural or urban areas. Sex of elderly population, mpce Quintiles, ever attended school, currently working or not, what are the marital status of the elderly population.

Going through the figure 4.10, it shows the comorbidity level in elderly population on the basis of residence. From the graph it is found that among the total identified population having morbidity, 45.49% of elderly populations are living in rural area affected by multi-morbidity, whereas 56.19% of elderly populations are living in urban area have multi-morbidity. It means that urban area is more prone to multi-morbidity for elderly population. There are multiple reasons for those conditions. It may be effect of pollution level in cities and unhygienic water availability. Populations affected by one disease are more in rural areas than urban areas.

Analysis of level of multi-morbidity among the elderly population on the basis of sex shown in figure 4.11 the figure shows that level of multi-morbidity are less in female than male. It may be the reason of biological capacity of women that makes women less susceptible for multiple diseases in comparison to men.

If we go through the graph of MPCE quintiles of elderly population which is indicated in figure 4.12 it is found that there is increasing trend of comorbidity level from poorest (56.87%) old population to richest population (45.14%). It makes the difference of around 12%. Poorer are living in less developed region but living in natural region. They are very less affected by any climatic disturbance, whereas people living in urban areas are rich and having more pressure of

climatic disturbance. Which results more multi-morbidity level in rich older population than poor old age population.

Going through the level of schooling in the term of ever attended school or not. Which is shown in figure 4.13 and shows that older population ever attended schools have more level of multi-morbidity than people ever not attended school. Who attended the schools in up shares 53.8% of elderly affected by co-morbidity and people not attended schools are 43.5% have multiple morbidity.

Caste wise analysis for multimorbidity level in elderly population has two classifications one is specified caste and another is tribal population. The figure 4.14 clearly indicates that tribal populations are less affected by comorbidity than other specified caste.

Figure 4.15 shows the level of multimorbidity on the basis of religion. Among the overall identified elderly population in the term of morbidity, 75% of Hindus are affected by multimorbidity. Whereas 47% of Muslims are affected by comorbidity. 60% older people of other religion have multimorbidity.

Going through the marital status it is found that older people who have not married ever shares lowest percentage (32.61%) in level of multi-morbidity, whereas divorced, widowed and deserted have maximum shares in multimorbidity. Most highest i.e. 70% of deserted older population who have multimorbidity and widowed have 58.73% and divorced have 55.56% and finally separated have 50% shares in the multi-morbidity level. The figure clearly indicates that if marriage is everlasting then there are less chances of multi-morbidity. But if any uncertainty comes under the married life such as divorced, widowhood, or separated etc. results to more chance of multimorbidity.

4.5-Socio-demographic characteristics and Multi-morbidity in Kerala

Kerala a state of Southern India is most developed in the term of socio-economic and demographic characteristics, Such as highest literacy rate highest economic level, less population as compared to Uttar Pradesh and also having highest sex ratio. Kerala is also high urbanized state which has high population density less maternal mortality rate and lower infant mortality rate as compared to less developed state of Uttar Pradesh. Some important points such as high sex ratio, high literacy rate, high per capita income, less maternal and less infant mortality rates makes different to Kerala in the term of developed state. Going through demographic transition model of population, Kerala comes under the fourth stage i.e. developed state and less birth rate, lower death rate that results to highest shares of elderly population i.e. 12.60% of old age population.

In such a way Kerala is one state is best for study of level of multi-morbidity among elderly population. If there will maximum share of old age population then obviously they will be affected by single as well as comorbidity. Kerala is also more urbanized area and urban area is most influenced by climatic and other disturbances which affect the health condition of elderly population.

The health condition of elderly population is directly affected by socio-economic and demographic condition of any society. On the basis of residence it is found that most of the older population lives in urban areas. The prevalence of multimorbidity in rural Kerala and urban Kerala are more or less equal. But one important point is that older populations are not well in the term of morbidity, it means they have more chances to come under the category of high comorbidity level.

The most important point in multimorbidity level is that the people whoever identified in the term of morbidity most of them have affected by multimorbidity under any socio-economic and demographic category. On the basis of sex of elderly population it is found that most of the male and female have comorbidity but female have little bit less as compared to male. Higher health facilities and biological capacity in Kerala makes favorable to sustain for long age of old population.

Going through the PMCE quintiles among old age population in Kerala the multimorbidity level is highest in richest people i.e. 83.39% and lowest in poorer older people i.e. 71% it makes a difference of around 12%. This is the effect of life style and type's food gaining by population. Richest old age population has no interest in simple lifestyle and food. They are living in such a scenario in which they have to maintain lifestyle level to others that's making such types of results i.e. high level of comorbidity in richest elderly population in Kerala.

on the basis of education level or ever attended school out of total respondent 78.94% of elderly population are suffering from multi-morbidity who attended the school and 75.21% of elderly who have not attended school are affected by multimorbidity. It makes a difference of around 4.1% of comorbidity level.

Going through the caste it is found that there are two caste categories one is specified caste and other is tribal caste. From the figure 4.22 shows that tribal community is less affected by multimorbidty in comparison to other specific caste. It may be reason of their orientation towards the natural environment around them.

On the basis religion of respondent there are three major categories of older people according to the religion i.e. Hindus, Muslims and Christians. Among these people Christians have more chances to be affected by multimorbidity following by Hindus (77.5%) and Muslims (76.9%).

Figure 4.24 shows the number of disease by the work status it means what will be the morbidity level if someone is working or not. So, from the figure it is found that in Kerala elderly who are not working are more affected by comorbidity and who are currently working are less infected by multi-morbidity. About 90% of people having multiple morbidity have no work.

Figure 4.25 shows the level of co-morbidity on the basis of marital status. It is found that deserted and divorced followed by currently married have maximum share of multi-morbidity among the total respondent. The figure clearly indicates that if marriage is everlasting then there are less chances of multi-morbidity. But if any uncertainty comes under the married life such as divorced, widowhood, or separated etc. results to more chance of multimorbidity. In comparison to Uttar Pradesh currently married older population are also fluently affected by multimorbidity. If they will be separated or divorced then mental disturbances makes more chances to result to other diseases in the body of elderly

- **Number of Diseases by Place of Residence in Uttar Pradesh and Kerala**

UP	RURAL	URBAN	OVERALL
1 disease	54.51	43.81	52.22
More than 1 disease	45.49	56.19	47.78

Kerala	RURAL	URBAN	OVERALL
1 disease	20.02	21.84	21.43
More than 1 disease	78.98	78.16	78.57
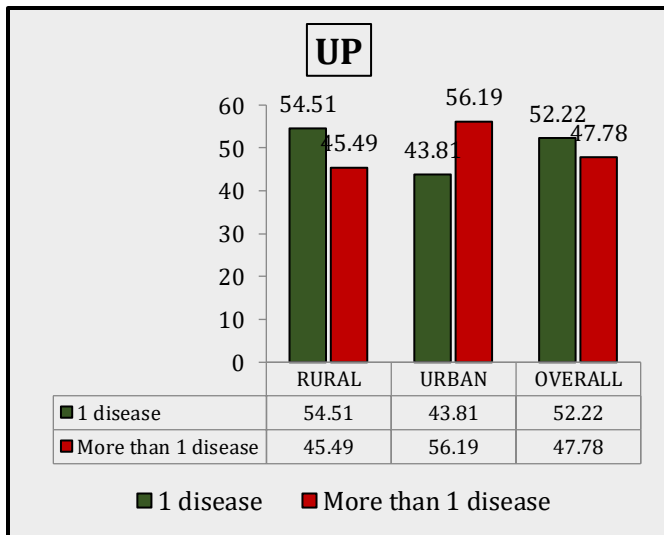
Figure 4.10: Number of diseases by place of residence in UP   Figure 4.18: Number of diseases by place of residence in Kerala
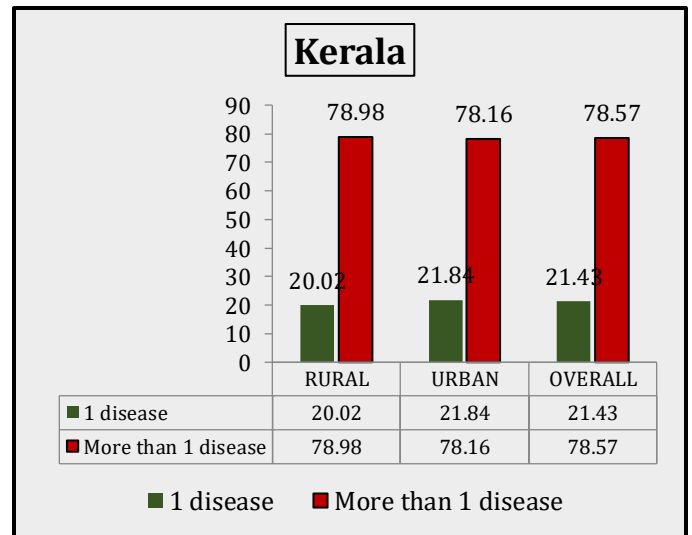
- **Number of Diseases by Sex of the respondents in Uttar Pradesh and Kerala**
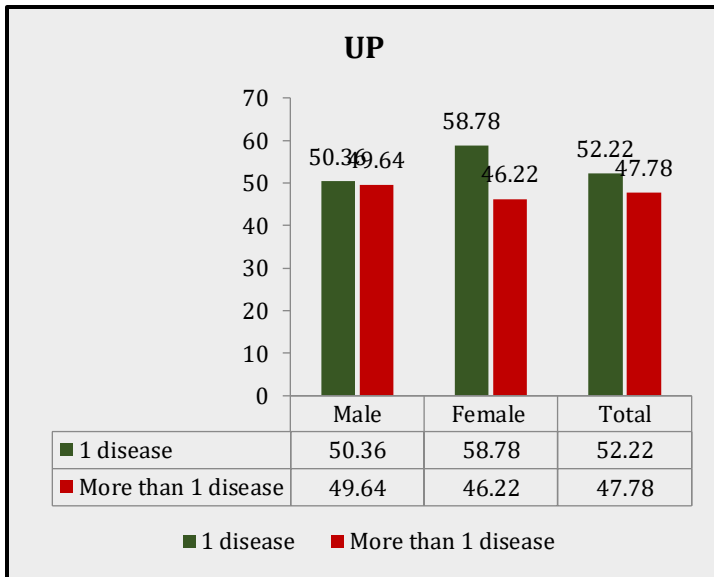
Figure 4.11: Number of Diseases by Sex of the respondents in Uttar Pradesh
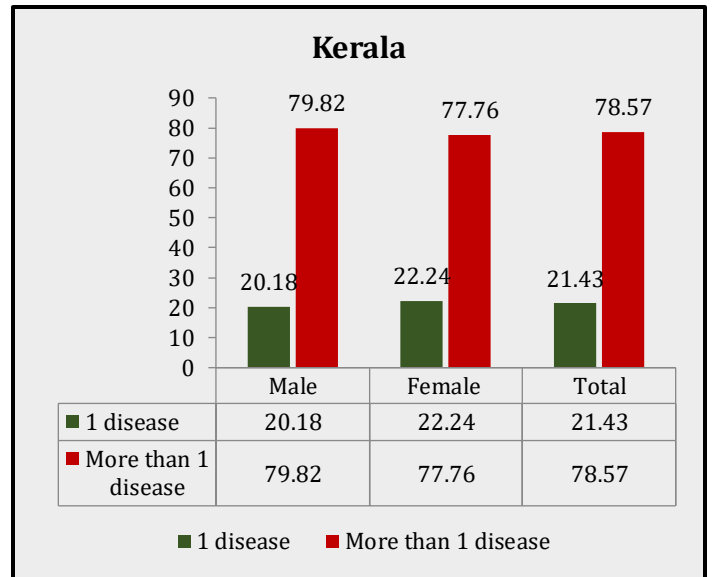
Figure 4.19: Number of Diseases by Sex of the respondents in Kerala

- **Number of Diseases by MCPE quintiles in Uttar Pradesh and Kerala**
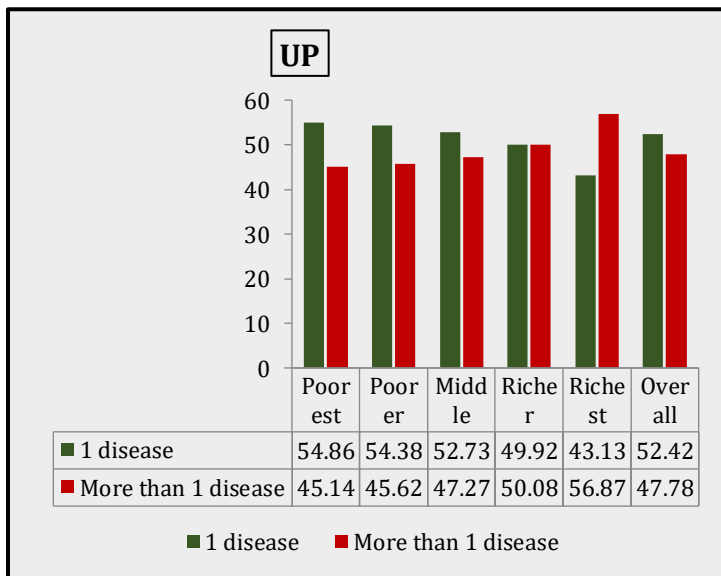
Figure 4.12: Number of Diseases by MCPE quintiles in Uttar Pradesh
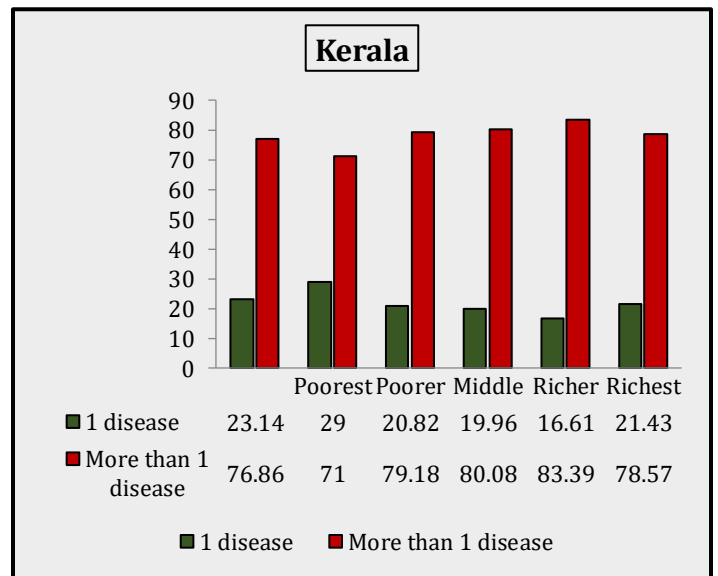
Figure 4.20: Number of Diseases by MCPE quintiles in Kerala

- **Number of Diseases by Level of Education in Uttar Pradesh and Kerala**

UP

1 disease	Yes	No	Overall
1 disease	46.19	56.33	52.22
More than 1 disease	53.81	43.67	47.78
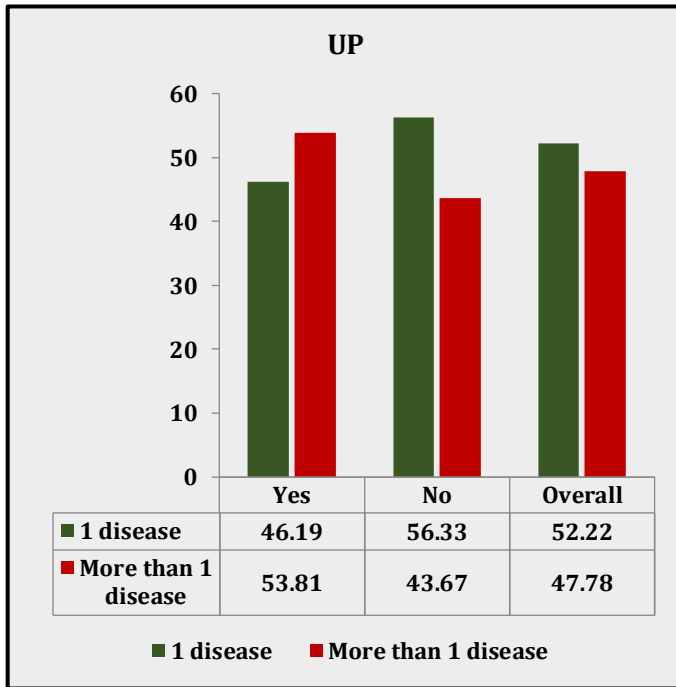
Figure 4.13: Number of Diseases by Level of Education in Uttar Pradesh

Kerala

	Yes	No	Overall
1 disease	21.06	24.79	21.43
More than 1 disease	78.94	75.21	78.57
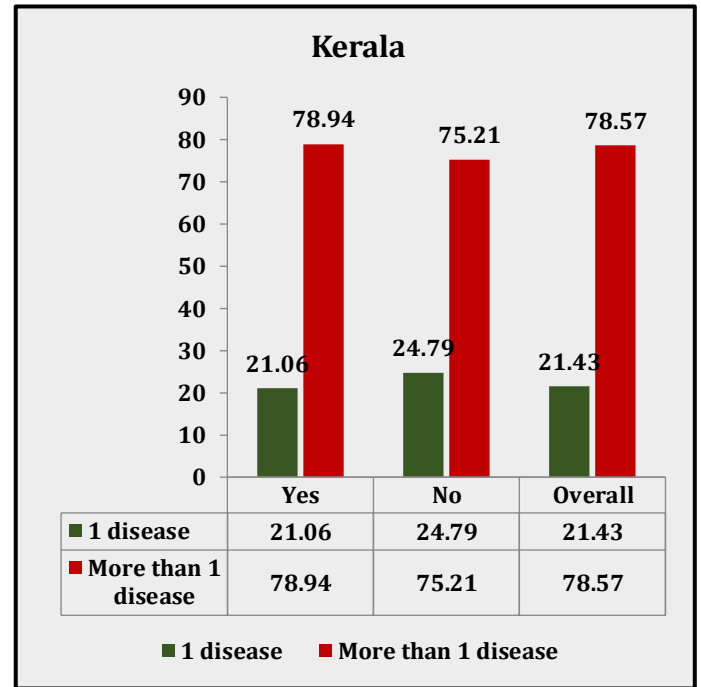
Figure 4.21: Number of Diseases by Level of Education in Kerala

- **Number of Diseases by Caste in Uttar Pradesh and Kerala**

UP

	Caste, specify: DM0	Tribe, specify: DM0	Total
1 disease	52.1	78.26	52.22
More than 1 disease	47.9	21.74	47.78
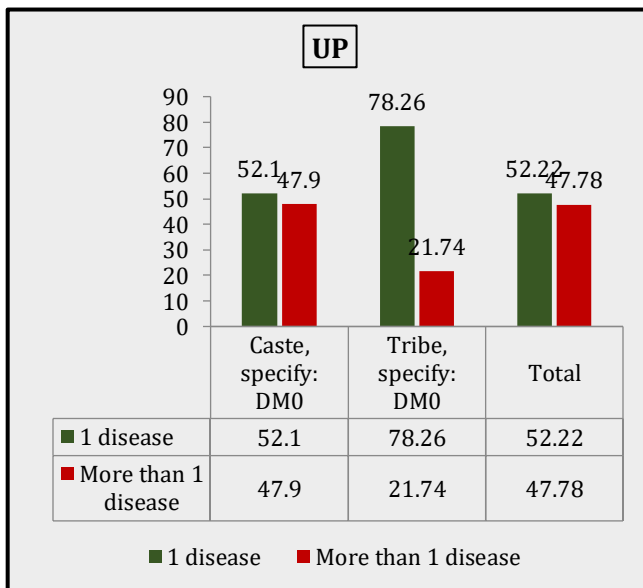
Figure 4.14: Number of Diseases by Caste in Uttar Pradesh

Kerala

	Caste, specify: DM0	Tribe, specify: DM0	Total
1 disease	21.37	38.46	21.37
More than 1 disease	78.63	61.54	78.63
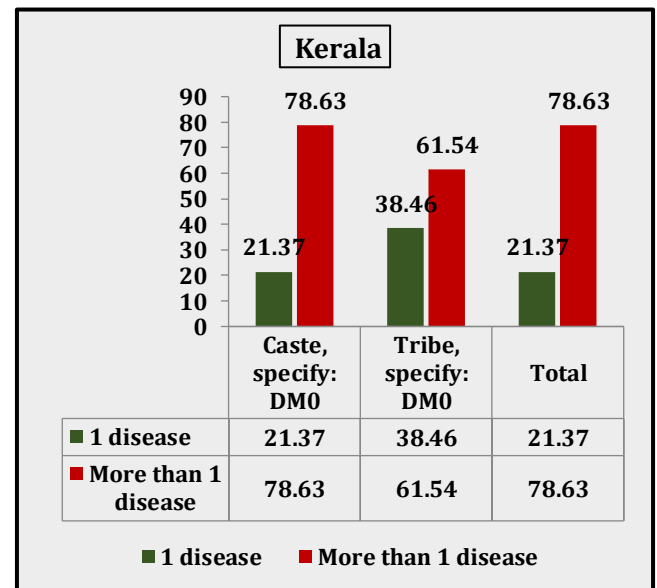
Figure 4.22: Number of Diseases by Caste in Kerala

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- **Number of Diseases by Religion in Uttar Pradesh and Kerala**
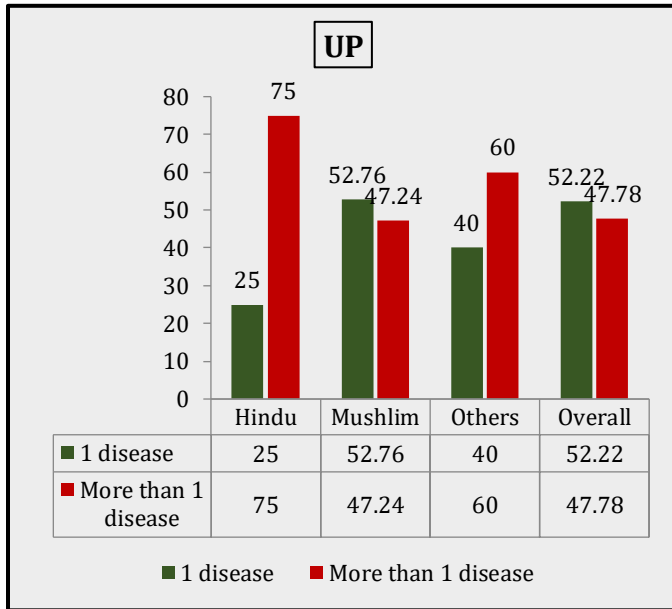
Figure 4.15: Number of Diseases by Religion in Uttar Pradesh
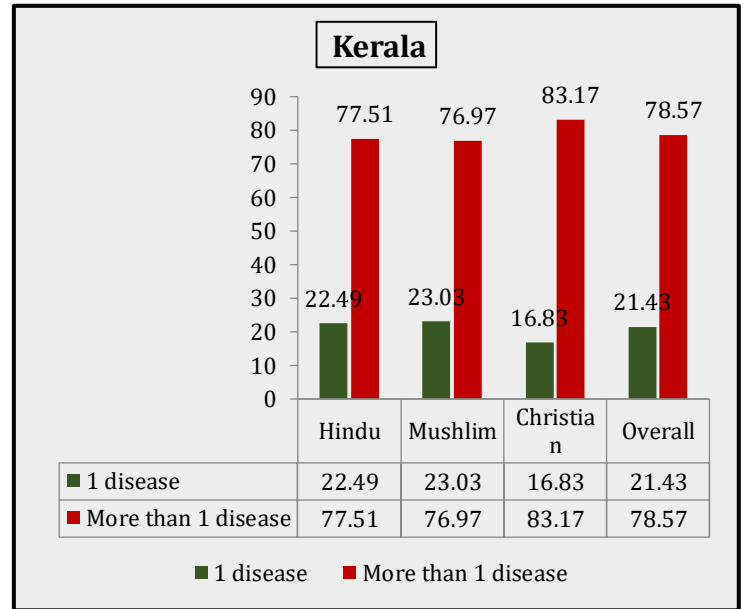
Figure 4.23: Number of Diseases by Religion in Kerala

- **Number of Diseases by Work Status in Uttar Pradesh and Kerala**
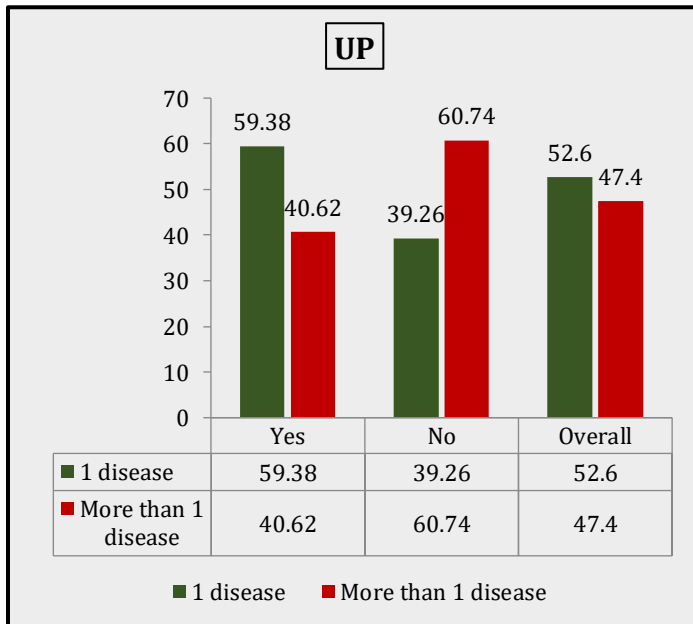
Figure 4.15: Number of Diseases by work status in Uttar Pradesh
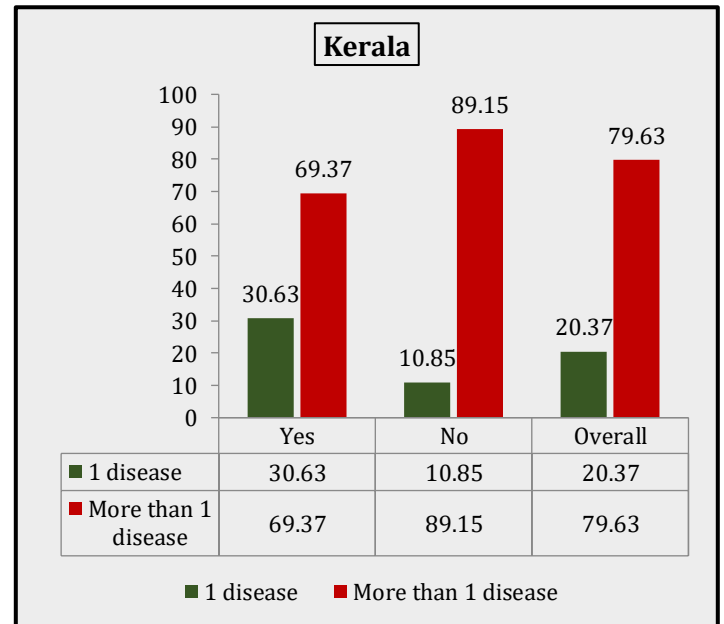
Figure 4.24: Number of Diseases by work status in Kerala

- **Number of Diseases by Marital Status in Uttar Pradesh and Kerala**
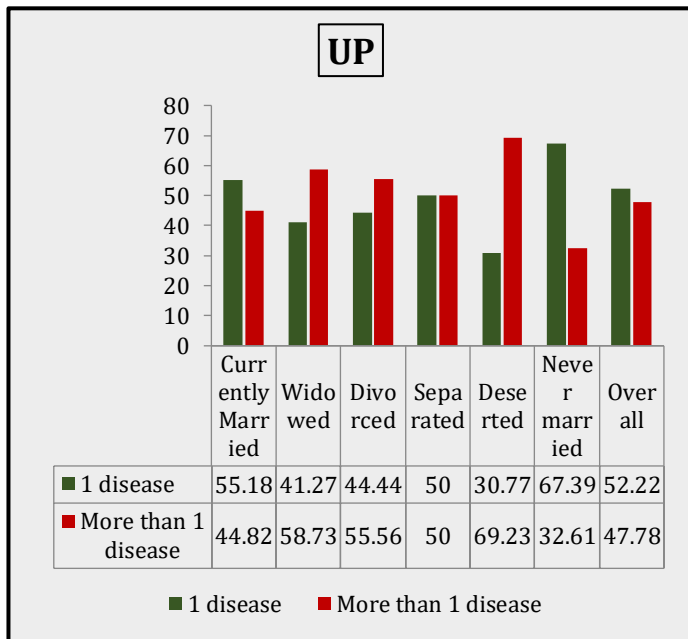
UP							
	Currently Married	Widowed	Divorced	Separated	Deserted	Never married	Overall
■ 1 disease	55.18	41.27	44.44	50	30.77	67.39	52.22
■ More than 1 disease	44.82	58.73	55.56	50	69.23	32.61	47.78
■ 1 disease ■ More than 1 disease							

Figure 4.17: Number of Diseases by Marital Status in Uttar Pradesh

Kerala							
	Currently Married	Widowed	Divorced	Separated	Deserted	Never married	Overall
■ 1 disease	23.35	12.78	14.29	50	16	27.5	21.43
■ More than 1 disease	76.65	27.22	85.71	50	84	72.5	78.57
■ 1 disease ■ More than 1 disease							
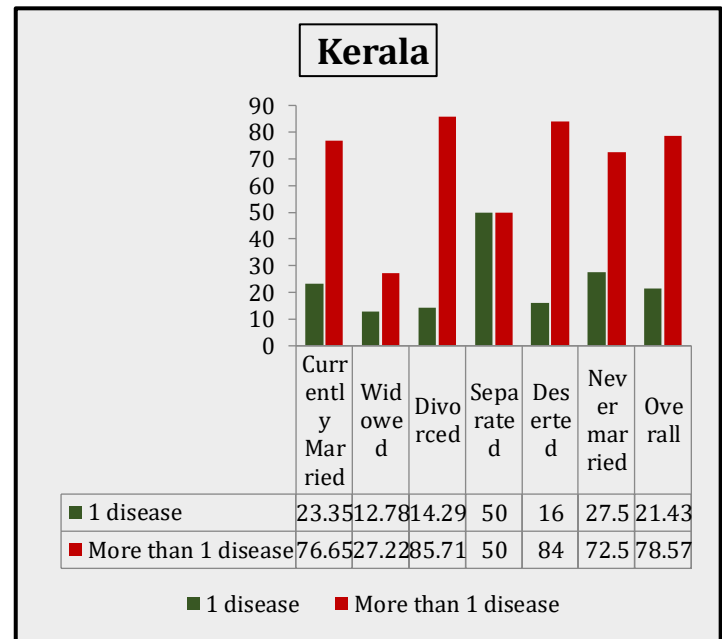
Figure 4.17: Number of Diseases by Marital Status in Kerala

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4.6 Conclusion

This chapter shows the distribution of multi-morbidity among the older adults on the basis of socio-demographic characteristics Over India and two States of Kerala and Uttar Pradesh. Findings show the urban residing older population is more susceptible to multi-morbidity; oldest old have more shares in case of multiple disease. Richest older populations are more infected by more than one disease and poorer are less. Widowed and divorced elderly have more multi-morbidity in comparison to currently married. Not Working population has more chances to getting affected with comorbidity. On the basis of caste the tribal communities are less affected by multiple diseases.

CHAPTER-5

DETERMINANTS OF MULTIMORBIDITY AND HEALTHCARE UTILIZATION

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DETERMINANTS OF MULTIMORBIDITY AND HEALTHCARE UTILIZATION

5.1 Introduction

Multimorbidity is a threat to patient safety. Patients with multimorbidity are at a greater risk of safety issues for many reasons. It is becoming progressively more common with advancing age. In addition to ageing, a number of other important risk factors are associated with the development of chronic disease. These include habits such as tobacco smoking and alcohol intake, over- and under nutrition, inactivity, and occupational exposures. Multi-morbidity also leads to greater extent of health care utilization because older comes under the dependent population even in the case of multimorbidity they need better care and that's results to higher pressure on healthcare system. This chapter is to fulfill the second objective of this study i.e. determinants of multimorbidity or association of socio-demographic indicators and multimorbidity.

India has a plurality of health care systems as well as different systems of medicine. The government and local administrations provide public health care in hospitals and clinics. Public health care in rural areas is concentrated on prevention and promotion services to the detriment of curative services. The rural primary health centers are woefully underutilized because they fail to provide their clients with the desired amount of attention and medication and because they have inconvenient locations and long waiting times. Public hospitals provide 60% of all hospitalizations, while the private sector provides 75% of all routine care. The private sector is composed of an equal number of qualified doctors and unqualified practitioners, with a greater ratio of unqualified to qualified existing in less developed states. In rural areas, qualified doctors

are clustered in areas where government services are available. With a population barely able to meet its nutritional needs, India needs universalization of health care provision to assure equity in health care access and availability instead of a large number of doctors who are profiting from the sicknesses of the poor.

5.2- Association of Socio-economic and Demographic characteristics with Multimorbidity over India

Multivariable associations between population characteristics and multimorbidity are presented in table 5.1. This table shows the association for overall India. The predicted probability of having a multiple diseases increased with age significantly from less than 40 years to more than 75 years, and at 71-80 years it is almost 5 times more likely (Adjusted OR=5.033; 95% CI = 4.553 - 5.564) to getting multi-morbidity with reference ≥ 40 years of age.

In the caste wise analysis, Women were more likely than men to have more than one morbidity (Adjusted OR=1.354; 95% CI = 1.296 - 1.416). It means women have 35% more chances to having more than one morbidity. Other socio-demographic characteristics in the form of residence like urban resident (OR= 1.406; 95% CI = 1.355 - 1.460) with reference to rural, shows that people living in urban areas have 40% more chance to get affected my multimorbidity than older population resided in rural areas.

Going through the religion wise, table 5.1 shows that Muslim (OR= 1.322; 95% CI = 1.250 - 1.398) have about 30% more likely to have comorbidity against Hindu. On the basis of working status of old age population the currently working (OR= 1.436; 95% CI = 1.373 - 1.503) have 43% more chances to affected by more than morbidity against not participated in any types of work. On the basis of Ever consumed any alcoholic beverages (OR= 1.198; 95% CI = 1.142 - 1.257). The older populations who have consumed any alcoholic beverages are more likely (20%)

to get infected with multi-morbidity against person who had not consumed any type of alcoholic beverages. According to marital status there are two major categories one is currently married and other is widowed. The widowed old age population (OR= 1.062;95% CI = 1.014 - 1.113) against currently married have higher likelihood of having multi-morbidity.

Analysis on the basis of caste indicates that the lower caste categories SC (OR= 0.891; 95% CI = 0.845 - 0.940) having 20% less chances, ST population (OR= 0.568; 95% CI = 0.53-0.601) have 44% less chances and OBC (OR= 0.861; 95% CI = 0.825 - 0.899) are 14% less likely of having multi-morbidity compared with the people without caste category.

Figure 5.1 Mean number of inpatient and outpatient visits with respect to Multi-morbidity status
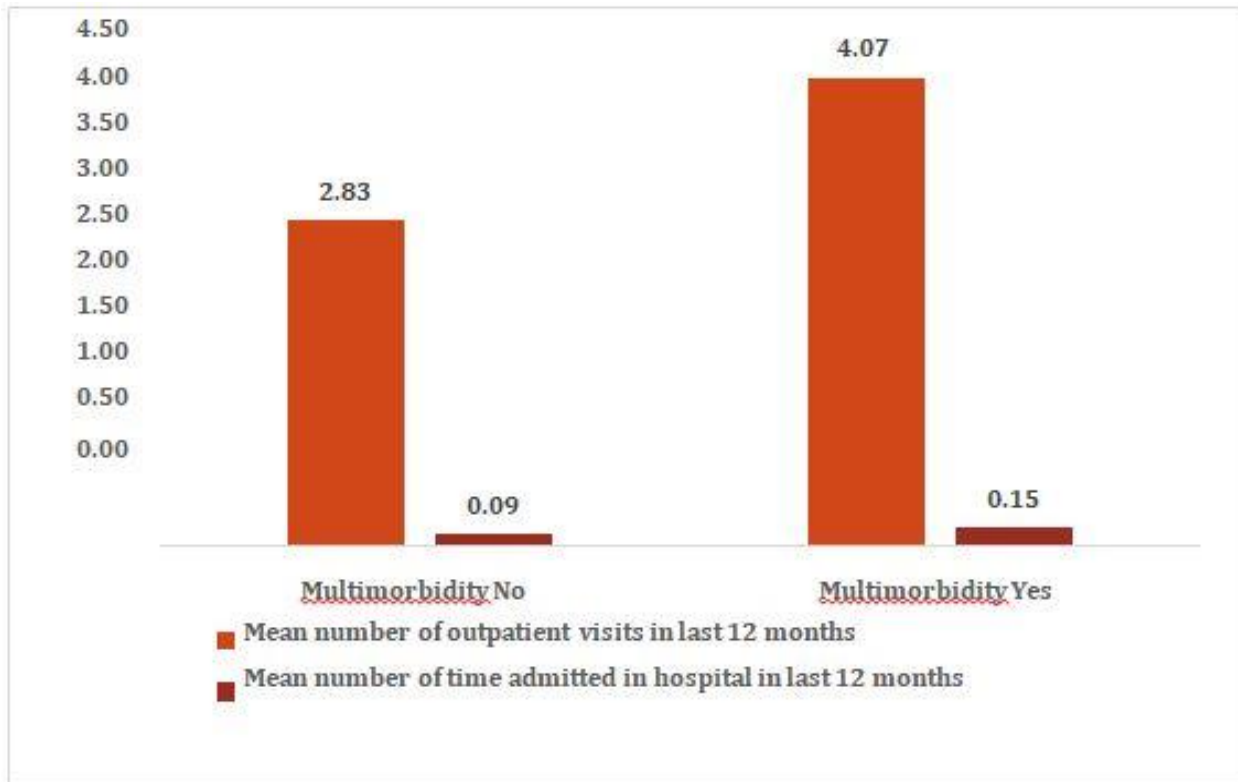
On the basis of MPCE quintiles there is increasing trend of getting multimorbidity from poor to richest in comparison to poorest category of elderly population. Poorer (OR= 1.244; 95% CI =

1.183 – 1.307), middile (OR= 1.375; 95% CI = 1.313 – 1.452), Richer (OR= 1.629; 95% CI = 1.550 – 1.719) and Richest (OR= 1.932; 95% CI = 1.824 – 2.032) are more likely of having multi-morbidity compared with poorest groups of elderly population. On the basis of highest level of education illiterate has been taken as a reference and table 5.1 shows that elderly has primary education level (OR= 1.340; 95% CI = 1.285 – 1.398), secondary or matriculation (OR= 1.321; 95% CI = 1.258 – 1.387) and above secondary level (OR= 1.202; 95% CI = 1.127 – 1.283) are more likely of having multi-morbidity as compared to illiterate elderly population.

It is quite evident that respondents with multi-morbidity have higher average number of outpatient as well as inpatient (hospitalization) visit in last 12 month (figure 5.1). Number of morbidity was associated with increased number of outpatient visits in the last 12 months. For example, coefficient for number of outpatient visits in the last 12 months for those with multimorbidity (coefficient = 0.364, 95% CI = 0.342 - 0.387) and coefficient for umber of times hospitalized in last 12 months (coefficient = 0.491, 95% CI = 0.417 - 0.565) was positively associated with multimorbidity (Table 5.2).

Table 5.2: Association between diseases and health care utilization (Negative binomial regression)

Multimorbidity	Number of outpatient visits in last 12 months (coeff. with 95% CI)	Number of times hospitalized in last 12 months (coeff. with 95% CI)
No	Reference	Reference
Yes	0.364 (0.342 - 0.387)	0.491 (0.417 - 0.565)

Table 5.1: Multiple logistic regression (Association between Multimorbidity and socio-demographic characteristics) over India

Multimorbidity	Odds Ratio	Std. Err.	P>z	[95% Conf. Interval]	
Place of Residence					
Rural (Reference)					
Urban	1.408	0.027	0.000	1.355	1.460
MPCE quintile					
Poorest (Reference)					
Poorer	1.244	0.032	0.000	1.183	1.307
Middle	1.375	0.036	0.000	1.313	1.452
Richer	1.629	0.043	0.000	1.550	1.719
Richest	1.932	0.053	0.000	1.824	2.032
Age at last birthday					
≥ 45 Years (Reference)					
46-60 Years	1.971	0.050	0.000	1.875	2.072
61-75 Years	3.000	0.088	0.000	2.831	3.178
Above 75 Years	3.325	0.146	0.000	3.050	3.624
Highest level of Education					
Illiterate (Reference)					

Primary education	1.340	0.029	0.000	1.285	1.398
Secondary/Matriculation	1.321	0.033	0.000	1.258	1.387
Above Secondary	1.202	0.040	0.000	1.127	1.283
Religion					
Hindu (Reference)					
Muslim	1.307	0.037	0.000	1.237	1.382
Others	1.207	0.032	0.000	1.146	1.272
Caste Category					
None of them (Reference)					
Scheduled caste	0.884	0.024	0.000	0.839	0.932
Scheduled tribe	0.564	0.016	0.000	0.533	0.596
Other backward class	0.857	0.019	0.000	0.821	0.894
Current Marital Status					
Currently married (Reference)					
Widowed	1.080	0.026	0.001	1.030	1.131
Others	0.946	0.045	0.238	0.863	1.037
Sex of Respondent					
Male (Reference)					
Female	1.340	0.030	0.000	1.282	1.401

Currently working					
No (Reference)					
Yes	1.489	0.034	0.000	1.423	1.558
Never worked	1.124	0.026	0.000	1.075	1.175
Ever consumed any alcoholic beverages					
No (Reference)					
Yes	1.195	0.029	0.000	1.140	1.254
Constant	0.367	0.015	0.000	0.339	0.398

5.3-Socio-economic and Demographic characteristics associated with Multi-morbidity in Uttar Pradesh

This section describes the association of multi-morbidity with socio-economic and demographic characteristics of Uttar Pradesh. From table 5.3, starting with residence of elderly population it is found that while comparing with the reference category of rural residence, the odds of having multi-morbidity among urban population is 0.5 times higher than that of rural population, at a significance level of 95%.

Keeping the most vulnerable group as the reference category, poorest in the mpce wealth quintiles, odds of having multi-morbidity was estimated. The odds of having multimorbidity among the richest quintiles 0.4 times higher than that of reference category (Poorest), where the odds of having multimorbidity is 0.09 times higher among richer quintile, 0.01 times higher among the middle quintile and 0.08 times less than the poorest quintile. Among the wealth quintiles, only the odds

ratio for the richest quintile is statistically significant. It means richest group of elderly population have highest chances to having more than one morbidity as compared to poorest group of elderly.

Going through the education level or ever attended schools, The Odds of having multimorbidity among those who have never attended school is 0.43 times less than among those who have ever attended schools. On the basis of caste of old age population, the Odds of having multimorbidity among tribes is 0.38 times less than among castes, which is statistically insignificant.

Among the Marital status keeping current married as the reference category, the odds ratio was estimated. The odds of having multimorbidity among the widowed group are 0.9 times higher than that for the currently married group. The never married group showed reduced odds ratio, the odds is 0.69 times less than that of the currently married group. Odds ratios for all other groups were statistically insignificant.

On the basis of religion some people had not mentioned their religion but responded for multiple-morbidity. So, among the religious groups keeping No religion as the reference category, the odds of having multimorbidity among is 0.91 times less than reference category while it is 0.90 times less than the reference category among Muslims.

On the basis of sex of identifies population to check chances of multimorbidity, The odds of being multi-morbidity among females are 0.17 times less than that among the males, which is not statistically significant. The odds of having multimorbidity among those who are currently working is 1.58 times higher than those who aren't currently working. While comparing the status of frequency of working hours keeping those responses "same each week" as reference category, the odds of having multimorbidity among those who responded "vary a lot across.." is 1.11 times higher than that of the reference category. All other categories are statistically insignificant.

Table 5.3: Multiple logistic regression (Association between Multimorbidity and socio-demographic characteristics) in Uttar Pradesh

multimorbidity	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
residence						
2 Urban	1.488	0.193	3.06	0.002	1.153	1.921
mpce_quintile						
2 Poorer	0.917	0.118	-0.67	0.505	0.712	1.181
3 Middle	1.010	0.137	0.08	0.94	0.773	1.320
4 Richer	1.094	0.168	0.58	0.559	0.809	1.47
5 Richest	1.429	0.238	2.14	0.032	1.030	1.983
dm010						
2 Hindu	0.086	0.093	-2.26	0.024	0.010	0.720
3 Muslim	0.091	0.099	-2.2	0.028	0.010	0.768
4 Christian	1	(empty)				
5 Sikh	0.080	0.142	-1.42	0.156	0.002	2.625
Buddhist/neo-Bu..	1	(empty)				
dm012						
Tribe, specify:..	0.613	0.432	-0.69	0.488	0.154	2.440
3 No Caste/Tribe	1	(empty)				
dm021						
2 Widowed	1.935	0.269	4.74	0	1.473292	2.543
3 Divorced	1	(empty)				
4 Separated	3.753	3.315	1.5	0.134	0.664	21.197
5 Deserted	8.599	9.734	1.9	0.057	0.935	79.077
Live-in relatio..	0.423	0.479	-0.76	0.448	0.046	3.894
7 Never married	0.310	0.174	-2.08	0.037	0.103	0.932

dm003						
2 Female	0.825	0.095	-1.67	0.096	0.658	1.034
we004						
2 No	2.582	0.633	3.87	0	1.597	4.175
we025						
Vary a little f..	1.047	0.126	0.39	0.698	0.827	1.326
Vary a lot from..	1.186	0.156	1.3	0.193	0.917	1.535
Vary a lot acro..	2.118	0.434	3.66	0	1.418	3.166
_cons	8.017	8.718	1.91	0.056	0.951	67.551

5.4-Socio-economic and Demographic characteristics associated with Multimorbidity in Kerala

This section describes the association of multi-morbidity with socio-economic and demographic characteristics of Kerala. From table 5.4, starting with residence of elderly population it is found that while comparing with the reference category of rural residence, the odds of having multi-morbidity among urban population is 0.2 times higher than that of rural population, at a confidence of interval of 95%.

Keeping the most vulnerable group as the reference category, poorest in the mpce wealth quintiles, odds of having multi-morbidity was estimated. The odds of having multimorbidity among the richest quintiles 0.76 times higher than that of reference category (Poorest), where the odds of having multimorbidity is 0.19 times higher among richer quintile, 0.03 times higher among the middle quintile and 0.36 times less than the poorest quintile. Among the wealth quintiles, none of the categories are statistically significant at a confidence level of 5%. The Odds of having multimorbidity among those who have never attended school is 0.57 times less than among those

who have ever attended schools. The odds of having multimorbidity among Hindus are 0.3 times higher than the reference category of no religion. The odds among Muslims are 0.1 times higher than the no religion group. Both of these odds ratios are statistical insignificant.

On the basis of caste among the tribal community and other than tribes, the Odds of having multimorbidity among tribes is 0.7 times less than among castes and the odds among those who are neither castes nor tribes is 0.3 times, which are statistically insignificant. Among the Marital status keeping current married as the reference category, the odds ratio was estimated. The odds of having multimorbidity among the widowed group are 0.4 times higher than that for the currently married group. The never married group showed reduced odds ratio, the odds is 0.4 times less than that of the currently married group. Odds ratios for all groups were statistically insignificant. The odds of being multimorbidity among females are 0.2 times less than that among the males, which is not statistically significant.

On the basis of working status the odds of having multimorbidity among those who are currently working is 4.1 times higher than those who aren't currently working. While comparing the status of frequency of working hours keeping those responses "same each week" as reference category, the odds of having multimorbidity among those who responded "Vary a little from season to season" is 0.33 times less than that of the reference category. All other categories are statistically insignificant.

Table 5.4: Multiple logistic regression (Association between Multimorbidity and socio-demographic characteristics) in Kerala

multimorbidity	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
residence						
2 Urban	1.235	0.212	1.23	0.219	0.881	1.731

mpce_quintile					
2 Poorer	0.633	0.178	-1.62	0.105	0.364	1.100
3 Middle	1.030	0.297	0.1	0.918	0.585	1.812
4 Richer	1.194	0.341	0.62	0.534	0.682	2.091
5 Richest	1.760	0.509	1.95	0.051	0.997	3.105
dm010					
1 None	1	(empty)				
2 Hindu	1.306	0.285	1.22	0.221	0.851	2.005
3 Muslim	1.135	0.322	0.45	0.655	0.650	1.981
4 Christian	1	(omitted)				
dm012					
2 Tribe, specify: DM012_tribe	0.288	0.275	-1.3	0.193	0.044	1.870
3 No Caste/Tribe	0.7012	0.319	-0.78	0.437	0.286	1.714
dm021					
2 Widowed	1.406	0.455	1.05	0.292	0.745	2.653
4 Separated	0.340	0.258	-1.42	0.156	0.076	1.508
5 Deserted	0.571	0.427	-0.75	0.455	0.131	2.477
6 Live-in relationship	1	(empty)				
7 Never married	0.588	0.351	-0.89	0.374	0.182	1.894
dm003					

2 Female	0.791	0.153	-1.21	0.227	0.540	1.157
we004						
2 No	5.128	1.542	5.43	0	2.843	9.246
we025						
Vary a little from season to season	0.664	0.127	-2.13	0.033	0.456	0.967
3 Vary a lot from season to season	0.933	0.224	-0.29	0.775	0.583	1.494
Vary a lot across weeks within a ..	1.546	0.567	1.19	0.235	0.753	3.172
_cons	2.00	0.677	2.05	0.041	1.029	3.886

5.5 Conclusion

With concluding this chapter which shows the association of multi-morbidity with socio-economic and demographic parameters, it is found that there are close association for the same. This chapter also explained the over utilization of health care system as increasing age in India. Number of times of hospitalization of elderlies is increasing with age. Urban Older has more chances to get infected with more than one disease. In such a way others indicators also affected the chances of multi-morbidity among older adults of Kerala and Uttar Pradesh.

CHAPTER-6
SUMMARY, DISCUSSION AND CONCLUSION

CHAPTER 6

SUMMARY, DISCUSSION AND CONCLUSION

6.1-Summary of the Result

There were two main objective of this study. The first one was to estimate the prevalence of multimorbidity among older adult in India as well as compared between two states of Uttar Pradesh and Kerala. Overall prevalence found to be 62.68% whereas in older population and richest quintile were the characteristics where the multimorbidity was most common. A common pattern comes out in each cases either India or both states is that multi-morbidity is increasing in Urban old age population, in richest people, and separated or widowed population etc. one most important thing in Kerala is that share of elderly population is more than Uttar Pradesh and also maximum share in level of multi-morbidity. In multivariable analysis it was again age (as increases) which came out as most significant factor (OR 3.3 for 75+ age group) associated with multimorobdity. One characteristic that does not come out quite significant that marital status (more specifically widowed). The healthcare utilization was also found to be significant in case of multimorbdity. healthcare utilization (inpatient and outpatient visits increases as number of morbidity increases.

6.2-Discussion

Multiple diseases can coexist in an individual for a number of reasons, including two diseases that share a common risk factor; two diseases where one disease causes the second disease; and scenarios where the presence of one disease increases the risk of a second disease (Neale & Kendler, 1995). Ageing and multimorbidity contribute to frailty, which, in turn, confers a higher risk of a number of complications and poor outcomes such as falls, disability, hospitalization and mortality (Barnett et al., 2012; Fried et al., 2004)

Our results revealed that multimorbidity is associated with greater healthcare utilization and greater financial burden for citizens in the countries studied–burden mainly driven by increased healthcare utilization (for both primary and secondary care), and in some cases by higher out-of- pocket expenditures per visit; findings consistent with earlier studies.

Multimorbidity increases in the elderly as was demonstrated in the study by Barnett et al., (2012)that included 1.7 million patients in Scotland, UK, where 30.4% of adults aged 45 to 64 years reported at least two chronic conditions, increasing to 64.9% of adults aged 65 to 84 years and more than 80% for those above 85 years old. Similar findings were described in the USA Medicare enrollee population (Barnett et al., 2012; Wolff et al., 2002). These results are not unexpected, in that the longer one lives, the more likely one is to be diagnosed with any chronic disease. While many chronic diseases are ultimately lethal, there may be a long time before death occurs. Thus, increasing longevity with diseases that are not immediately lethal, such as hypertension, can be expected to result in multimorbidity in ageing populations.

We identified a higher prevalence of multimorbidity among the most affluent groups, which contrasts with some earlier studies from lower middle-income countries (Freid et al., 2012; Hosseinpoor et al., 2012). This could be due to self-reporting of health status in our data, as respondents from higher socioeconomic background have better access to health services resulting in better diagnoses of their diseases (Vellakkal et al., 2013).

6.3-Conclusion

This total study was about the prevalence of multimorbidity or distribution of multimorbidity on the basis of socio-demographic characterstics in India as well as compared with Kerala and Uttar Pradesh. Along with this association of mutimorbidity with socio-economic and demographic

charaterstics was also studied. This comparison shows that Kerala has more shares in level of multimorbidity in comparison to Uttar Pradesh.

The study shows more burdens of diseases and health care facilities because most of the elderly are living in urban areas and having multiple diseases. The prevalence of multimorbidity increases with age, but is not just an issue for older adults. As a result of advances in medical care and public health, a growing proportion of people have multimorbidity. In an Australian cohort study, more than 40 percent of the people with multimorbidity were less than 60 years of age. The prevalence of multimorbidity is striking in studies conducted in several countries in different parts of the world. While the prevalence varies, this partially depends on the source of the population studied (patients vs. population based samples), sources of data (e.g., surveys, chart reviews, administrative data), data collection methods, targeted age groups, diagnoses considered and study populations, making the comparability of prevalence estimates questionable. The presence of multimorbidity also indicates higher risk of additional conditions; people with multimorbidity are at a higher risk of Being diagnosed with two or more new diseases than those with no disease. Multimorbidity is even more important when each condition may influence the care of the other condition(s) through limitations of life expectancy, interactions between therapies, and/or direct contraindications to therapy for one condition by other conditions themselves. Forty eight percent of older adults have three or more chronic conditions. In younger populations, 35 percent of disabled adults have three or more chronic conditions. Among children, where the definition of a chronic health condition is less clear, prevalence estimates range from less than one percent up to 44 percent of children having multimorbidity. It can be useful to think about the prevalence of multimorbidity with varied approaches. While it is important to note how many people have multimorbidity, and which specific conditions they have, it is also worth considering reporting data in different ways. For example, among older women participating in the United States nationally representative survey NHANES,

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examining five major chronic diseases (coronary heart disease, stroke, diabetes mellitus, arthritis, and chronic lower respiratory tract disease) with pattern analyses reveals that less than 20 percent of people with coronary heart disease have that disease alone, and not one of the other four conditions. Similar findings for how often the disease occurs in isolation were found for stroke, diabetes mellitus, and chronic lower respiratory tract disease. For arthritis, the prevalence of arthritis alone was 47 percent. These numbers would be smaller if a larger pool of conditions was considered. This work demonstrates that multimorbidity is the norm, not the exception, for many chronic diseases, and may speak to researchers, disease managers, policy makers and providers who have traditionally taken an index disease approach. Researchers have investigated whether specific conditions "cluster," or occur together at greater rates than would be expected by chance alone. Such work highlights the need to understand the underlying pathogenesis of multimorbidity, and may identify targets for preventive approaches.

Our study provides evidence on the emerging burden of multimorbidity in the Indian context, highlighting the need for better recognition by physicians, health planners and policy makers. Specifically our findings indicate a need for the growing burden of multimorbidity to be considered within the context of health system planning, encompassing workforce training and quality improvement strategies, including the development of clinical guidelines and quality indicators. Our findings reinforce the importance of strengthening primary care systems in lower middle-income countries, which is the most appropriate setting for these patients to be managed, and emphasize the need to improve financial protection in these settings. Further research is required to better understand the epidemiology of multimorbidity and associated impacts on health care utilization and costs in India and other similar settings in various states.

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Table-1 Number of Diseases by Place of Residence in UP

Place of residence	multi-morbidity		Total
	0	1	Total
1 Rural	1,957	1,633	3,590
	54.51	45.49	100
2 Urban	428	549	977
	43.81	56.19	100
Total	2,385	2,182	4,567
	52.22	47.78	100

Table-2: Number of diseases by Religion in UP

Religion	Multi-morbidity		Total
	0	1	Total
1 None	4	12	16
	25.00	75.00	100
2 Hindu	2,019	1,841	3,860
	52.31	47.69	100
3 Muslim	354	317	671
	52.76	47.24	100
4 Christian	1	1	2
	50.00	50.00	100
5 Sikh	5	5	10
	50.00	50.00	100

Buddhist/neo-Buddhi	**2**	**5**	**7**
	28.57	**71.43**	**100**
9 Parsi/Zoroastrian	**0**	**1**	**1**
	0.00	**100.00**	**100**
Total	**2,385**	**2,182**	**4,567**
	52.22	**47.78**	**100**

Table-3: Number of diseases by MCPE quintiles in UP

MPCE	multimorbidity		
quintile	0	1	Total
1 Poorest	**688**	**566**	**1,254**
	54.86	**45.14**	**100**
2 Poorer	**633**	**531**	**1,164**
	54.38	**45.62**	**100**
3 Middle	**512**	**459**	**971**
	52.73	**47.27**	**100**
4 Richer	**323**	**324**	**647**
	49.92	**50.08**	**100**
5 Richest	**229**	**302**	**531**
	43.13	**56.87**	**100**
Total	**2,385**	**2,182**	**4,567**
	52.22	**47.78**	**100**

Table-4: Number of diseases by Level of Education in UP

Ever attended	Multi-morbidity		
school	0	1	Total
1 Yes	**855**	**996**	**1,851**
	46.19	**53.81**	**100**

2 No	**1,530**	**1,186**	**2,716**
	56.33	**43.67**	**100**
Total	**2,385**	**2,182**	**4,567**
	52.22	**47.78**	**100**

Table-5: Number of diseases by Caste category in UP

		multimorbidity		
		Caste	**0** **1**	**Total**
1	**Caste, specify: DM0**	**2,365** **2,174**		**4,539**
		52.10 **47.90**		**100**
2	**Tribe, specify: DM0**	**18** **5**		**23**
		78.26 **21.74**		**100**
	3 No Caste/Tribe	**1** **3**		**4**
		25.00 **75.00**		**100**
	4 Dont Know	**1** **0**		**1**
		100.00 **0.00**		**100**
	Total	**2,385** **2,182**		**4,567**
		52.22 **47.78**		**100**

Table-6: Number of diseases by Marital Status in UP

Current Marital	**Multi-morbidity**		
Status	**0** **1**		**Total**
1 Currently married	**1,929** **1,567**		**3,496**
	55.18 **44.82**		**100**
2 Widowed	**404** **575**		**979**

	41.27	58.73		100
3 Divorced	4	5		9
	44.44	55.56		100
4 Separated	9	9		18
	50.00	50.00		100
5 Deserted	4	9		13
	30.77	69.23		100
Live-in relationshi	4	2		6
	66.67	33.33		100
7 Never married	31	15		46
	67.39	32.61		100
Total	2,385	2,182		4,567
	52.22	47.78		100

Table-7: Number of diseases by Sex of the respondents in UP

Sex of	Multi-morbidity		
Respondent	0	1	Total
1 Male	1,048	1,033	2,081
	50.36	49.64	100
2 Female	1,337	1,149	2,486
	53.78	46.22	100
Total	2,385	2,182	4,567
	52.22	47.78	100

Table-8: Number of diseases by Work Status in UP

Frequency of working hours	Multi-morbidity		Total
	0	1	
1 Same each week	337	244	581
	58.00	42.00	100
2 Vary a little from	489	311	800
	61.12	38.88	100
3 Vary a lot from sea	309	216	525
	58.86	41.14	100
4 Vary a lot across w	58	76	134
	43.28	56.72	100
Total	1,193	847	2,040
	58.48	41.52	100

Table-9: Number of Diseases by Place of Residence in KERALA

Place of	Multi-morbidity		Total
	0	1	
1 Rural	267	1,003	1,270
	21.02	78.98	100
2 Urban	268	959	1,227
	21.84	78.16	100
Total	535	1,962	2,497
	21.43	78.57	100

Table-10: Number of diseases by MCPE quintiles in KERALA

MPCE quintile	Multi-morbidity 0 1		Total
1 Poorest	87	289	376
	23.14	76.86	100
2 Poorer	134	328	462
	29.00	71.00	100
3 Middle	102	388	490
	20.82	79.18	100
4 Richer	106	425	531
	19.96	80.04	100
5 Richest	106	532	638
	16.61	83.39	100
Total	535	1,962	2,497
	21.43	78.57	100

Table-11: Number of diseases by Level of Education in Kerala

Ever attended school	Multi-morbidity 0 1		Total
1 Yes	475	1,780	2,255
	21.06	78.94	100
2 No	60	182	242
	24.79	75.21	100

Total	535	1,962	2,497
	21.43	78.57	100

Table-12 Number of diseases by Caste category in Kerala

Multi-morbidity			
Caste	0	1	Total
Caste, specify: DM0	508	1,869	2,377
	21.37	78.63	100
Tribe, specify: DM0	5	8	13
	38.46	61.54	100
3 No Caste/Tribe	20	84	104
	19.23	80.77	100
Total	533	1,961	2,494
	21.37	78.63	100

Table-13: Number of diseases by Marital Status in Kerala

Current Marital	Multi-morbidity		
Status	0	1	Total
1 Currently married	449	1,474	1,923
	23.35	76.65	100
2 Widowed	62	423	485
	12.78	87.22	100
3 Divorced	1	6	7
	14.29	85.71	100
4 Separated	7	7	14
	50.00	50.00	100
5 Deserted	4	21	25
	16.00	84.00	100
Live-in relationshi	1	2	3
	33.33	66.67	100
7 Never married	11	29	40

	27.50	72.50		100
Total	535	1,962		2,497
	21.43	78.57		100
Sex of	Multi-morbidity			
Respondent	0	1		Total
1 Male	200	791		991
	20.18	79.82		100
2 Female	335	1,171		1,506
	22.24	77.76		100
Total	535	1,962		2,497
	21.43	78.57		100

Table-14 Number of diseases by Work Status in KERALA

Frequency of working hours	multi-morbidity		Total
	0	1	
1 Same each week	100	325	425
	23.53	76.47	100
2 Vary a little from	79	168	247
	31.98	68.02	100
3 Vary a lot from sea	37	95	132
	28.03	71.97	100
4 Vary a lot across w	11	47	58
	18.97	81.03	100
Total	227	635	862
	26.33	73.67	100

Table-15 Number of diseases by Work Status in KERALA

Currently working	Multi-morbidity		Total
	0	1	
1 Yes	215	487	702
	30.63	69.37	100
2 No	82	674	756
	10.85	89.15	100
Total	297	1,161	1,458
	20.37	79.63	100

Table-16 Number of Diseases by Place of Residence over India

	RURAL	URBAN	OVERALL
NO disease	20.65	14.08	18.57
1 disease	19.88	16.33	18.75
More than 1 disease	59.48	69.59	62.68

Table-17 Number of diseases by Sex of the respondents

	Male	Female	Overall
NO disease	18.3	18.76	18.5
1 disease	19.4	18.29	18.75
More than 1 disease	62.3	62.95	62.68

Table-18 Number of diseases by Caste category over India

	Scheduled Caste	Scheduled Tribe	Other Backward class	None of them	Overall
NO disease	19.46	29.78	18.48	14.39	18.57
1 disease	20.24	20.65	18.84	17.01	18.75
More than 1 disease	60.3	49.58	62.68	68.6	62.68

Table-19: Number of diseases by Caste category over India

	> 45 Years	46-60 Years	61-75 Years	Above 75 years	Overall
NO disease	30.75	21.1	12.71	9.24	18.57
1 disease	20.95	19.67	17.11	16.9	18.75
More than 1 disease	48.31	59.23	70.18	73.86	62.68

Table-20 Number of diseases by Level of Education over India

	Illitrate	Primary	Secondary/Matriculation	Above Secondary	Overall
NO disease	20.95	16.37	15.52	17.04	18.57
1 disease	19.71	17.47	18.19	17.98	18.75
More than 1 disease	59.34	66.17	66.29	64.99	62.68

Table-21 Number of diseases by MCPE quintiles over India

	Poorest	poor	middle	Richer	Richest	Overall
NO disease	24.86	19.79	18.13	16.34	12.82	18.57
1 disease	21.36	19.33	19.68	17.68	15.21	18.75
More than 1 disease	53.78	60.87	62.19	65.99	71.97	62.68

Table-22 Number of diseases by Religion over India

	Hindu	Muslim	Others	Overall
NO disease	19.13	15.59	16.77	18.57
1 disease	19.12	16.88	17.42	18.75
More than 1 disease	61.75	67.53	65.81	62.68

Table-23 Number of diseases by Work Status over India

	Yes	No	Never Worked	Overall
NO disease	23.42	11.12	17.45	18.57
1 disease	20.63	16.74	17.52	18.75
More than 1 disease	55.96	72.15	65.03	62.68

Table-24 Number of diseases by Marital Status over India

	Currently Married	Widowed	others	Overall
NO disease	19.75	13.53	25.83	18.57
1 disease	19.33	16.96	17.09	18.75
More than 1 disease	60.92	69.51	57.08	62.68

Table-25 Socio-demographic variables and multi-morbidity

Demographic Indicators	Freq.	Percent	No disease (95% CI)		One disease (95% CI)		More than diseases (95% CI)	
Overall	72,250	100	18.57	(17.96-19.19)	18.75	(18.16-19.36)	62.68	(61.90-63.45)
Place of Residence								
Rural	49,274	68.2	20.65	(20.07-21.23)	19.88	(19.32-20.44)	59.48	(58.79-60.17)
Urban	22,976	31.8	14.08	(12.7-15.58)	16.33	(14.94-17.84)	69.59	(67.66-71.45)
MPCE quintile								
Poorest	14,956	20.7	24.86	(23.57-26.2)	21.36	(20.15-22.63)	53.78	(52.32-55.23)
Poorer	15,328	21.22	19.79	(18.75-20.88)	19.33	(18.29-20.42)	60.87	(59.53-62.19)
Middle	14,790	20.47	18.13	(17.03-19.29)	19.68	(17.98-21.5)	62.19	(60.42-63.92)

Richer	14,151	19.59	16.34	(14.57-18.27)	17.68	(16.57-18.84)	65.99	(64.08-67.85)
Richest	13,025	18.03	12.82	(11.66-14.08)	15.21	(13.98-16.54)	71.97	(70.02-73.84)
Age at last birthday								
≥ 45 Years	9,168	12.69	30.75	(28.86-32.70)	20.95	(19.61-22.36)	48.31	(46.01-50.61)
46-60 Years	33,115	45.83	21.10	(20.09-22.15)	19.67	(18.65-20.73)	59.23	(57.93-60.51)
61-75 Years	24,002	33.22	12.71	(11.93-13.54)	17.11	(16.29-17.96)	70.18	(69.06-71.27)
Above 75 Years	5,965	8.26	9.24	(7.85-10.86)	16.90	(14.95-19.04)	73.86	(71.44-76.14)
Highest level of Education								
Illiterate	35,763	49.50	20.95	(20.21-21.71)	19.71	(18.98-20.46)	59.34	(58.40-60.28)
Primary	16,771	23.21	16.37	(15.39-17.39)	17.47	(16.58-18.00)	66.17	(64.93-67.38)

Secondary/Matriculation	12,216	16.91	15.52 (14.44-16.67)	18.19 (16.88-19.58)	66.29 (64.50-68.03)
Above Secondary	7,499	10.38	17.04 (13.70-20.99)	17.98 (14.76-21.72)	64.99 (60.39-69.32)
Religion					
Hindu	59,186	81.92	19.13 (18.53-19.73)	19.12 (18.46-19.80)	61.75 (60.92-62.58)
Muslim	8,428	11.67	15.59 (14.02-17.00)	16.88 (15.15-18.77)	67.53 (65.10-69.87)
Others	4,631	6.41	16.77 (12.44-22.23)	17.42 (15.39-19.64)	65.81 (61.47-69.91)
Caste Category					
Scheduled caste	13,688	19.66	19.46 (18.39-20.58)	20.24 (19.16-21.37)	60.30 (58.92-61.66)
Scheduled tribe	6,102	8.76	29.78 (28.14-31.47)	20.65 (19.19-22.18)	49.58 (47.66-51.49)

Other backward class	32,527	46.72	18.48 (17.37-19.63)	18.84 (17.76-19.98)	62.68 (61.21-64.13)
None of them	17,310	24.86	14.39 (13.60-15.22)	17.01 (16.16-17.89)	68.6 (67.53-69.66)
Sex of Respondent					
Male	30,342	42.00	18.3 (17.53-19.09)	19.4 (18.58-20.25)	62.30 (61.20-63.38)
Female	41,908	58.00	18.76 (17.89-19.66)	18.29 (17.46-19.15)	62.95 (61.85-64.03)
Currently working					
Yes	33,431	46.28	23.42 (22.59-24.27)	20.63 (19.83-21.45)	55.96 (54.83-57.07)
No	18,884	26.14	11.12 (10.28-12.02)	16.74 (15.79-17.73)	72.15 (70.91-73.35)
Never worked	19,915	27.57	17.45 (15.99-19.02)	17.52 (16.11-19.01)	65.03 (63.20-66.82)

Current Marital Status				
Currently married	54,621	75.60	19.75 (19.14-20.38)	19.33 (18.62-20.06)	60.92 (60.04-61.78)
Widowed	15,650	21.66	13.53 (12.45-14.69)	16.96 (15.89-18.08)	69.51 (67.98-71.00)
Others	1,975	2.73	25.83 (17.03-37.15)	17.09 (14.08-20.59)	57.08 (48.73-65.04)