

Prevalence and Social Determinants of Multiple Long-term Conditions among Adults of Odisha, India: A Population-based Cross-sectional Study

Abstract

Multiple long-term conditions (MLTCs) defined as the co-occurrence of ≥ 2 chronic conditions are rising in low- and middle-income countries such as India. MLTCs can require continued medical support, investigations, and medications calling for health system strengthening. This highlights the need for assessing the burden of MLTC in the community. We estimated the prevalence of MLTCs and assessed their social determinants in Odisha, India. A cross-sectional study was conducted in two villages of Khordha district, Odisha, employing a systematic random sampling method. We recruited 530 adults aged ≥ 18 years between March and June 2023. Prevalence was presented as frequency and proportion, along with a 95% confidence interval (CI) as a measure of uncertainty. The relationship between MLTCs (≥ 2 conditions out of 28 assessed chronic conditions) and various sociodemographic traits – such as age, gender, education, and employment elicited using a validated Multimorbidity Assessment Questionnaire for Primary Care tool was examined through a multivariable logistic regression model. Results were expressed as adjusted odds ratios (AOR) with 95% CI. The overall prevalence of MLTCs was 29.21% (95% CI: 25.4–33.32). Individuals aged 60 years or older (AOR: 23.56 [95% CI: 7.55–73.53]), compared to those aged 18–30 years, and those residing in rural areas (AOR: 3.18 [95% CI: 1.70–5.92]), compared to their urban counterparts, were more likely to have MLTCs. Almost one-third of the adults had MLTCs that suggest an immediate need to develop, strengthen, and promote healthcare services for chronic conditions in the community that is accessible and cost-effective.

Keywords: India, multimorbidity assessment questionnaire for primary care, multimorbidity, multiple long-term conditions, prevalence

Introduction

Chronic conditions often require continued health care support and may accumulate with age, leading to multiple long-term conditions (MLTCs) or multimorbidity.^[1] MLTCs are defined as the presence of two or more chronic conditions in an individual without defining an index disease.^[2] The prevalence of MLTCs is increasing in low- and middle-income countries (LMICs) such as India, due to a shift in demography and epidemiology.^[2] Longevity has increased as a consequence of developments in healthcare technology, infrastructure, and accessible healthcare facilities.^[3] In addition, environmental, dietary, and lifestyle choices contribute to the rising burden of multiple morbidities.^[3] A systematic review reported the overall pooled prevalence of MLTCs among adults aged ≥ 18 years to be around 36.4% in LMICs which is comparable with most of the high-income countries

(HICs).^[4] In addition, a study conducted among rural Indian adults aged ≥ 18 years estimated the prevalence of MLTCs to be around 58.5%.^[5] MLTCs often lead to frequent visits to healthcare facilities, longer consultations, routine investigations, multiple medications (polypharmacy), and emergency care.^[6] This also hampers the health-related quality of life among these individuals along with physical and psychological distress.^[7]

For the majority of people with MLTCs, primary care is still the initial point of contact, particularly in rural India.^[6] In view of this, the Government of India has taken recent steps to strengthen the primary care. Nonetheless, primary care remains swamped, driving the need to generate evidence on MLTCs in rural areas to guide future policies. In addition, older adults and women are often dependent on others to visit these health facilities in villages which makes continuity of care difficult

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for them,^[8] a problem often exacerbated by MLTCs due to the multiple visits not only to the same doctor but also to different specialists. Nonetheless, very few studies have investigated MLTCs in rural areas. Evidence suggests that MLTC is not confined to only older adults, rather all adults are at risk.^[9] Hence, it is imperative to garner evidence on the burden of MLTCs among all adults rather than focusing only on older adults. This study estimated the prevalence of MLTCs and assessed its social determinants among the rural adults in the Jatni block of Odisha, India.

Methods

Study design and setting

A cross-sectional study was conducted in two villages of the Khordha district of Odisha, India. Odisha is situated in eastern India with the majority of the population residing in rural areas. Khordha, a predominantly rural district located along the coastal belt of Odisha, is divided into two subdivisions out of which Bhubaneswar subdivision was randomly chosen followed by a selection of Jatni from its four blocks. Further, two villages of Jatni block were randomly selected for this study.

Study participants

Individuals aged ≥ 18 years who were willing to participate by giving informed written consent were included in the study. All age-eligible individuals residing in a household were recruited. We excluded persons with severe cognitive impairment.

Sample size and sampling

The sample size was estimated in OpenEpi software version 3.01 with the prevalence of MLTCs to be around 20% among adults, a confidence level of 95%, alpha of 0.05, and the minimum required sample was 407.^[10] A nonresponse rate of 15% (based on previous studies in the area) was added making the final sample size to be around 468. However, we recruited a total of 530 participants as we completed the survey of the entirety of the two selected villages. A systematic random sampling method was used to identify the two villages, but all age-eligible individuals from all households (census survey) were included in the survey.

Data collection and management

The data were gathered utilizing the Multimorbidity Assessment Questionnaire for Primary Care (MAQ-PC) through the Open Data Kit Collect software on Android-based mobile devices.^[11] MAQ-PC is a validated tool which has been developed through an iterative process and has been used in diverse settings. Data were collected from March to June 2023. Face-to-face interviews were conducted by uniformly trained field investigators following a pre-laid protocol. Data collection was monitored by the investigators and around 10% of the data were re-checked for quality assurance purposes. MAQ-PC tool elicited

information on sociodemographic characteristics, and 28 self-reported chronic conditions (arthritis, hypertension, diabetes, chronic lung disease, acid peptic disease, stroke, chronic back pain, chronic heart disease, visual impairment, hearing impairment, dementia, chronic alcoholism, chronic kidney disease, epilepsy, thyroid disease, tuberculosis, leprosy, irritable bowel syndrome, chronic constipation, sleep disorders, psoriasis, eczema, lymphatic filariasis, chronic rhinitis, prostate disease, cancer, chronic liver diseases, and mental disorders) [Supplementary Table 1].

Statistical analysis

The data were downloaded in Microsoft Excel format and were checked for outliers and missing values if any followed by analysis using Stata v. 17.0 (Stata Corp., Texas). Prevalence was presented as frequency and proportion along with a 95% confidence interval (CI) for all proportions as a measure of uncertainty. Age was reported as the mean along with the standard deviation. A bivariate logistic regression model was executed to assess the association between MLTCs (outcome variable, yes/no) and various sociodemographic variables reported as odds ratio (OR) with 95% CI. The association between MLTCs and different sociodemographic traits was predicted by a multivariable logistic regression model, and the results were expressed as an adjusted OR (AOR) with 95% CI.

Ethical consideration

This study received approval from the Institutional Human Ethics Committee of the Indian Council of Medical Research-Regional Medical Research Centre in Bhubaneswar, Odisha. All participants were informed about the study's objectives, and written consent was obtained before their participation.

Results

The mean age of the participants was 43.6 ± 24.1 years. Nearly one-third of the individuals were between 31 and 45 years old, and approximately 51.5% were male [Table 1]. The majority of the population resided in the rural areas (81.3%), but a few had migrated to urban and were present in the village during survey (18.7%).

The most prevalent chronic conditions were visual impairment (14.3%), arthritis (14.1%), acid peptic disease (13.6%), and hypertension (12.1%) [Supplementary Table 1]. The overall prevalence of MLTCs was 29.2% (95% CI: 25.4–33.3). The prevalence of MLTCs tended to rise with increasing age, with the highest prevalence of 52.9% (95% CI: 42–64) among the participants aged ≥ 60 years. A slight male predilection of 32.2% (95% CI: 27.0–38.1) was seen as compared with females [Table 1].

The bivariate association showed age, rural residence, lesser years of education, and homemakers to be associated with MLTCs [Table 2]. The highest chances of MLTCs were observed among the participants aged ≥ 60 years (AOR:

Table 1: Sociodemographic characteristics and prevalence of multiple long-term conditions across various sociodemographic attributes

Sociodemographic variables	Categories	n (%)	Prevalence of MLTCs % (95% CI)
Age (years)	18–30	149 (28.1)	6.7 (3.3–1)
	31–45	174 (32.8)	25.3 (19–32.4)
	46–59	122 (23)	45.9 (37–56)
	≥60	85 (16)	52.9 (42–64)
Gender	Male	273 (51.5)	32.2 (27–38.1)
	Female	256 (48.3)	26.6 (21.2–32.4)
Place of residence	Rural	430 (81.3)	31.9 (27.5–36.5)
	Urban	99 (18.7)	18.2 (11.1–27.2)
Caste	Scheduled caste	90 (16.9)	16.7 (10–26)
	Other backward classes	53 (9.9)	28.3 (17–42.3)
	General	389 (73.1)	32.4 (28–37.3)
Marital status	Currently married	441 (82.3)	31.1 (27–36)
	Never married	74 (13.9)	12.2 (6–22)
	Separated/divorce/widow (er)	17 (3.2)	58.8 (33–82)
Education	No formal education	73 (13.8)	53.4 (41.4–65.2)
	Primary	96 (18.2)	37.5 (28–48)
	Secondary	296 (56.1)	23 (18.3–28.2)
	Higher	63 (11.9)	19.1 (10.2–30.9)
Employment status	Employed	143 (26.9)	22.4 (16–3)
	Homemaker	243 (45.8)	33.3 (27.4–4)
	Retired	4 (0.7)	50 (6.7–93.2)
	Unemployed	140 (26.4)	29.3 (22–38)

CI: Confidence interval, MLTCs: Multiple long-term conditions

Table 2: Association of multiple long-term conditions with various sociodemographic attributes

Sociodemographic variables	Categories	OR (95% CI)	AOR (95% CI)
Age (years)	18–30	Reference	Reference
	31–45	4.7 (2.3–9.7)	8.2 (3.0–22.3)
	46–59	11.8 (5.7–24.6)	20.2 (7.1–57.2)
	≥60	15.6 (7.2–33.8)	23.6 (7.5–73.5)
Gender	Male	1.3 (0.9–1.9)	1.2 (0.7–2.3)
	Female	Reference	Reference
Residence	Rural	2.1 (1.2–3.6)	3.2 (1.7–5.9)
	Urban	Reference	Reference
Ethnicity	Scheduled caste	2.4 (1.3–4.3)	3.1 (1.5–6.3)
	Other backward classes	1.9 (0.9–4.4)	2.1 (0.8–5.5)
	General	Reference	Reference
Marital status	Currently married	3.2 (1.6–6.7)	0.5 (0.1–1.4)
	Never married	Reference	Reference
	Separated/divorced/widow (er)	10.3 (3.1–33.9)	0.7 (0.1–3.4)
Education	No formal education	4.9 (2.2–10.6)	1.4 (0.5–3.7)
	Primary	2.5 (1.2–5.4)	0.90 (0.4–2.2)
	Secondary	1.3 (0.6–2.5)	0.92 (0.4–1.9)
	Higher	Reference	Reference
Employment status	Employed	Reference	Reference
	Homemaker	1.7 (1.1–2.8)	1.41 (0.7–2.9)
	Retired	3.5 (0.5–25.6)	2.32 (0.2–23.0)
	Unemployed	1.4 (0.8–2.4)	1.40 (0.7–2.7)

OR: Odds ratio, CI: Confidence interval, AOR: Adjusted odds ratios

23.6 [95% CI: 7.5–73.5]) as compared to those aged 18–30 years [Table 2]. Respondents residing in the rural areas had 3.18 times higher odds (AOR: 3.2 [95% CI: 1.7–5.9]) of having MLTCs as compared to their urban counterparts. Individuals with general ethnicity had 3.1 times (AOR: 3.1 [95% CI: 1.5–6.3]) higher chances

of having MLTCs as compared with those from scheduled caste.

Discussion

The present study highlights that the prevalence of MLTCs was found to be high. Increasing age, individuals residing in rural areas, and ethnicity were found to be significant predictors of MLTCs.

The observed prevalence of MLTCs in the current study is similar to a study conducted in Odisha, India that reported the prevalence of MLTCs to be around 28.3% among adults aged 18 years and above attending primary care though the study setting vary.^[12] In contrast, our findings are lower than those of another study conducted among patients attending AYUSH clinics of Delhi, India which reported a prevalence of MLTCs around 39% among adults aged ≥ 18 years.^[13] Another study conducted among participants aged ≥ 18 years in Odisha, India also showed the prevalence of MLTCs to be around 40%.^[14] However, a study conducted among respondents aged ≥ 30 years in rural Punjab, India reported a prevalence of MLTCs to be 18%.^[15] A recent systematic review and meta-analysis showed the pooled prevalence of MLTCs to be around 20% in India.^[6] This evidence suggests that there exists a wide range in the prevalence of MLTCs in Odisha as well as in the India that varies with the age group being considered for inclusion, number of chronic conditions being considered for enumerating MLTCs, along with study settings such as community or primary care. The comparable prevalence of MLTC between the present population-based survey with the previous primary care-based studies emphasizes that that it is important to identify MLTCs at the population level as there might be missing cases if only facility-based surveys are conducted. Nonetheless, the prevalence is comparable not only with other similar LMICs but also to HICs as suggested by a systematic review.^[16] Further, this highlights that MLTCs are equally prevalent in LMICs as well requiring urgent interventions to combat.

The current study shows that with increasing age, the prevalence of MLTCs also increased which is similar to other studies conducted in India where age was significantly associated with MLTCs and the risk of having MLTCs increased with an increase in age.^[17] A systematic review to identify the risk factors of MLTCs also reported that MLTCs progressively increase with age.^[18] In India, chronic conditions are set in early (around 40 years of age) as compared to other HICs and keep on accumulating with age which is a key driver of increasing MLTCs prevalence. The other factors responsible for the increased trend of MLTC with age could be behavioral, environmental, and social changes that predispose risk for MLTCs among older adults.^[2] Another most evident reason could be the limited access and usage of healthcare services as people become dependent on the care providers for taking them to healthcare facilities which predisposes

them to underutilization of healthcare services, ultimately resulting in delayed diagnosis of many chronic conditions. Furthermore, this also hampers the continuity of care required to manage the chronic conditions and emphasizes the need for early screening and continued treatment that could be provided by strengthening the Community Health Officers (newly appointed community nurses).

Furthermore, MLTCs were more prevalent among rural residents which are in harmony with the results of a similar study conducted by Talukdar and Himanshu 2017 that showed the dominance of MLTCs in this population.^[19] Inequality in accessing health care due to these facilities being slower in improving infrastructure as compared to the urban public health setups may be one of its causes. Here, the Ayushman Arogya Mandir (upgraded Primary Healthcare Centres) that have been envisaged to provide preventative and curative services for chronic conditions may play a major role as with the strengthening of these institutions in rural areas, health care will be more accessible and affordable.

We observed general ethnicity is significantly associated with MLTC which is in contrast with the findings of a study conducted by Zanwar *et al.* 2024 that observed MLTC to be higher and most common among those belonging to scheduled castes.^[20] With Universal Health Coverage being the focus, all people irrespective of social status should be provided with egalitarian healthcare services.

Implications for policy and practice

Ayushman Arogya Mandir or the most peripheral health center should be the focal point of all preventive and curative services as these are capable of providing accessible and affordable health services with a focus on continuity of care, especially for vulnerable populations such as older adults. Addressing health disparities among older adults in India requires a multifaceted approach, including prevention and management of chronic diseases, improving access to health care and implementing culturally appropriate and cost-effective interventions. Further, family-level interventions such as reducing risk factors (salt intake and physical activity) will help in preventing and controlling MLTCs. These interventions also align with the most prevalent chronic conditions among the population, i.e., hypertension. Further, dietary habits and lifestyle modifications also help in preventing acid peptic disease.

Strengths and limitations

Our work reported social determinants among adults having MLTCs using a prevalidated tool to assess MLTC. Further, we interviewed individuals from the community to ensure generalizability though the setting was limited to only Odisha. However, chronic conditions were determined through self-reporting, which may lead to recall bias. However, the validity and reliability of self-reporting have

already been established in previous studies. Further, being a cross-sectional study, the temporality of risk factors could not be established.

Conclusion

The evidence from the present study suggests that the burden of MLTCs is high with every third individual having MLTCs. There is a need to develop, strengthen, and promote the healthcare services to provide a continuum of care for multiple chronic conditions.

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Conflicts of interest

There are no conflicts of interest.

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Supplementary Table 1: Prevalence of various chronic conditions*

Condition	<i>n</i> (%)
Arthritis	75 (14.1)
Diabetes	38 (7.17)
Hypertension	64 (12.05)
Chronic lung disease	21 (3.97)
Acid peptic disease	72 (13.58)
Chronic back pain	49 (9.23)
Chronic heart disease	18 (3.38)
Stroke	6 (1.13)
Visual impairment	76 (14.29)
Hearing impairment	23 (4.32)
Dementia	7 (1.32)
Chronic alcoholism	9 (1.69)
Chronic kidney disease	1 (0.19)
Epilepsy	7 (1.32)
Thyroid disease	9 (1.69)
Tuberculosis	3 (0.56)
Leprosy	2 (0.38)
Irritable bowel syndrome	7 (1.32)
Chronic constipation	28 (5.26)
Sleep disorder	22 (4.14)
Psoriasis	3 (0.56)
Eczema	14 (2.64)
Lymphatic filariasis	32 (6.06)
Chronic rhinitis	3 (0.56)
Prostate disease (<i>n</i> =273)	8 (2.93)
Mental disorders	12 (2.27)

*Cancer and chronic liver diseases were not prevalent