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Older adults with pre-existing noncommunicable conditions and their healthcare access amid COVID-19 pandemic in Nepal: findings from eastern Nepal

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Abstract

Objectives

COVID-19 has greatly impacted older adults with pre-existing noncommunicable conditions (hereafter called pre-existing conditions) in terms of their access to essential healthcare services. Based on the theory of vertical health equity, this study investigated access to healthcare by Nepali older adults with pre-existing conditions during the COVID-19 pandemic.

Methods

A cross-sectional study surveyed 847 randomly selected older adults (≥60 years) in three districts of eastern Nepal. Survey questionnaire, administered by trained community health workers, collected information on participants reported difficulty obtaining routine care and medications during the pandemic, in addition to questions on demographics, socioeconomic factors, and pre-existing conditions. Cumulative scores for pre-existing conditions were recoded as no pre-existing condition, single condition, and multimorbidity for the analyses. Chi-square tests and binary logistic regressions determined inferences.

Results

Nearly two-thirds of the participants had a pre-existing condition (43.8% single condition and 22.8% multimorbid) and reported experiencing difficulty obtaining routine care (52.8%) and medications (13.5%). Participants with single (OR: 3.06, 95%CI: 2.17-4.32) and multimorbid (OR: 5.62, 95%CI: 3.63-8.71) conditions had three and five-fold increased odds of experiencing difficulty accessing routine care. Findings were similar for difficulty obtaining medication (OR single: 3.12, 95%CI: 1.71-5.69; OR multimorbid: 3.98, 95%CI: 2.01-7.87) where odds were greater than three-folds.

Conclusions

Older adults with pre-existing conditions in Nepal, who require routine medical care and medication, faced significant difficulties obtaining them during the pandemic, which may lead to deterioration in their pre-existing conditions. Public health emergency preparedness should incorporate plans for both managing the emergency and providing continuing care.

Keywords: Older adults, pre-existing noncommunicable conditions, healthcare access, COVID-19.

Strengths and limitation of this study

- This is the first study from Nepal that reported older adults with NCDs facing difficulty in receiving routine medical care and medication amid COVID-19 pandemic.
- The study findings are framed within the principle of vertical health equity.
- This study reminds us to revisit national emergency preparedness and revise future planning using a more holistic approach, addressing both emerging and existing healthcare needs.
- This is a cross-sectional study, therefor causality cannot be inferred.
- The information on pre-existing conditions was self-reported and many of study participants may not be aware of their sub-clinical conditions, which may have introduced misclassification bias in the measurements, thereby underestimating the true burden of pre-existing conditions

Background

In Nepal, a South Asian country nestled in the Himalayas between India and China, population aging is a relatively new yet rapidly expanding issue. Consistent with the United Nation's definition, Nepal's Senior Citizens Act [1] identified individuals aged 60 and older as senior citizens. In accordance with the global trend, Nepal has been observing a continuous decline in mortality rates and an increase in life expectancy from 54.3 to 66.6 years between 1991 to 2011 [2]. Although the overall national population growth rate is declining, that of the older population is increasing and exceeds the national average growth rate (1.4% vs. 3.1%) [2]. Furthermore, from 1991 to 2011, Nepal, in late demographic transition, has experienced a significant increase in the aging index (from 13.6 to 23.3) and median age (from 18.9 to 22.3 years), reminding the society to be prepared to address the social, economic and health needs of burgeoning Nepali older adults [2]. While population aging is an emerging and neglected topic in Nepal [3], the increased vulnerability of the older population due to the ongoing pandemic has provoked us to revisit their health needs.

Nepal experienced an epidemiological shift in terms of declining burden of communicable diseases and a growing burden of noncommunicable disease (NCDs) in the last decade [4]. This means that a significant share of the population has been living for many years with chronic conditions, increasing the burden on Nepal's limited health resources [5]. Among older age groups (50 and older), in 2017, NCDs contributed to 55.3% of the disease burden [6]. In addition to single NCDs, the prevalence of multimorbidity or the presence of two or more chronic conditions is increasing, both globally and in Nepal [7,8]. Multimorbidity is often more challenging than a single condition because of the synergistic impact of multiple conditions, each of which may require a multitude of specialists' referrals, biomedical investigations, and treatments [9]. Although nationwide estimates

for multimorbidity are unavailable, estimates from rural parts of Eastern Nepal suggest that one in seven older adults had multimorbid chronic conditions [7].

Nepal has experienced a series of COVID-19 outbreaks; more recently the Delta strain, which has worsened the COVID-19 situation in Nepal. As of July 6, 2021, the pandemic has claimed 9,263 lives out of 648,085 positive cases in Nepal [10]; the highest proportion of deaths (67.8%) reported among older adults (>54 years) and all the deceased older adults had at least one pre-existing condition [11]. In Nepal, cardiovascular diseases, diabetes, and respiratory illness were the most common conditions linked to COVID-19 deaths [12].

Through its commitment to Sustainable Development Goals (SDG), Nepal aims to reduce premature deaths due to NCDs by one-third by 2030 [13]. People with one or more NCDs have extensive and diverse health-related needs and require continuity of care, self-management, medication adherence, and often seek repeated and regular interactions with the health system [14]. The principle of vertical health equity advocates for access to healthcare based on an individual's needs, i.e., those with greater needs should have greater access to healthcare [15]. Since those with one or more health problems have greater health needs than those without a health condition, they should have greater access to healthcare. Moreover, the needs are even greater for those with multimorbidity.

Despite the high needs, Nepal ranks far below the average in the Universal Health Coverage index [16], meaning that individuals and communities in Nepal do not have access to quality essential health services due to financial hardship. The COVID-19 pandemic may have further jeopardized healthcare access. On one hand, the nationwide lockdown, imposed by the Nepal government as a measure of mass quarantine to contain the COVID-19, may have aggravated the risk factors for NCDs such as sedentary lifestyles, unhealthy diets, smoking, alcohol, tobacco use, lack of sleep, non-compliance to medications, etc. [17–19]. On the other hand, it has resulted in the closure of services connected to day-to-day life like transportation, markets, city centers, and general health checkups in hospitals [20]. Due to the lockdowns, people have had difficulties not just fulfilling their everyday needs but also accessing healthcare in the absence of transport services [21]. Consequently, a rapid decrease in the number of per-day patient visits was noted during the lockdown [22]. Healthcare was inaccessible even pre-COVID, but at that time, it was tightly linked to income. During the COVID-19 lockdowns, even those who could afford healthcare were deprived of access [20]. Although the impact of COVID-19 is yet to be fully understood, inaccessible healthcare due to the COVID-19 pandemic may lead to a deterioration in pre-existing conditions, increase the severity of disease and disability, escalate premature deaths, and contribute to major economic loss for the country [23].

Previous studies from India, Bangladesh, and Hong Kong have reported difficulty accessing healthcare and/or obtaining medication during the pandemic [24–26]. Although the previous literature from Nepal has suggested disruptions in health services amidst the pandemic [20], it is unknown from patients' perspectives how much difficulty they experienced accessing healthcare amidst the pandemic. Framing the current study within the principle of vertical health equity, we aim to assess the relationships between pre-existing conditions and challenges in obtaining routine healthcare and medications during the COVID-19 pandemic among older adults in eastern Nepal.

Methodology

This study is reported following the STROBE guidelines [27] (Supplemental Table 1).

Study design and study participants

This study followed a cross-sectional design and surveyed 847 randomly selected older adults between July and September 2020; further detailed elsewhere [28]. The study took place in three districts of Province 1 in eastern Nepal, namely *Morang*, *Pachthar*, and *Terathum* (Figure 1). While Morang lies in the southern plains, *Pachthar* and *Terathum* are hilly districts. The population and key infrastructure indicators for these districts are provided in Supplemental Table 2. Nepali nationals who were residents in the study area for a minimum of a year and aged ≥60 years were included. Those in institutional settings and with significant hearing and communication problems that interfered with the survey were excluded.

Data collection and study tools

Surveyors were community health workers, certified in General Medicine, and employed by the Nepal government in the selected study areas. Surveyors received two sessions of orientations via zoom, each four hours long, on study methodology, tools, ethics, and field logistics. Following standard COVID-19 protocols implemented by national and local governments, surveyors visited households and conducted face-to-face interviews using a questionnaire implemented in the KoBoToolbox mobile app. A common group in WhatsApp was used to share and troubleshoot any field problems and to provide consistent information to all field enumerators. Initially developed in English, the study tool was translated into Nepali and pre-tested among ten older adults.

Study variables

Dependent variable: There were two outcome variables: whether participants faced difficulty obtaining 1) routine medical care and 2) prescribed medicines because of the COVID-19 pandemic. For each item, participants expressed their level of difficulty in the four-response Likert scale (‘none,’ ‘some,’ ‘very much,’ ‘unable’), which were then dichotomized as no difficulties or difficulties faced (responses ‘some,’ ‘very much,’ ‘unable’).

Independent variables: The main independent variable of interest was the presence of pre-existing conditions. Participants were asked if they had any pre-existing conditions diagnosed by a health professional and/or taking any prescription medications for that condition. In multiple response type questions, participants selected all the applicable conditions. Finally, via an open-ended follow-up question, they were asked to specify any other conditions that were not already captured. A cumulative score for all the conditions was calculated for each participant and was categorized into no pre-existing conditions, single condition, and multimorbidity. Definition of chronic conditions is tabulated in Supplemental Table 3.

Covariates: Other variables included age, sex, marital status, ethnicity, education, urban/rural residence, current occupation, living arrangement, proximity to the health center, financial hardships to access healthcare , and recipient of social security allowance. All these covariates were categorical with response levels as specified in Table 1.

Patient and public involvement

Patients and/or the public were not involved in developing research questions, designing, and conducting the study, and disseminating the results.

Ethics

This study received ethics approval (Ref# 150/2020) from the ethics board of Nepal Health Research Council (NHRC), Kathmandu, Nepal. All study participants provided informed written consent. For participants unable to read and write, proxy written consent was obtained from their close guardians. Participation was voluntary, and older adults did not receive any financial compensation. After completing the interview, community health care providers delivered 10 minutes of counseling services on dealing with COVID-19 was delivered to all participants.

Statistical analyses

All analyses are performed separately for each of the two dependent variables: access to 1) routine care and 2) medications. Since all our variables were categorical, they are summarized in Table 1 in terms of frequencies and percentages, and the group differences were evaluated using chi-square tests. Binary logistic regression analysis assessed if participants' pre-existing conditions were associated with difficulty obtaining healthcare. A stepwise selection method, using AIC criteria, was used for model selection and started with all the covariates reported in Table 1 while only retaining, in the final model, age, ethnicity, residence, occupation, walking proximity to the nearest health center, and financial hardships with healthcare. The VIF for each variable included in the final model was below 2 suggesting no multicollinearity issues. Adjusted and unadjusted odds ratios and 95% confidence intervals are reported in Table 2. All statistical analyses were conducted using SAS 9.4.

Results

Participants' characteristics

The largest proportion of the participants were in their sixties (45.4%), male (51.1%), married (75.8%), minorities (68.4%), without formal schooling (68.4%), urban residents (56.1%), involved in agriculture (47.4%), and living with family (89.1%) (Table 1). More than half of the participants faced financial hardship (55.0%) and received social security allowances (51.5%). Only one-third of the participants were free of pre-existing NCDs conditions; 43.8% had single, and 22.8% had multiple conditions (Table 1).

More than half of the participants reported facing difficulty obtaining healthcare (P=52.8%, 95%CI: 49.4%-56.2%), and 13.5% (95%CI: 11.2%-15.8%) reported facing difficulty obtaining medications. In bivariate analyses, among the covariates, age, ethnicity, occupation, walking proximity to the nearest health center, and financial hardships with healthcare were significantly associated with both of the outcome variables (Table 1); interestingly, only rural residents reported experiencing difficulties obtaining medications.

Association between pre-existing conditions and difficulty obtaining healthcare and medications during COVID-19

In bivariate analysis, participants' pre-existing conditions were significantly associated with their reported difficulty getting routine healthcare and medications (P<0.001) (Table 1). In the regression analyses (Table 2), participants' pre-existing condition was significantly associated with difficulty obtaining healthcare and medications in both adjusted and unadjusted models. Notably, the strength of the association was greater for those with multimorbidity than those with single conditions. After adjusting for the covariates, compared to participants without any pre-existing conditions, those with single (OR: 3.06, 95%CI: 2.17-4.32) and multiple (OR: 5.62, 95%CI: 3.63-8.71) conditions respectively had about three times and six times higher odds of experiencing difficulties in obtaining routine healthcare. Likewise, for medications, those with single (OR: 3.12, 95%CI: 1.71-5.69) and multiple (OR: 3.98, 95%CI: 2.01-7.87) conditions had more than three times increased odds of experiencing difficulties in obtaining medications (Table 2).

Discussion

This study found a significant positive association between participants' pre-existing conditions and difficulty obtaining both routine healthcare and medications during the COVID-19 pandemic in three studied districts of eastern Nepal. Those with multiple conditions were even more likely to experience difficulty accessing healthcare than those with single conditions despite their likely increased need.

Although people with pre-existing conditions require routine medical checkups and medication, both during and after pandemic, our participants faced significant difficulty obtaining them. This study is the first of its kind in Nepal, and a similar study is unavailable for direct comparison. However, our findings align with studies conducted in India [25] and Hong Kong [24] among the general population and Bangladesh among the older population [26], which also reported significant challenges faced by those with pre-existing conditions to access healthcare during the pandemic. In India, participants missed follow-up visits, and experienced difficulty in medication procurement, resulting in a worsening of pre-existing symptoms [29].

Acknowledging that inaccessible healthcare is a long-term problem in Nepal, existent even prior to the COVID-19 pandemic, several factors, at both the micro and macro levels, help explain why healthcare was not easily accessible to our participants. We believe the restricted movement and cessation of public transportation, imposed as part of the nationwide lockdown, to be the most important barrier to access. As a preventive measure to curb the spread of the virus, Nepal's government imposed several intermittent nationwide lockdowns of varying lengths. In a country where the majority rely on public transportation and a private vehicle is a privilege enjoyed only by the rich, cessation of public transportation meant that people with existing conditions had no means to reach health facilities, especially in rural areas where facilities are distant. In the current pandemic, it is obvious that an ill-equipped health system may not have been able to maintain essential services because of limited human resources for health (HRH) or shifting of HRH from primary healthcare (PHC) to COVID-19 management centers/hospitals. Furthermore, there were reported interruptions in health service delivery amidst the pandemic [23] due to the closure of peripheral healthcare facilities (such as PHCs, health posts) and fears of COVID-19 transmission

among healthcare workers [20,23]. A rapid assessment of 163 countries by the World Health Organization on the impact of the COVID-19 pandemic on NCDs resources and services revealed a considerable disruption to NCDs services in many countries, and in some South Asian countries, the government funds for NCDs were reallocated to COVID-19 treatment and management [23].

The pandemic has been overwhelming, but we know that its impact is likely to wane over the next few years. So, what are the implications of our findings beyond the COVID-19 pandemic? The broader implications of our findings should be contextualized within the context of historical, contemporary, and inevitable future outbreaks and public health emergencies. Although "We are all in this together" was a highly popularized phrase during the pandemic, evidences suggests significant inequalities in severe morbidity and mortality during a pandemic, whereby certain age groups, minorities, and those with low socioeconomic status bear the greater impact, as noted during the 1918 Spanish influenza pandemic, the 2009 H1N1 outbreak, and the current COVID-19 pandemic [30,31]. The noted disparities, in the grounds of social determinants of health, point to the gaps in our emergency preparedness and the failure of society to protect the most vulnerable in a time of catastrophe.

Although focusing on curative and preventive strategies to curb the pandemic is important, it should be noted that health systems have dual responsibilities in both responding to the outbreak as well as providing essential health services, especially to those with greater needs, such as older adults with NCDs. As demonstrated by previous [32,33] and current studies, the latter was neglected in many countries, thus depriving people with NCDs of access to continuing care and essential medications. At the policy level, Nepal's COVID-19 response plan has no specific prioritization and provisions for either older adults and/or people with NCDs [34]. Policymakers in Nepal should recognize that the impact of the COVID-19 pandemic can only be mitigated if strategies to provide essential routine services to their vulnerable population are in place. These strategies should be informed by epidemiological data, health system capacity, and available resources during health crises. Given the disruption of healthcare access during the COVID-19 pandemic, there is a need to co-design and evaluate new models of care with the engagement of key stakeholders, citizens, developmental partners, local and decision-makers. These models of care should be designed in a way that it can meet the health needs of the population during and beyond the pandemic. One important strategy is putting PHC at the center of emergency response plan to address the healthcare needs at the community level. There is an opportunity to focus on developing alternative pathways to deliver health services and essential drugs such as door-to-door services, mobilizing community health workers, expanding telehealth or mobile health, and remote health consultations [23].

Strength, limitations, and generalizability of the findings

This study is one of its first kind from Nepal to assess challenges to healthcare access amidst the pandemic among older adults with NCDs. Large sample size, the inclusion of both urban and rural areas, and data collection by trained community health workers add to the reliability of the data. However, this study also has some limitations. The first is that due to the cross-sectional study design, it is not possible to infer causality. However, the questionnaire did ask respondents to respond to questions with reference to "compared to before COVID" and "due to COVID"; thus, the responses reflected their view of changes that had occurred. The information on pre-existing conditions was self-reported, and we believe it to be underestimated because, in the Nepali context,

it is common to access healthcare only when the symptoms are obvious and severe. Hence, many of our participants may not be aware of their sub-clinical conditions, which may have introduced misclassification bias in the measurements, thereby underestimating the true burden of pre-existing conditions. The study districts are in hills and plain areas of eastern Nepal, and thus the findings may not be generalizable to other settings of Nepal. Our study did not assess reasons for access problems, and future studies should explore the underlying reasons for inaccessibility.

Conclusions

Nepali older adults with one or more pre-existing conditions, despite their higher health needs, faced more difficulties obtaining routine healthcare and medications during the COVID-19 pandemic, which is against the principle of vertical health inequity. Policymakers, healthcare practitioners, and local stakeholders should be cognizant of the existing inequality in healthcare and urgently address the gaps in healthcare accessibility for older adults with NCDs. The broader consequences of inaccessible healthcare during the pandemic and its subsequent impact on Nepal's commitment to the attainment of SDG-3 of reducing NCDs burden by one-third by 2030 [13] is yet to be fully understood. Yet, the pandemic reminds us to revisit our national emergency preparedness and revise future planning using a more holistic approach, addressing both emerging and existing healthcare needs.

List of abbreviations:

NCD: Non-communicable disease

OR: Odds Ratio

CI: Confidence Interval

STROBE: The Strenthening the Reporting of Observational Studies in Epidemiology

SDG: Sustainable Development Goal

Consent for publication

NA

Availability of data and materials

The data that support the findings of this study are available and an anonymized dataset is included as an additional supporting file.

Competing interests

The authors received no financial support for the research or publication of this article and have no conflict of interests to declare regarding the publication of this paper

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Authors' contributions

UNY, SG ,SKM and MFH conceived the idea. UNY,OPY and SM collected the data. SG and AS analyzed the data. SG, AS and UNY drafted the first draft. All authors contributed significantly and approved the final version.

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Table 1. Characteristics of the study participants- overall and by their experiences in obtaining healthcare during the COVID-19 pandemic.

	Overall n (%) (N=843)	Difficulty obtaining healthcare n (%)			Difficulty obtaining medications n (%)		
		Yes (n=445, 52.8%)	No (n=398, 47.2%)	[1]p-Value	Yes (n=114, 13.5%)	No (n=729, 86.5%)	[1]p-Value
Age in years							
60-69	383 (45.4)	164 (36.9)	219 (55.0)	<0.001	35 (30.7)	348 (47.7)	0.001
70-79	315 (37.4)	189 (42.5)	126 (31.7)		59 (51.8)	256 (35.1)	
80+	145 (17.2)	92 (20.7)	53 (13.3)		20 (17.5)	125 (17.1)	
Sex							
Female	412 (48.9)	229 (51.5)	183 (46.0)	0.112	44 (38.6)	368 (50.5)	0.018
Male	431 (51.1)	216 (48.5)	215 (54.0)		70 (61.4)	361 (49.5)	
[2]Marital status							
Married	639 (75.8)	321 (72.1)	318 (79.9)	0.009	93 (81.6)	546 (74.9)	0.121
Without partner	204 (24.2)	124 (27.9)	80 (20.1)		21 (18.4)	183 (25.1)	
Ethnicity							
Brahmins/Chhetri	266 (31.6)	159 (35.7)	107 (26.9)	0.006	18 (15.8)	248 (34.0)	<0.001
Minorities and others	577 (68.4)	286 (64.3)	291 (73.1)		96 (84.2)	481 (66.0)	
Education							
No formal schooling	577 (68.4)	298 (67.0)	279 (70.1)	0.328	70 (61.4)	507 (69.5)	0.082
Formal schooling	266 (31.6)	147 (33.0)	119 (29.9)		44 (38.6)	222 (30.5)	
Residence							
Rural	370 (43.9)	204 (45.8)	166 (41.7)	0.227	114 (100.0)	256 (35.1)	NA
Urban	473 (56.1)	241 (54.2)	232 (58.3)		0	473 (64.9)	
Current occupation							
Agriculture	400 (47.4)	231 (51.9)	169 (42.5)	0.001	88 (77.2)	312 (42.8)	<0.001
Non-agriculture	169 (20.0)	68 (15.3)	101 (25.4)		12 (10.5)	157 (21.5)	
Housewife/Retired	274 (32.5)	146 (32.8)	128 (32.2)		14 (12.3)	260 (35.7)	
Living arrangement							
Live alone	92 (10.9)	51 (11.5)	41 (10.3)	0.590	11 (9.6)	81 (11.1)	0.642
Live with family	751 (89.1)	394 (88.5)	357 (89.7)		103 (90.4)	648 (88.9)	
Walking proximity to the nearest health center							
< 30 minutes	272 (32.3)	124 (27.9)	148 (37.2)	0.006	41 (36.0)	231 (31.7)	0.000
30-60 minutes	372 (44.1)	201 (45.2)	171 (43.0)		32 (28.1)	340 (46.6)	
> 60 minutes	199 (23.6)	120 (27.0)	79 (19.8)		41 (36.0)	158 (21.7)	
Financial hardships with healthcare							
No	379 (45.0)	184 (41.3)	195 (49.0)	0.026	65 (57.0)	314 (43.1)	0.005
Yes	464 (55.0)	261 (58.7)	203 (51.0)		49 (43.0)	415 (56.9)	

Receiving social security allowance							
No	409 (48.5)	185 (41.6)	224 (56.3)	<0.001	51 (44.7)	358 (49.1)	0.385
Yes	434 (51.5)	260 (58.4)	174 (43.7)		63 (55.3)	371 (50.9)	
[3]Pre-existing (NCDs) conditions							
None	282 (33.5)	84 (18.9)	198 (49.7)	<0.001	17 (14.9)	265 (36.4)	<0.001
Single condition	369 (43.8)	220 (49.4)	149 (37.4)		60 (52.6)	309 (42.4)	
Multimorbidity	192 (22.8)	141 (31.7)	51 (12.8)		37 (32.5)	155 (21.3)	

[1]P-values from a chi-square test comparing participants experiencing and not experiencing difficulty.
[2]Includes widowed, separated, and never married. [3]NCDs= Non-communicable diseases.

Table 2. Association between pre-existing (NCDs) conditions and difficulty obtaining healthcare and medications

	Difficulty obtaining healthcare		Difficulty obtaining medications	
	Unadjusted OR (95%CI)	**[a]Adjusted OR (95%CI)**	**Unadjusted OR (95%CI)**	**[b]Adjusted OR (95%CI)**
[1]Pre-existing (NCDs) conditions				
None	Reference		Reference	
Single condition	**3.48 (2.50 - 4.84)**	**3.06 (2.17 - 4.32)**	**3.03 (1.72 - 5.31)**	**3.12 (1.71 - 5.69)**
Multimorbidity	**6.52 (4.33 - 9.81)**	**5.62 (3.63 - 8.71)**	**3.72 (2.03 - 6.83)**	**3.98 (2.01 - 7.87)**

[1]NCDs= Non-communicable diseases. Statistically significant odds ratios are bolded.
[a]Adjusted for age, ethnicity, residence, occupation, walking proximity to the nearest health center, and financial hardships with healthcare .
[b]Adjusted for age, ethnicity, occupation, walking proximity to the nearest health center, and financial hardships with healthcare .

Figure 1. Map of Nepal highlighting the three study districts in the eastern region.

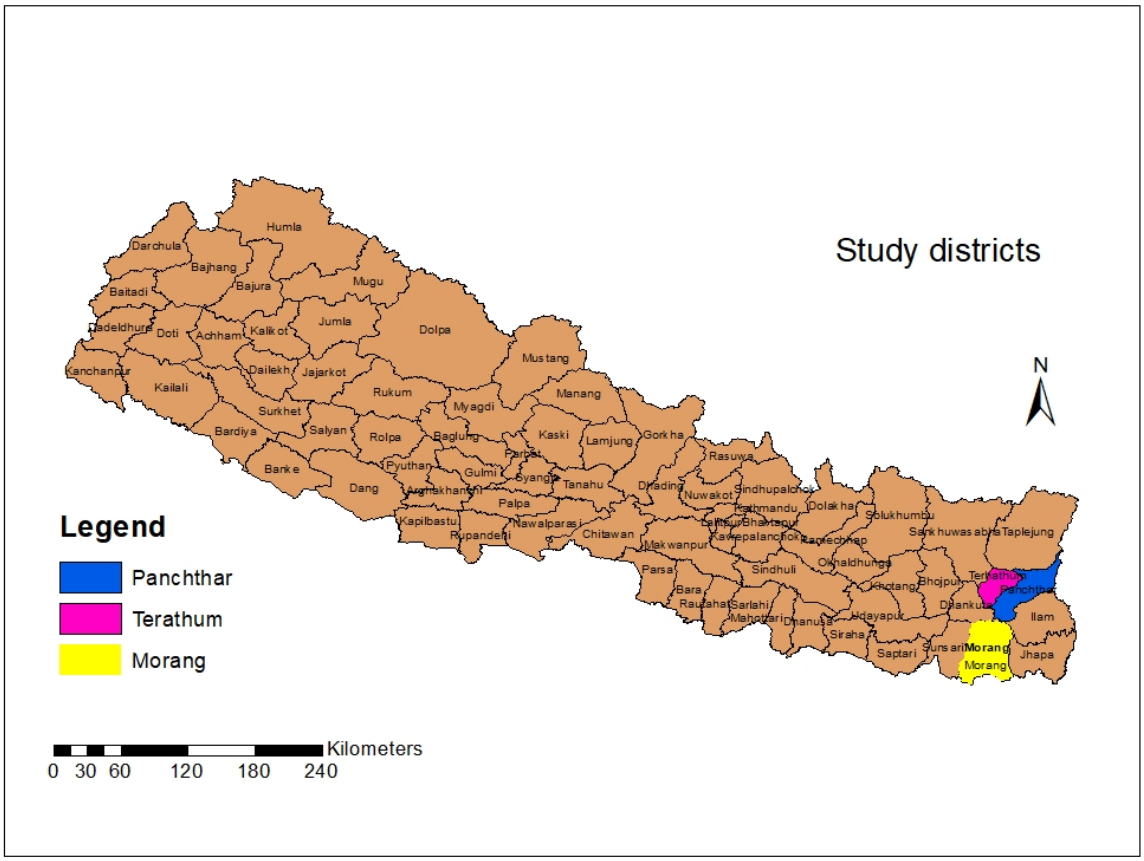

Figure 1. Map of Nepal highlighting the three study districts in the eastern region.

Supplemental Table 2: Demographic and socioeconomic characteristics of study districts

Attributes	National	Study districts		
		Morang	Pachthar	Terathum
Total Population	26,494,504	965,370	191,817	101,577
60+ Population	2,154,410	79,636	16,918	9,946
60+ Male	1,063,949	39,878	8,598	4,772
60+ Female	1,090,461	39,758	8,320	5,174
% literate population (6 years and above)	66.6	70.9	73.4	75.2
[1]National rank of the district by literacy status	NA	25	17	11
% of households with improved source of drinking water	85.9	97.7	73.4	78.8
% of solid fuel used for cooking	75.4	71.3	92.9	94.6
% electricity used for lighting	66.7	76.1	28.0	67.4
% having toilet facility	61.6	63.7	88.2	75.0
% Urbanization level	29.0	44.2	12.9	19.4

[1]National literacy rate urban: 82.3% and rural: 62.5% with the eastern region, where the three study districts are located, has slightly higher (67.2%) than the national average. National literacy for older population is low: 26.2% for ages 60-64 and 20.8% for 65+.

Source: National Population and Housing Census 2011, Nepal

Supplemental Table 3: Definition of a single condition and multimorbidity

Conditions	Definition[1]
Hypertension	Self-reported hypertension and/or taking antihypertensive medications.
Heart diseases	Self-report of heart attack, angina, or "heart trouble," or taking medications for heart diseases.
Stroke	Self-report of the previous stroke or taking medication for a recent episode of stroke.
Hypercholesterolemia	Self-reported raised cholesterol and/or taking medication for hypercholesterolemia.
Diabetes	Self-reported diabetes and/or taking insulin or antidiabetic medications.
Chronic respiratory diseases	Self-reported chronic respiratory diseases, asthma, COPD or taking medication for the conditions.
Chronic kidney disease	Taking medication for chronic kidney disease or undergoing dialysis.
Cancer	Taking medication for cancer; having past or current cancer therapy, including chemotherapy and radiation therapy.
Osteoarthritis	Self-report of joint pain problems.

[1] Self-report was assessed by asking participants if a doctor or other health professional ever told them they had the given condition.

Supplemental Table 1. STROBE Checklist

	Item No	Recommendation	Reported on
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Pages 1 & 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Pages 4 & 5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 5
Methods			
Study design	4	Present key elements of study design early in the paper	Page 5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page 5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 6
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page 6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 7 & Table 1
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	Page 7 & Table 1
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 7 & Table 2
		(*b*) Report category boundaries when continuous variables were categorized	Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Pages 7-8
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable,	Page 1

	for the original study on which the present article is based

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Older adults with pre-existing noncommunicable conditions and their healthcare access amid COVID-19 pandemic: a cross-sectional study in eastern Nepal

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Older adults with pre-existing noncommunicable conditions and their healthcare access amid COVID-19 pandemic: a cross-sectional study in eastern Nepal

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Abstract

Background

COVID-19 has greatly impacted older adults with pre-existing noncommunicable conditions (hereafter called pre-existing conditions) in terms of their access to essential healthcare services. Based on the theory of vertical health equity, this study investigated access to healthcare by Nepali older adults with pre-existing conditions during the COVID-19 pandemic.

Methods

A cross-sectional study surveyed 847 randomly selected older adults (≥60 years) in three districts of eastern Nepal. Survey questionnaires, administered by trained community health workers, collected information on participants reported difficulty obtaining routine care and medications during the pandemic, in addition to questions on demographics, socioeconomic factors, and pre-existing conditions. Cumulative scores for pre-existing conditions were recoded as no pre-existing condition, single condition, and multimorbidity for the analyses. Chi-square tests and binary logistic regressions determined inferences.

Results

Nearly two-thirds of the participants had a pre-existing condition (43.8% single condition and 22.8% multimorbid) and reported experiencing difficulty obtaining routine care (52.8%) and medications (13.5%). Participants with single (OR: 3.06, 95%CI: 2.17-4.32) and multimorbid (OR: 5.62, 95%CI: 3.63-8.71) conditions had three and five-fold increased odds of experiencing difficulty accessing routine care. Findings were similar for difficulty obtaining medication (OR single: 3.12, 95%CI: 1.71-5.69; OR multimorbid: 3.98, 95%CI: 2.01-7.87) where odds were greater than three-folds.

Conclusions

Older adults with pre-existing conditions in Nepal, who require routine medical care and medication, faced significant difficulties obtaining them during the pandemic, which may lead to deterioration in their pre-existing conditions. Public health emergency preparedness should incorporate plans for both managing the emergency and providing continuing care.

Keywords: Nepali older adults, pre-existing noncommunicable conditions, healthcare access, COVID-19.

Strengths and limitations of this study:

- The study is one of its first kind from Nepal to assess challenges in healthcare access amidst the pandemic among older adults with NCDs.
- Large sample size and data collection by trained community health workers add to the reliability of the data.
- Cross-sectional study design limits causality inferences.
- The information on pre-existing conditions was self-reported and may be underestimated.
- Generalizability is limited due to the inclusion of three districts from Eastern Nepal.

Background

In Nepal, a South Asian country nestled in the Himalayas between India and China, population aging is a relatively new yet rapidly expanding issue. Consistent with the United Nation's definition, Nepal's Senior Citizens Act [1] identified individuals aged 60 and older as senior citizens. In accordance with the global trend, Nepal has been observing a continuous decline in mortality rates and an increase in life expectancy from 54.3 to 66.6 years between 1991 to 2011 [2]. Although the overall national population growth rate is declining, that of the older population is increasing and exceeds the national average growth rate (1.4% vs. 3.1%) [2]. Furthermore, from 1991 to 2011, Nepal, in late demographic transition, has experienced a significant increase in the aging index (from 13.6 to 23.3) and median age (from 18.9 to 22.3 years), reminding the society to be prepared to address the social, economic and health needs of burgeoning Nepali older adults [2]. While population aging is an emerging and neglected topic in Nepal [3], the increased vulnerability of the older population due to the ongoing pandemic has provoked us to revisit their health needs.

Nepal experienced an epidemiological shift in terms of declining burden of communicable diseases and a growing burden of noncommunicable diseases (NCDs) in the last decade [4]. This means that a significant share of the population has been living for many years with chronic conditions, increasing the burden on Nepal's limited health resources [5]. Among older age groups (50 and older), in 2017, NCDs contributed to 55.3% of the disease burden in Nepal [6]. In addition to single NCDs, the prevalence of multimorbidity or the presence of two or more chronic conditions is increasing, both globally and in Nepal [7,8]. Multimorbidity is often more challenging than a single condition because of the synergistic impact of multiple conditions, each of which may require a multitude of specialists' referrals, biomedical investigations, and treatments [9]. Although nationwide estimates for multimorbidity are unavailable, estimates from rural parts of Eastern Nepal suggest that one in seven older adults had multimorbid chronic conditions [7].

Nepal has experienced a series of COVID-19 outbreaks; more recently, the Delta strain, which has worsened the COVID-19 situation in Nepal. As of July 6, 2021, the pandemic has claimed 9,263 lives out of 648,085 positive cases in Nepal [10]; the highest proportion of deaths (67.8%) reported among older adults (>54 years), and all the deceased older adults had at least one pre-existing condition [11]. In Nepal, cardiovascular diseases, diabetes, and respiratory illness were the most common conditions linked to COVID-19 deaths [12].

Through its commitment to Sustainable Development Goals (SDG), Nepal aims to reduce premature deaths due to NCDs by one-third by 2030 [13]. People with one or more NCDs have extensive and diverse health-related needs and require continuity of care, self-management, medication adherence, and often seek repeated and regular interactions with the health system [14]. Horizontal health equity advocates for equal access to health care. In contrast, vertical health equity is defined as the principle that advocates for access to healthcare based on an individual's needs, i.e., those with greater needs should have greater access to healthcare [15]. Since those with one or more health problems have greater health needs than those without a health condition, they should have greater access to healthcare. Moreover, the needs are even greater for those with

multimorbidity. In the context of our study, the principle of vertical health equity is violated if those with one or more pre-existing NCDs experience greater challenges to access health care.

Despite the high needs, Nepal ranks far below the average in the Universal Health Coverage index [16], meaning that individuals and communities in Nepal do not have access to quality essential health services due to financial hardship. The COVID-19 pandemic may have further jeopardized healthcare access. On one hand, the nationwide lockdown, imposed by the Nepal government as a measure of mass quarantine to contain the COVID-19, may have aggravated the risk factors for NCDs such as sedentary lifestyles, unhealthy diets, smoking, alcohol, tobacco use, lack of sleep, non-compliance to medications, etc. [17–19]. On the other hand, it has resulted in the closure of services connected to day-to-day life like transportation, markets, city centers, and general health checkups in hospitals [20]. Due to the lockdowns, people have had difficulties not just fulfilling their everyday needs but also accessing healthcare in the absence of transport services [21]. Consequently, a rapid decrease in the number of per-day patient visits was noted during the lockdown [22]. Healthcare was inaccessible even pre-COVID, but at that time, it was tightly linked to income. During the COVID-19 lockdowns, even those who could afford healthcare were deprived of access [20]. Although the impact of COVID-19 is yet to be fully understood, inaccessible healthcare due to the COVID-19 pandemic may lead to a deterioration in pre-existing conditions, increase the severity of disease and disability, escalate premature deaths, and contribute to major economic loss for the country [23].

Previous studies from India, Bangladesh, and Hong Kong have reported difficulty accessing healthcare and/or obtaining medication during the pandemic [24–26]. Although the previous literature from Nepal has suggested disruptions in health services amidst the pandemic [20], it is unknown from patients' perspectives how much difficulty they experienced accessing healthcare amidst the pandemic. Framing the current study within the principle of vertical health equity, we aim to assess the relationships between pre-existing conditions and challenges in obtaining routine healthcare and medications during the COVID-19 pandemic among older adults in eastern Nepal.

Methodology

This study is reported following the STROBE guidelines [27] (Supplemental Table 1).

Study design and study participants

This study followed a cross-sectional design and surveyed 847 randomly selected older adults between July and September 2020; further detailed elsewhere [28]. Using an unknown prevalence of 50%, 5% precision, a design effect of 2, and a non-response rate of 5.0%, the minimum required sample size was calculated to be 847. Multi-stage cluster sampling was used for selecting participants. In the first stage, the three districts of Province 1 in eastern Nepal, namely *Morang*, *Pachthar*, and *Terathum* (Figure 1), were randomly selected. While Morang lies in the southern plains, *Pachthar* and *Terathum* are hilly districts. The population and key infrastructure indicators for these districts are provided in Supplemental Table 2. Briefly, the three study districts have a higher literacy rate and access to sanitary toilets than the national average. While Morang district is above the national average in terms of urbanization and access to electricity and improved drinking water sources, the other two districts, Pachthar and Terathum,

are below the national average (Supplemental Table 2). In the second stage, one urban and one rural municipality were randomly selected in each district. Next, from each municipality, three wards (lowest administrative units in Nepal) were randomly selected, and in the final stage, participants were randomly selected from each ward. Nepali nationals who were residents in the study area for a minimum of a year and aged ≥60 years were included. Those in institutional settings and with significant hearing and communication problems that interfered with the survey were excluded.

Data collection and study tools

Surveyors were community health workers, certified in General Medicine, and employed by the Nepal government in the selected study areas. Surveyors received two sessions of orientations via zoom, each four hours long, on study methodology, tools, ethics, and field logistics. Following standard COVID-19 protocols implemented by national and local governments, surveyors visited households and conducted face-to-face interviews using a questionnaire implemented in the KoBoToolbox mobile app. A common group in WhatsApp was used to share and troubleshoot any field problems and to provide consistent information to all field enumerators. Initially developed in English, the study tool was translated into Nepali and pre-tested among ten older adults.

Study variables

Dependent variable: There were two outcome variables: whether participants faced difficulty obtaining 1) routine medical care and 2) prescribed medicines because of the COVID-19 pandemic. For each item, participants expressed their level of difficulty in the four-response Likert scale ('none,' 'some,' 'very much,' 'unable'), which were then dichotomized as no difficulties or difficulties faced (responses 'some,' 'very much,' 'unable').

Independent variables: The main independent variable of interest was the presence of pre-existing conditions. Participants were asked if they had any pre-existing conditions diagnosed by a health professional and/or taking any prescription medications for that condition. In multiple response type questions, participants selected all the applicable conditions. Finally, via an open-ended follow-up question, they were asked to specify any other conditions that were not already captured. A cumulative score for all the conditions was calculated for each participant and was categorized into no pre-existing conditions, single condition, and multimorbidity. Definition of chronic conditions is tabulated in Supplemental Table 3.

Covariates: Other variables included age, sex, marital status, ethnicity, education, urban/rural residence, current occupation, living arrangement, proximity to the health center, financial hardships to access healthcare, and recipient of social security allowance. All these covariates were categorical with response levels as specified in Table 1.

Patient and public involvement

Patients and the public were not involved in the design of the study and interpretation of the results.

Statistical analyses

All analyses are performed separately for each of the two dependent variables: access to 1) routine care and 2) medications. Since all our variables were categorical, they are summarized in Table 1 in terms of frequencies and percentages, and the group differences were evaluated using chi-square tests. Binary logistic regression analysis assessed if participants' pre-existing conditions were associated with difficulty obtaining healthcare. A stepwise selection method, using AIC criteria, was used for model selection and started with all the covariates reported in Table 1 while only retaining, in the final model, age, ethnicity, residence, occupation, walking proximity to the nearest health center, and financial hardships with healthcare. The VIF for each variable included in the final model was below 2 suggesting no multicollinearity issues. Adjusted and unadjusted odds ratios and 95% confidence intervals are reported in Table 2. All statistical analyses were conducted using SAS 9.4.

Results

Participants' characteristics

Data were collected from 843 of the approached 847 participants (a response rate of 99.5%). The largest proportion of the participants were in their sixties (45.4%), male (51.1%), married (75.8%), minorities (68.4%), without formal schooling (68.4%), urban residents (56.1%), involved in agriculture (47.4%), and living with family (89.1%) (Table 1). More than half of the participants faced financial hardship (55.0%) and received social security allowances (51.5%). Only one-third of the participants were free of pre-existing NCDs conditions; 43.8% had single, and 22.8% had multiple conditions (Table 1).

More than half of the participants reported facing difficulty obtaining healthcare (p=52.8%, 95%CI: 49.4%-56.2%), and 13.5% (95%CI: 11.2%-15.8%) reported facing difficulty obtaining medications. In bivariate analyses, among the covariates, age, ethnicity, occupation, walking proximity to the nearest health center, and financial hardships with healthcare were significantly associated with both of the outcome variables (Table 1); interestingly, only rural residents reported experiencing difficulties obtaining medications.

Association between pre-existing conditions and difficulty obtaining healthcare and medications during COVID-19

In bivariate analysis, participants' pre-existing conditions were significantly associated with their reported difficulty getting routine healthcare and medications (P<0.001) (Table 1). In the regression analyses (Table 2), participants' pre-existing condition was significantly associated with difficulty obtaining healthcare and medications in both adjusted and unadjusted models. Notably, the strength of the association was greater for those with multimorbidity than those with single conditions. After adjusting for the covariates, compared to participants without any pre-existing conditions, those with single (OR: 3.06, 95%CI: 2.17-4.32) and multiple (OR: 5.62, 95%CI: 3.63-8.71) conditions respectively had about three times and six times higher odds of experiencing difficulties in obtaining routine healthcare. Likewise, for medications, those with single (OR: 3.12, 95%CI: 1.71-5.69) and multiple (OR: 3.98, 95%CI: 2.01-7.87) conditions had

more than three times increased odds of experiencing difficulties in obtaining medications (Table 2).

Discussion

This study found a significant positive association between participants' pre-existing conditions and difficulty obtaining both routine healthcare and medications during the COVID-19 pandemic in three studied districts of eastern Nepal. Those with multiple conditions were even more likely to experience difficulty accessing healthcare than those with single conditions despite their likely increased need.

Although people with pre-existing conditions require routine medical checkups and medication, both during and after the pandemic, our participants faced significant difficulty obtaining them. This study is the first of its kind in Nepal, and a similar study is unavailable for direct comparison. However, our findings align with studies conducted in India [25] and Hong Kong [24] among the general population and Bangladesh among the older population [26], which also reported significant challenges faced by those with pre-existing conditions to access healthcare during the pandemic. In India, participants missed follow-up visits, and experienced difficulty in medication procurement, resulting in a worsening of pre-existing symptoms [29].

Acknowledging that inaccessible healthcare is a long-term problem in Nepal, existent even prior to the COVID-19 pandemic, several factors, at both the micro and macro levels, help explain why healthcare was not easily accessible to our participants. We believe the restricted movement and cessation of public transportation, imposed as part of the nationwide lockdown, to be the most important barrier to access. As a preventive measure to curb the spread of the virus, Nepal's government imposed several intermittent nationwide lockdowns of varying lengths. In a country where the majority rely on public transportation and a private vehicle is a privilege enjoyed only by the rich, cessation of public transportation meant that people with existing conditions had no means to reach health facilities, especially in rural areas where facilities are distant. In the current pandemic, it is obvious that an ill-equipped health system may not have been able to maintain essential services because of limited human resources for health (HRH) or shifting of HRH from primary healthcare (PHC) to COVID-19 management centers/hospitals. Furthermore, there were reported interruptions in health service delivery amidst the pandemic [23] due to the closure of peripheral healthcare facilities (such as PHCs, health posts) and fears of COVID-19 transmission among healthcare workers [20,23]. A rapid assessment of 163 countries by the World Health Organization on the impact of the COVID-19 pandemic on NCDs resources and services revealed a considerable disruption to NCDs services in many countries, and in some South Asian countries, the government funds for NCDs were reallocated to COVID-19 treatment and management [23].

The pandemic has been overwhelming, but we know that its impact is likely to wane over the next few years. So, what are the implications of our findings beyond the COVID-19 pandemic? The broader implications of our findings should be contextualized within the context of historical, contemporary, and inevitable future outbreaks and public health emergencies. Although "We are all in this together" was a highly popularized phrase during the pandemic, evidence suggests significant inequalities in severe morbidity and mortality during a pandemic, whereby certain age groups, minorities, and those with low socioeconomic status bear the greater impact, as noted during the 1918 Spanish influenza pandemic, the 2009 H1N1 outbreak, and the current COVID-

19 pandemic [30,31]. The noted disparities, on the grounds of social determinants of health, point to the gaps in our emergency preparedness and the failure of society to protect the most vulnerable in a time of catastrophe.

Although focusing on curative and preventive strategies to curb the pandemic is important, it should be noted that health systems have dual responsibilities in both responding to the outbreak as well as providing essential health services, especially to those with greater needs, such as older adults with NCDs. As demonstrated by previous [32,33] and current studies, the latter was neglected in many countries, thus depriving people with NCDs of access to continuing care and essential medications. Acknowledging that Nepal Government has provisions to provide universal health care and essential medicines, at the policy level, Nepal's COVID-19 response plan has no specific prioritization and provisions for either older adults and/or people with NCDs [34]. Policymakers in Nepal should recognize that the impact of the COVID-19 pandemic can only be mitigated if strategies to provide essential routine services to their vulnerable population are in place. These strategies should be informed by epidemiological data, health system capacity, and available resources during health crises. Given the disruption of healthcare access during the COVID-19 pandemic, there is a need to co-design and evaluate new models of care with the engagement of key stakeholders, citizens, local developmental partners, and decision-makers. These models of care should be designed in a way that it can meet the health needs of the population during and beyond the pandemic. One important strategy is putting PHC at the center of an emergency response plan to address the healthcare needs at the community level. There is an opportunity to focus on developing alternative pathways to deliver health services and essential drugs such as door-to-door services, mobilizing community health workers, expanding telehealth or mobile health, and remote health consultations [23].

Strength, limitations, and generalizability of the findings

This study is one of its first kind from Nepal to assess challenges to healthcare access amidst the pandemic among older adults with NCDs. Large sample size, the inclusion of both urban and rural areas, and data collection by trained community health workers add to the reliability of the data. However, this study also has some limitations. The first is that due to the cross-sectional study design, it is not possible to infer causality. However, the questionnaire did ask respondents to respond to questions with reference to "compared to before COVID" and "due to COVID"; thus, the responses reflected their view of changes that had occurred. The information on pre-existing conditions was self-reported, and we believe it to be underestimated because, in the Nepali context, it is common to access healthcare only when the symptoms are obvious and severe. Hence, many of our participants may not be aware of their sub-clinical conditions, which may have introduced misclassification bias in the measurements, thereby underestimating the true burden of pre-existing conditions. The study includes a large proportion of participants from a minority background and does not represent the general Nepali population, thus limiting the generalizability of study findings. Additionally, the study districts are in hills and plain areas of eastern Nepal, and thus the findings may not be generalizable to other settings of Nepal. Our study did not assess reasons for access problems, and future studies, employing a mixed-method approach, should explore the underlying reasons for inaccessibility.

Conclusions

Nepali older adults with one or more pre-existing conditions, despite their higher health needs, faced more difficulties obtaining routine healthcare and medications during the COVID-19 pandemic, which is against the principle of vertical health inequity. Policymakers, healthcare practitioners, and local stakeholders should be cognizant of the existing inequality in healthcare and urgently address the gaps in healthcare accessibility for older adults with NCDs. The broader consequences of inaccessible healthcare during the pandemic and its subsequent impact on Nepal's commitment to the attainment of SDG-3 of reducing NCDs burden by one-third by 2030 [13] is yet to be fully understood. Yet, the pandemic reminds us to revisit our national emergency preparedness and revise future planning using a more holistic approach, addressing both emerging and existing healthcare needs.

Declarations

The authors received no financial support for the research or publication of this article and have no conflict of interests to declare regarding the publication of this paper.

Ethical approval

Nepal Health Research Council approved the original study, and the Institutional Review Board at Miami University exempted this secondary data analysis. Participants provided written consent prior to data collection. For participants unable to read and write, a guardian provided proxy written consent.

Author's contribution

UNY, SG,SKM and MFH conceived the idea. UNY,OPY ,SKM and SM collected the data. SG,AS,BC and UNY analyzed the data. SG, AS ,BC, SKM ,PY and UNY drafted the first draft. AMA,LBR,SKM and MFH provided significant scientic inputs in improving the quality of paper.All authors contributed significantly and approved the final version.

Data availability: All data relevant to the study are included in the article or uploaded as supplementary information.

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Table 1. Characteristics of the study participants- overall and by their experiences in obtaining healthcare during the COVID-19 pandemic.

	Overall n (%) (N=843)	Difficulty obtaining healthcare n (%)			Difficulty obtaining medications n (%)		
		Yes (n=445, 52.8%)	No (n=398, 47.2%)	[1]p-Value	Yes (n=114, 13.5%)	No (n=729, 86.5%)	[1]p-Value
Age in years							
60-69	383 (45.4)	164 (36.9)	219 (55.0)	<0.001	35 (30.7)	348 (47.7)	0.001
70-79	315 (37.4)	189 (42.5)	126 (31.7)		59 (51.8)	256 (35.1)	
80+	145 (17.2)	92 (20.7)	53 (13.3)		20 (17.5)	125 (17.1)	
Sex							
Female	412 (48.9)	229 (51.5)	183 (46.0)	0.112	44 (38.6)	368 (50.5)	0.018
Male	431 (51.1)	216 (48.5)	215 (54.0)		70 (61.4)	361 (49.5)	
[2]Marital status							
Married	639 (75.8)	321 (72.1)	318 (79.9)	0.009	93 (81.6)	546 (74.9)	0.121
Without partner	204 (24.2)	124 (27.9)	80 (20.1)		21 (18.4)	183 (25.1)	
Ethnicity							
Brahmins/Chhetri	266 (31.6)	159 (35.7)	107 (26.9)	0.006	18 (15.8)	248 (34.0)	<0.001
Minorities and others	577 (68.4)	286 (64.3)	291 (73.1)		96 (84.2)	481 (66.0)	
Education							
No formal schooling	577 (68.4)	298 (67.0)	279 (70.1)	0.328	70 (61.4)	507 (69.5)	0.082
Formal schooling	266 (31.6)	147 (33.0)	119 (29.9)		44 (38.6)	222 (30.5)	
Residence							
Rural	370 (43.9)	204 (45.8)	166 (41.7)	0.227	114 (100.0)	256 (35.1)	NA
Urban	473 (56.1)	241 (54.2)	232 (58.3)		0	473 (64.9)	
Current occupation							
Agriculture	400 (47.4)	231 (51.9)	169 (42.5)	0.001	88 (77.2)	312 (42.8)	<0.001
Non-agriculture	169 (20.0)	68 (15.3)	101 (25.4)		12 (10.5)	157 (21.5)	
Housewife/Retired	274 (32.5)	146 (32.8)	128 (32.2)		14 (12.3)	260 (35.7)	
Living arrangement							
Live alone	92 (10.9)	51 (11.5)	41 (10.3)	0.590	11 (9.6)	81 (11.1)	0.642
Live with family	751 (89.1)	394 (88.5)	357 (89.7)		103 (90.4)	648 (88.9)	
Walking proximity to the nearest health center							
< 30 minutes	272 (32.3)	124 (27.9)	148 (37.2)	0.006	41 (36.0)	231 (31.7)	0.000
30-60 minutes	372 (44.1)	201 (45.2)	171 (43.0)		32 (28.1)	340 (46.6)	
> 60 minutes	199 (23.6)	120 (27.0)	79 (19.8)		41 (36.0)	158 (21.7)	
Financial hardships with healthcare							
No	379 (45.0)	184 (41.3)	195 (49.0)	0.026	65 (57.0)	314 (43.1)	0.005
Yes	464 (55.0)	261 (58.7)	203 (51.0)		49 (43.0)	415 (56.9)	

Receiving social security allowance							
No	409 (48.5)	185 (41.6)	224 (56.3)	<0.001	51 (44.7)	358 (49.1)	0.385
Yes	434 (51.5)	260 (58.4)	174 (43.7)		63 (55.3)	371 (50.9)	
[3]Pre-existing (NCDs) conditions							
None	282 (33.5)	84 (18.9)	198 (49.7)	<0.001	17 (14.9)	265 (36.4)	<0.001
Single condition	369 (43.8)	220 (49.4)	149 (37.4)		60 (52.6)	309 (42.4)	
Multimorbidity	192 (22.8)	141 (31.7)	51 (12.8)		37 (32.5)	155 (21.3)	

[1]P-values from a chi-square test comparing participants experiencing and not experiencing difficulty.
[2]Includes widowed, separated, and never married. [3]NCDs= Non-communicable diseases.

Table 2. Association between pre-existing (NCDs) conditions and difficulty obtaining healthcare and medications

	Difficulty obtaining healthcare		Difficulty obtaining medications	
	Unadjusted OR (95%CI)	**[a]Adjusted OR (95%CI)**	**Unadjusted OR (95%CI)**	**[b]Adjusted OR (95%CI)**
[1]Pre-existing (NCDs) conditions				
None	Reference		Reference	
Single condition	**3.48 (2.50 - 4.84)**	**3.06 (2.17 - 4.32)**	**3.03 (1.72 - 5.31)**	**3.12 (1.71 - 5.69)**
Multimorbidity	**6.52 (4.33 - 9.81)**	**5.62 (3.63 - 8.71)**	**3.72 (2.03 - 6.83)**	**3.98 (2.01 - 7.87)**

[1]NCDs= Non-communicable diseases. Statistically significant odds ratios are bolded.
[a]Adjusted for age, ethnicity, residence, occupation, walking proximity to the nearest health center, and financial hardships with healthcare .
[b]Adjusted for age, ethnicity, occupation, walking proximity to the nearest health center, and financial hardships with healthcare .

Figure 1. Map of Nepal highlighting the three study districts in the eastern region.

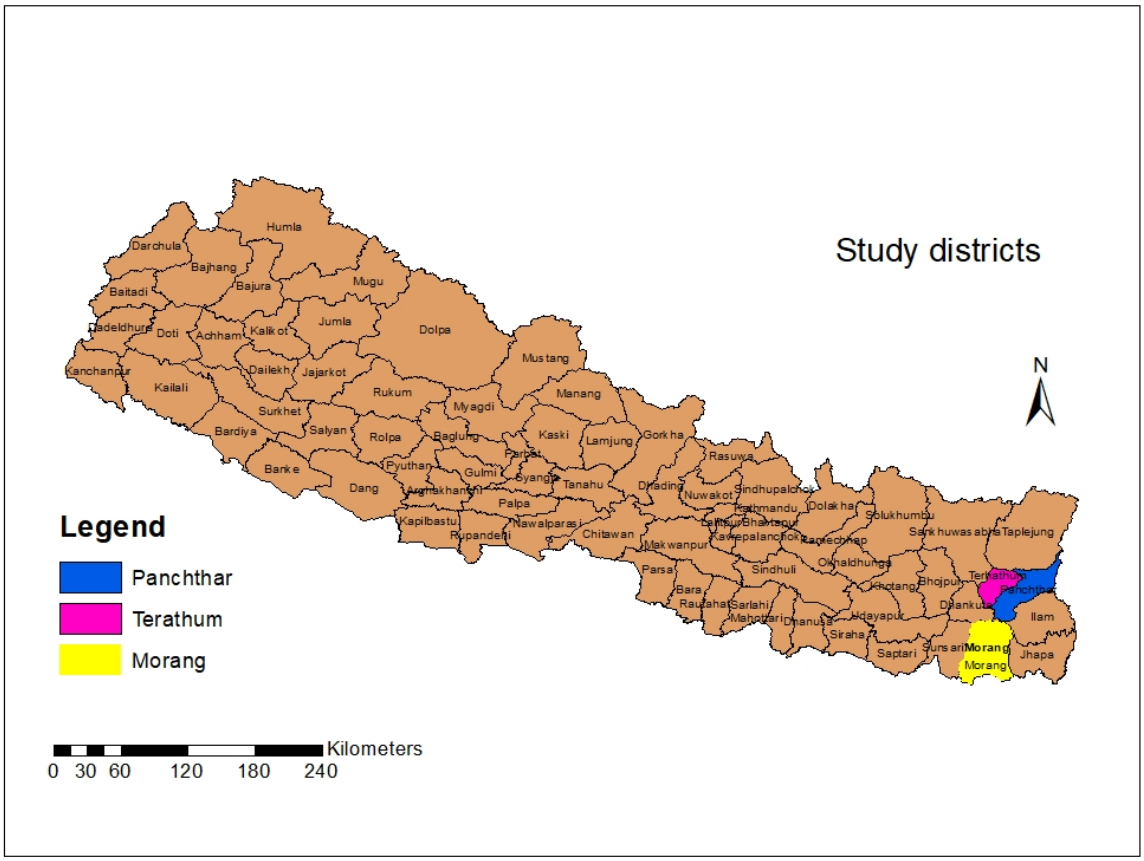

Figure 1. Map of Nepal highlighting the three study districts in the eastern region.

Supplemental Table 1. STROBE Checklist

	Item No	Recommendation	Reported on
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Pages 1 & 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Pages 4 & 5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 5
Methods			
Study design	4	Present key elements of study design early in the paper	Page 5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page 5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 6
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page 6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 7 & Table 1
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	Page 7 & Table 1
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 7 & Table 2
		(*b*) Report category boundaries when continuous variables were categorized	Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Pages 7-8
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable,	Page 1

	for the original study on which the present article is based

Supplemental Table 2: Demographic and socioeconomic characteristics of study districts

Attributes	National	Study districts		
		Morang	Pachthar	Terathum
Total Population	26,494,504	965,370	191,817	101,577
60+ Population	2,154,410	79,636	16,918	9,946
60+ Male	1,063,949	39,878	8,598	4,772
60+ Female	1,090,461	39,758	8,320	5,174
% literate population (6 years and above)	66.6	70.9	73.4	75.2
[1]National rank of the district by literacy status	NA	25	17	11
% of households with improved source of drinking water	85.9	97.7	73.4	78.8
% of solid fuel used for cooking	75.4	71.3	92.9	94.6
% electricity used for lighting	66.7	76.1	28.0	67.4
% having toilet facility	61.6	63.7	88.2	75.0
% Urbanization level	29.0	44.2	12.9	19.4

[1]National literacy rate urban: 82.3% and rural: 62.5% with the eastern region, where the three study districts are located, has slightly higher (67.2%) than the national average. National literacy for older population is low: 26.2% for ages 60-64 and 20.8% for 65+.

Source: National Population and Housing Census 2011, Nepal

Supplemental Table 3: Definition of a single condition and multimorbidity

Conditions	Definition[1]
Hypertension	Self-reported hypertension and/or taking antihypertensive medications.
Heart diseases	Self-report of heart attack, angina, or "heart trouble," or taking medications for heart diseases.
Stroke	Self-report of the previous stroke or taking medication for a recent episode of stroke.
Hypercholesterolemia	Self-reported raised cholesterol and/or taking medication for hypercholesterolemia.
Diabetes	Self-reported diabetes and/or taking insulin or antidiabetic medications.
Chronic respiratory diseases	Self-reported chronic respiratory diseases, asthma, COPD or taking medication for the conditions.
Chronic kidney disease	Taking medication for chronic kidney disease or undergoing dialysis.
Cancer	Taking medication for cancer; having past or current cancer therapy, including chemotherapy and radiation therapy.
Osteoarthritis	Self-report of joint pain problems.

[1] Self-report was assessed by asking participants if a doctor or other health professional ever told them they had the given condition.