Prevalence and correlates of Multimorbidity among older adults in rural Nepal: a cross sectional study

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Abstract

Background Multimorbidity among older adults is an increasing challenge for health systems. Compared to a single disease condition, multimorbidity lowers the quality of life and experience higher hospital admission and health care expenditure. Although multimorbidity has gained global attention, it remains a less studied area in Nepal. Our study aimed to estimate the prevalence of major chronic diseases and multimorbidity among older adults in rural Nepal and examine the associated socioeconomic and behavioral risk factors.

Methods We analyzed data of 794 Nepalese older adults recruited using a multi-stage cluster sampling approach in two rural setting of Sunsari and Morang District of Nepal. This was a cross-sectional study, conducted between January to April 2018. Socio-demographics and health conditions data [Osteoarthritis, Cardiovascular diseases (CVD), Diabetes, Chronic Obstructive Pulmonary Diseases (COPD)] were collected through the help of trained research assistants using a validated questionnaire. The correlates of multimorbidity were examined using mixed-effects logistic regression.

Results 48.9% of the participants had at least one chronic condition, and 14% were multimorbid. The prevalence of individual conditions were osteoarthritis- 41.7%, CVD- 2.39%, diabetes- 5.29%, and COPD- 15.7%. In the adjusted model, older adults aged 70-79 years, those from underprivileged Madhesi and other ethnic groups, without a history of alcohol drinking, and those physically inactive, were significantly associated with multimorbidity.

Conclusion Our study found a sizeable proportion of the older adults had multimorbidity in our studied population. This prevalence of multimorbidity and its socioeconomic and behavioural correlates, need to be addressed through multi-level preventive strategies, including clinical guidelines and the development of a multidisciplinary workforce to address the needs of the multimorbid older adults.

Background

The population of older adults is increasing globally [1] and is projected to increase to over 1.5 billion by 2050 [2]. A similar demographic transition is occurring in Nepal. The Senior Citizen Act in Nepal 2006, defines “an individual aged 60 and over as a senior citizen” [3]. In the most recent census in Nepal in 2011, there were 2.5 million population older adults (8.1%). This population is growing at a rate of 3.5% annually, which exceeds the nation’s overall population growth rate at 1.35% [4]. While we celebrate longevity [5, 6], health and quality of life are two crucial agendas for the older population which significantly increases the demand on health services [7-9].

Multimorbidity is the simultaneous coexistence of two or more chronic conditions in the same individual [10]. Multimorbidity has a significant impact on the quality of life and the demand for health care [11, 12]. The impact of multimorbidity is greater than the cumulative effect of the single disease [13]. Individuals with multimorbidity are at substantially greater risk of death compared to those with single conditions

[14]. Multimorbidity also adds to the existing challenges of providing quality geriatric health care, especially in developing countries with limited resources.

The prevalence of chronic multimorbidity has increased substantially across the globe, especially among those aged 65+ with a reported prevalence of 33.1% [15]. Longevity, coupled with an increase in incident chronic disease and sedentary and unhealthy lifestyles, suggests that the burden of multimorbidity, especially among the older population, will continue to rise globally [10]. Momentum to recognize and address multimorbidity in clinical settings has increased in many high income countries [16]. However, in developing countries, this emerging public health issue is often overlooked [17]. South Asians are comparatively at an elevated risk for developing cardio-metabolic and other chronic diseases [18], which makes them more susceptible to multimorbidity. The Nepal STEPS survey, 2013 reported that 99.6% of the Nepali adults had at least one (of the eight known risk factors for chronic diseases) [19]. Hence, the burden of multimorbidity among Nepalese is anticipated to be higher. There is, however, comparatively little information on its prevalence. Previously, using data from the 2003 World Health Survey, a 15.2% prevalence of multimorbidity among the Nepali population was estimated, which doubled for the older age groups (30.2%) [20]. Previous research on multimorbidity has mostly focused on quantifying the prevalence [20, 21], and has not analysed its association with risk behaviours or underlying social and economic factors.

Although multimorbidity requires a multitude of specialists' referrals, biomedical investigations, and polypharmacy, current health care is based on a single disease approach to treatment, which may not be appropriate to manage patients with multimorbidity. Multimorbidity is challenging for both patients and health professionals, especially in setting priority goals for self-management. As we understand more about the multimorbidity and the inequalities in its burden, subpopulations at risk may be identified for preventive strategies. Till date, there has been no specific study that focused on multi-morbidity in Nepalese older adults. Therefore, this study aimed to assess the prevalence of major chronic diseases and multimorbidity among Nepali older adults and examine the associated socioeconomic and behavioural risk factors.

Methods

Study designs and participants

This study was a community based cross sectional study conducted among Nepalese older adults 60 years or older living rural part of *Sunsari* and *Morang* districts of Nepal. We recruited study samples using a multi-stage cluster sampling approach and data was collected from 794 study participants through face to face interview. The data collection period was between January to April 2018. Details of the methodology of this study are documented elsewhere [22]. Data were collected using a validated Nepali version survey questionnaire administered through trained research assistant in the field. Prior to the interview, thumb impressions were obtained from those who were unable to read and write and written informed consent from all literate participants.

Measurements

Multimorbidity

Co-variates

Included independent variable were age; gender; religion; ethnicity; living arrangement; marital status; occupation; literacy status; monthly personal income; alcohol drinking habits; smoking habit; habit of tobacco chewing and physical activity. These co-variates have been described in the previous work published by Yadav et.al [23]. The study protocol was approved by the Ethics Board of Nepal Health Research Council, Government of Nepal, Kathmandu.

Statistical analysis

Stata (Version 13.0). was used to analyze the data. Descriptive analysis was performed on each of the studied variables. Univariate analysis was performed using the chi-square (χ^2) test and the variables with p-value <0.2 were included in a mixed-effected logistic regression model. The generalized estimating equation (GEE) approach with 95% confidence intervals (95% CI) was employed to examine the association between multimorbidity and its associated factors.

Results

The mean age of the participants was 69.9 years, and there was equal participation by gender; 50.4% male and 49.6% female. The majority of participants were Hindu (78.7%), illiterate (80.1%), married (53.8%), from indigenous or Madhesi ethnic groups (72.0%), unemployed (54.2%) and had a family income of 44 USD or less at the time of the survey. The majority of the participants were physically inactive (77.1%) and had a history of tobacco smoking (62.2%), but no history of alcohol use (63.4%) (Table 2).

Prevalence of multimorbidity

The prevalence of the individual chronic diseases and their combinations is presented in Table 2. The prevalence of osteoarthritis, CVD, diabetes, and COPD was 41.7%, 2.4%, 5.3%, and 15.4%, respectively. While 48.9% of the participants were suffering from at least one chronic condition, 14.7% were suffering from multimorbidity.

Socioeconomic, lifestyle characteristics and multimorbidity

Table 3 shows the distribution of multiple morbidities by different socioeconomic and lifestyle characteristics of the participants. The mean age of the participants suffering from multimorbidity was 70.3 years. The prevalence of multimorbidity was similar in both genders (16.8% vs. 12.5%, $p=0.09$). Participants who were from Muslim communities had a relatively higher prevalence of multimorbidity (16.0%). The prevalence of multimorbidity was significantly higher among unemployed (18.4% vs. 10.2%,

p=0.001), those who never had alcohol drinking habit (16.9% vs. 10.7%, p=0.01) and physically inactive (18.3% vs. 2.2%, p<0.001).

Risk factors associated with multimorbidity

Factors associated with multimorbidity, estimated in the crude and adjusted logistic regression model, are shown in Table 4. In the final adjusted model, age, ethnicity, alcohol drinking habit, and physical inactivity were significantly associated with multimorbidity. Individuals in their 70s (70-79 years) had 62% higher odds of multimorbidity (AOR: 1.62; 95% CI: 1.04-2.54; p-value=0.033) compared to the individuals aged 60-69 years. Individuals from the *Madhesi* and other ethnic groups had a 52% lower probability of multimorbidity than those of the higher caste (AOR: 0.48; 95% CI: 0.31-0.77; p-value=0.002). Unemployed participants had 50% higher odds of multimorbidity than those employed, although the statistical significance was at the borderline (p-value = 0.060). Surprisingly, study participants with no alcohol drinking history had around 50% higher probability of multimorbidity than those with a history. However, physically inactive individuals had five times higher odds of multimorbidity than those with regular physical activities (AOR: 5.02; 95% CI: 1.47-17.17; p-value=0.010).

Discussion

This is the first study to assess the prevalence and correlates of multimorbidity among older adults in rural Nepal. We found that almost half (48.9%) of the older adults had at least one NCD conditions. Approximately, 15% had multimorbidity – most frequently involving osteoarthritis and COPD. Participant's age and behavioral risk factors (alcohol use and physical inactivity) were associated with multimorbidity.

A sizeable proportion of the older adults had multimorbidity, despite having a mean age of 69.9 years which is low compared to studies in other countries. Previous studies of multimorbidity among the Nepalese population are limited, and the only available estimates come from the World Health Survey (2003), which showed a prevalence of 15.2% among the Nepali population, which doubled for the age group 65+ (30.2%) [20]. Since Nepal is in the epidemiologic transition, we would expect to see a higher prevalence of multimorbidity compared to the estimates from 2003 [20]. However, our prevalence estimate (14%) is half that of the 2003 World Health Survey for the older age group. In our study, the possible reasons behind this discrepancy could be due to the measurement of a limited number of common chronic conditions (only four conditions were included) [22], methodological differences, or geographical variation. In this regard, we suggest the need to develop a uniform standardized definition of multimorbidity, including the specific conditions to be included. A study from India showed that illiterate participants tend to overestimate health problems when self-reported [24]. In the present context, illiteracy is high among older Nepali adults [4], which may explain the higher prevalence of multimorbidity in the World Health Survey, resulting from overestimates of self-reported conditions. Second, in the study of multimorbidity, the number, and type of chronic conditions included in the count contributed to greater variability in estimates between the studies [25]. Given that the high prevalence of depression among

older Nepali adults (50%) [26], the inclusion of depression (included in World Health Survey but not in our study) is likely to explain the higher prevalence of multimorbidity estimated in that survey.

The finding that one in seven older people in the study had multimorbidity is, however, not surprising given the high prevalence of chronic diseases and the increasing rates of physical inactivity and excessive alcohol consumption [19]. These risk behaviors increase the incidence of chronic conditions as well as the progression into multimorbidity from a single condition. The observed prevalence of multimorbidity is of concern because the impact of multimorbidity is greater than the cumulative effects of single disease [13]. Multimorbidity substantially reduces the quality of life and increases the risk of premature death [11, 14]. It increases the demand for health care and thus adds to the existing challenges faced by health and social services [11, 12].

Significant differences in multimorbidity by ethnicity were noted: minority groups, particularly the Madhesi ethnic group, were slightly more likely to suffer from multimorbidity than the upper caste groups. Our finding is consistent with previous literature from Nepal, which documented a higher burden of chronic disease among the Madhesi ethnic group [22, 27]. Historically, the Madhesi ethnic group was considered disadvantaged in the society as they were discriminated against by the upper caste groups and had limited access to education and employment [28]. As one of the marginalized groups, these groups have a comparatively lower socioeconomic status increasing threats to their poor outcomes in health and wellbeing [29].

The increased risk of multimorbidity among physically inactive individuals is consistent with other research [30–32]. However, surprisingly, study participants with no prior history of alcohol use had 50% higher odds of multimorbidity than those with alcohol use. The literature on the association between alcohol consumption and multimorbidity has been inconsistent since previous studies have reported lower odds of having multimorbidity among those who consumed alcohol daily [30], whereas other studies found no association between alcohol consumption and multimorbidity [31, 33]. Two things may explain the findings. First, in a society where alcohol consumption is prohibited, self-reported measures of alcohol consumption are not reliable, and participants' responses may be subjected to social desirability bias. Second, in a low-income setting such as ours, the ability to consume alcohol also indicates an individual's purchase capacity and relative wealth. Hence, older adults who could afford to consume alcohol may have had a relatively better socio-economic status that may have provided an advantage to better health in later life.

In light of our findings, we suggest the need to shift from the approach of treating and management of single conditions to a more integrated approach where patients' needs can be more comprehensively met. Our study demonstrated the strong association between multimorbidity and physical inactivity, which suggests both the opportunity for early prevention and the need for tailoring the physical activity to the level of disability (especially for osteoarthritis). In this regard, our findings have implications at the primary health care level as well as at the secondary/tertiary levels, where health care providers can assess physical activity level among the multimorbidity patients and can tailor interventions accordingly

to avert the further health consequences among the people with multimorbidity, especially among socioeconomically deprived communities.., Physical activity needs to be mainstreamed in existing community health programs and at all levels of care. We also underscore the need for the attention of policymakers and the implementors to invest more in the development of multidisciplinary management packages for chronic multimorbid conditions.

Moreover, we suggest the need for a community based longitudinal study that can look at a large number of conditions with a more precise measurement of the lifestyle factors. Further, we also suggest the need for qualitative research to understand the problems at the individual and population levels, community/family level, and organizational level, which might be help to develop a comprehensive intervention package for people with chronic multimorbid conditions.

Some of the strengths of this study include a very high response rate, data collection by trained enumerators who were fluent local languages (Maithili/Tharu/Nepali). Limitations included: a) cross-sectional design that precludes examination of the cause-effect relationship; b) limited generalizability to younger age groups and geography other than Morang and Sunsari districts of Nepal. Additional limitation includes the inclusion of only four chronic conditions in the definition of multimorbidity. Further, our lifestyle measures may be subject to social desirability bias.

Conclusions

This study found a high prevalence of multimorbidity among older adults in rural Nepal. There is a need to conduct a more comprehensive, nationally representative study to obtain a more reliable estimate of prevalence and correlates of its multimorbidity. In recent years, there have been increased concerns and commitments from the Nepal government to identify and address the health and social needs of older Nepali adults. As such, the findings will help policymakers and stakeholders to identify needs, develop preventive strategies and clinical guidelines, and address the needs of a growing multi-morbid older population.

Abbreviations

NCD: Non-communicable disease

COPD: Chronic Obstructive Pulmonary Disease

CVD: Cardiovascular disease

CI : Confidence Interval

AOR: Adjusted Odds Ratio

RM: Rural Municipalities

Declarations

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Contributions

Conceived and designed the experiments: UNY, SG, LBR and MFH. Performed field work: UNY, SG, SKM and LBR. Analysed the data: UNY, SG SKM, SS, LBR and MFH. Wrote the paper: UNY, SG SKM, SS, LBR and MFH. All authors read and approved the final manuscript.

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Ethics approval and consent to participate

The study was approved by the Institutional Review Board of Nepal Health Research Council, Government of Nepal, Ministry of Health, Kathmandu. After detailed information, all study participants gave their written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests. Lal Bahadur Rawal is the member of editorial board of BMC Public Health.

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Tables

Table.1. Definition of chronic conditions included in the study

Conditions	Definition
Diabetes	Taking diabetic medications (insulin, hypoglycemic); self-report of diabetes; or diabetes recorded as a diagnosis in the medical record.
Chronic obstructive pulmonary disease (COPD)	Clinical assessment as evident in the medical records or use of bronchodilators, or self-reported production of sputum for last three months with any smoking history.
Cardiovascular disease	Presence of any of the following conditions: - <ul style="list-style-type: none"> Hypertension – self-report of diagnosed hypertension; verified by blood pressure level in the provided medical records. Self-report of heart attack, angina, or “heart trouble” Stroke – self-reported presence of valve disease or taking medications for those.
Osteoarthritis	Self-report of joint pain problems
Multimorbidity	Presence of more than one of the four aforementioned conditions in the same individual. Multimorbidity was then dichotomized as present (i.e. 2-4 conditions) or absent (i.e., single condition) for assessing relationships with the independent variables.

Table 2 Prevalence of chronic diseases and multiple morbidities (n=794)

Conditions	Osteoarthritis n (%)	CVD n (%)	Diabetes n (%)	COPD n (%)
Osteoarthritis (OA)	331 (41.7%)			
Cardiovascular diseases (CVD)	13 (1.6%)	19 (2.4%)		
Diabetes	16 (2.0%)	3 (0.4%)	42 (5.3%)	
Chronic Obstructive Pulmonary Diseases (COPD)	90 (11.3%)	8 (1.0%)	6 (0.8%)	122 (15.4%)
OA and CVD			1 (0.1%)	5 (0.6%)
Diabetes & COPD	4 (0.5%)	0		
Any co-morbidities ¹ n (%)	388 (48.9)			
Multiple morbidities ² n (%)	116 (14.7)			

¹Suffering from at least one of the chronic conditions: osteoarthritis, CVD, diabetes, and COPD. ²Suffering from two or more chronic conditions.

Table.3. Socio-demographic and lifestyle characteristics and status of multimorbidity

	¹ Multimorbidity		
	No N=678, (%)	Yes N=116, (%)	P value
Age (mean, SD)	69.9(8.9)	70.3(7.8)	0.627
Age (year, %)			
60 - 69	381(86.6)	59(13.4)	0.235
70 - 79	193(82.1)	42(17.9)	
≥ 80	104(87.3)	15(12.7)	
Gender			
Male	350(87.5)	50(12.5)	0.090
Female	328(83.2)	66(16.8)	
District			
<i>Morang</i>	351(86.9)	53(13.1)	0.226
<i>Sunsari</i>	327(83.9)	63(16.1)	
Religion			
Hinduism	529(84.7)	96(15.3)	0.046
Buddhism	19(100.0)	0(0.0)	
Islam	105(84.0)	20(16.0)	
Christianity	25(100.0)	0(0.0)	
Ethnicity			
<i>Brahmin/Chettri/ Thakuri</i>	62(89.9)	7(10.1)	0.706
<i>Aadiwasi/Janjatis</i>	255(85.6)	43(14.4)	
<i>Dalit</i>	132(84.1)	25(15.9)	
<i>Madhesi and other ethnic groups</i>	229(84.9)	41(15.1)	
Marital status			
Married	365(85.9)	60(14.1)	0.674
² Others	313(84.9)	56(15.1)	
Literacy			
Illiterate	538(84.6)	98(15.4)	0.201
literate	140(88.7)	18(11.3)	
Past occupation			
Employed	327(89.9)	37(10.1)	0.001
Unemployed	351(81.7)	79(18.3)	
Family monthly income			
USD < 49	331(86.9)	50(13.1)	0.453

USD 49 - 88	120(82.8)	25(17.2)	
USD > 88	227(84.8)	41(15.2)	
Tobacco smoking			
Never smoker	257(85.7)	43(14.3)	0.864
Having smoking history	421(85.2)	73(14.8)	
Tobacco chewing habit			
Never tobacco chewer	354(86.1)	57(13.9)	0.540
Having tobacco chewing history	324(84.7)	59(15.4)	
Alcohol drinking habit			
Never drinker	419(83.1)	85(16.9)	0.018
Having alcohol drinking history	259(89.3)	31(10.7)	
Physical activity			
No physical exercise at all	500(81.7)	112(18.3)	<0.001
Daily physical exercise	178(97.8)	4(2.2)	

¹Suffering from at least two of the chronic conditions: osteoarthritis, CVD, diabetes, and COPD. ²Others denotes widowed/divorced/separated/unmarried.

Table. 4. Factors associated with multimorbidity in a multiple logistic regression model

	Crude			Adjusted		
	OR	P-value	95% CI	OR	P-value	95% CI
Age (year, %)						
60 - 69	1.00			1.00		
70 - 79	1.61	0.027	1.06-2.45	1.62	0.033	1.04-2.54
≥ 80	1.24	0.155	0.92-1.67	0.97	0.834	0.75-1.26
Gender						
Male	1.00			Not taken in the model		
Female	1.34	0.132	0.92-1.96			
District						
<i>Morang</i>	1.00			Not taken in the model		
<i>Sunsari</i>	1.27	0.713	0.36-4.49			
Religion						
Hinduism	1.00			Not taken in the model		
Buddhism	1.00	-	-			
Islam	0.69	0.396	0.79-1.62			
Christianity	1.00	-	-			
Ethnicity						
<i>Brahmin/Chettri/Thakur</i>	1.00			1.00		
<i>Aadiwasi/Janjatis</i>	0.66	0.042	0.44-0.99	0.80	0.489	0.44-1.49
<i>Dalit</i>	0.58	0.000	0.44-0.76	0.80	0.392	0.48-1.33
<i>Madheshi and other ethnic groups</i>	0.45	0.002	0.28-0.75	0.48	0.002	0.31-0.77
Marital status						
Married	1.00			Not taken in the model		
¹ Others	1.01	0.951	0.67-1.54			
Literacy						
Literate	1.00			Not taken in the model		
Illiterate	1.40	0.465	0.57-3.43			
Occupation						
Employed	1.00			1.00		
Unemployed	1.72	0.012	1.12-2.62	1.49	0.060	0.98-2.26
² Income						
USD < 49	1.00			Not taken in the model		

USD 49 - 88	0.98	0.972	0.42-2.31			
USD > 88	1.11	0.656	0.69-1.82			
Smoking habit						
Never tobacco user	1.00				Not taken in the model	
Having tobacco use history	1.05	0.713	0.81-1.35			
Tobacco chewing habit						
Never tobacco chewer	1.00				Not taken in the model	
Having tobacco chewing history	0.99	0.942	0.72-1.36			
Alcohol drinking habit						
Having alcohol drinking history	1.00			1.00		
Never drinker	1.41	0.006	1.10-1.81	1.53	0.002	1.18-2.01
Physical activity						
Daily physical exercise	1.00			1.00		
No physical exercise at all	5.51	0.007	1.60-19.05	5.02	0.010	1.47-17.17

Significant p-values are bolded. ²Others denotes widowed/divorced/separated/unmarried. ²113 Nrs approximates 1 US Dollar. Abbreviation: CVD- Cardiovascular disease, COPD- Chronic Obstructive Pulmonary Disease.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklistcrosssectional.doc](#)