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Catastrophic health expenditure on chronic non-communicable diseases among elder population: A cross-sectional study from a sub-metropolitan city of Eastern Nepal

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Abstract

Introduction

This study was conducted with the objective to analyze the out-of-pocket (OOP) healthcare expenditure and catastrophic healthcare expenditure (CHE) on chronic non-communicable diseases (CNCD) among the elderly population, and the association of CHE on CNCD with associated factors among the same population.

Materials and methods

We collected data from the elderly population of Dharan Sub-metropolitan city of the Eastern Nepal via door-to-door survey and face-to-face interview. The ten wards out of twenty were chosen by lottery method, and the equal proportion out of 280 samples was purposively chosen from each of ten wards (28 participants from each selected ward). The data were entered in Microsoft Excel 2019 v16.0 and statistical analysis was performed by using statistical package for social sciences, IBM SPSS® v21. The chi-square test was used to test the group differences. Multivariable logistic regression was used to determine independent factors associated with CHE (all variables with P < 0.20), and adjusted odds ratios (AOR) were calculated at 95% confidence interval (CI).

Results

The median household, food and health expenditures were 95325 (72112.50–126262.50), 45000 (33000–60000) and 2100 (885.00–6107.50) NPR respectively. The proportion of the participants with CHE was 14.6%. The single living participants had 3.4 times higher odds of catastrophic health expenditure (AOR = 3.4, 95% CI = 1.2–9.6, P-value = 0.022) than those

diseases; CTP, capacity to pay; NPR, Nepalese Rupee; OOP, out-of-pocket payment.

who are married. Similarly, those who had cancer had 0.1 times lower odds of CHE (AOR = 0.1, 95% CI = 0.0–0.2, P-value = <0.001) than those without cancer.

Conclusion

The elder population had significant financial health shocks due to chronic health ailments. There should be the provision of mandatory health insurance programmes for elderly to cut down the catastrophic healthcare expenditure. Similarly, there should be the provision of exemption scheme for vulnerable elderly who are more likely to face catastrophic expenditure from all available health facilities.

Introduction

Chronic non-communicable diseases (CNCD) like hypertension, cardiovascular diseases (stroke and acute coronary syndrome), diabetes mellitus, chronic obstructive pulmonary diseases (COPD), cancer, etc. contribute to the major burden of disability and death worldwide [1,2]. Due to requirement of long-term treatment and care, the expenditure on CNCD is expensive. Out-of-pocket (OOP) healthcare expenditure is one of the means of financing health expenditure around the world, and particularly developing countries where access to financial protection (provided by government) or health insurance is marginal [3].

Globally the population aged 60 years and above was estimated at 11% in 2007 and set to rise to over 20% by 2050 [4]. For the treatment and management of CNCD for a long period of time to restore the health condition of elderly, they have to pay high OOP to the health provider which leads to financial burden to the household [5,6].

Sustainable Development Goal (SDG) indicator focuses on financial protection, and defines OOP healthcare expenditure as that proportion of the population who has large household expenditure on health from total household expenditure or income [7]. It is viewed as catastrophic according to world health organization (WHO) when it is equal or exceeds 40% of a household's capacity of pay [8].

In country like Nepal, people have to pay in both public and private sectors in all health services. So, a significant proportion of healthcare financing consists of OOP [9]. Nepal healthcare financing system doesn't protect household from catastrophic health expenditure owing to low-income nation. The available national social security act, a community-based health insurance (CBHI) of Nepal covers only 5% of population in 2018 and the participation is entirely voluntary. There has been alarming rate of commercialization and privatization of health care, increasing the economic burden on general public for health care [10].

This study aimed to assess the OOP and the catastrophic healthcare expenditure (CHE) on CNCD among elder population, and also helped to identify the associated factors for CHE among the elderly population.

Materials and methods

Design

We did a community-based cross-sectional study among people aged 60 years and above, residing in selected areas of Dharan Sub-metropolitan city and having chronic non-communicable diseases from 1st September, 2018 to 31st August, 2019.

Setting

Dharan is a Sub-metropolitan city located in Sunsari district in the Province No. 1 of the Eastern Nepal with an area of 192.61 km^2. It has a total population of 137,705 with male and female being 64,671 and 73,034 respectively. It has a total of 20 wards, and 34,834 households as per census 2021 [11,12].

Study population

Our study included all those participants aged 60 years and above either having hospital/clinic reported diagnosis of chronic non-communicable disease (CNCD) and under prescribed medication for previous three or more months or admitted frequently with same CNCD for more than 2 times in the hospital in last three months. Those not willing to consent to participate in the study and/or whose costs of treatment and medication fully paid by pension, or social security act (community-based health insurance of Nepal) were excluded from the study.

Sample size calculation

Assuming the prevalence of catastrophic healthcare expenditure (CHE) to be 13.8% [13] with significance level set at 5%, absolute precision of 4% and a finite population correction, the sample size was calculated to be 280. To collect the information from 280 participants, we selected 10 wards out of total 20 wards of Dharan Sub-metropolitan city through lottery method viz., 1, 2, 4, 6, 7, 9, 10, 11, 16, and 19 numbered wards. Equal number of participants (28 participants from 28 different households of each selected wards) meeting the inclusion criteria were approached by door-to-door survey and face-to-face interview method. If there was no elderly with CNCD in the selected household and/or did not give consent, the next household with elderly with CNCD was selected until the sample size was met for that respective ward. If more than one participant were available in the same household, then one participant was selected using lottery method.

Variables studied

Dependent variables were the presence or absence of catastrophic health expenditure. **Independent variables** were **socio-demographic characteristics** which included age, gender, educational status and occupation; **household characteristics** which included religion, ethnicity, marital status, type of family, number of family members, foreign employee, number of children, living with/without children, family income, and poverty line; **health utilization behavior and disease characteristics** which included type of health services used [Allopathic, Allopathic with Ayurveda and other (traditional healer and homeopathic)], type of health facilities (private/public/both) and type of CNCD [hypertension, cardiovascular diseases (heart diseases and stroke), diabetic mellitus, chronic obstructive pulmonary disease (COPD), cancer and multi-morbidity].

Data collection

Door-to-door survey was done for people with age more than or equal to 60 years with CNCD. They were identified by asking their age by birth year, or citizenship cards. CNCD were identified with the OPD card, hospital reports and/or the drugs list. The data was collected through face-to-face interview with the semi-structured questionnaires. If the respondent was not available in the selected household, three follow-up visits were done. Even after third visit if respondent was not available, next household was selected.

Total household expenditure (THoE/EXP) including total food expenditure or subsistence expenditure (TFE/SE) was calculated for 3 months by taking the reference from 1st month, and out-of-pocket (OOP) healthcare expenses (i.e., total health expenditure, THE) was asked for three months before interview to minimize the recall bias. The OOP did not determine the financial risk of the household so we use the catastrophic health expenditure of its OOP health expenditure was equal to or greater than 40% of its capacity to pay. The WHO recommends a cut-off level of 40% of non-food expenditure for catastrophic health expenditure (8)

Equations used in the measurement of CHE

ThoE/EXP: total household expenditure for 3 months
TFE/SE: total food expenditure for 3 months/ subsistence expenditure
OOP/THE: out-of-pocket payment/ total health expenditure
CTP: capacity to pay = ThoE-TFE
CHE: ≥40% of OOP/CTP

Data entry and analysis

Data were entered into Microsoft Excel 2019 v16.0 (Microsoft, WA, USA) and appropriate commands were used for data cleaning. Entered data was analyzed using Statistical Packages for Social Sciences version 21 (IBM SPSS Corporation, Armonk, New York, USA). Data were presented as frequency, percentages, means ± or standard deviations (SD), medians and inter-quartile range as necessary. The Chi-square test was used to test for group differences. For uni-variable logistic regression analyses, odds ratios (OR) and 95% confidence interval (CI) were calculated. Multivariable logistic regression was used to determine independent factors associated with CHE, and adjusted odds ratios (AOR) were calculated at 95% confidence interval (CI). All variables with $P < 0.20$ were retained in the final multivariable model.

Operational definitions

Alternative medicine: It comprises traditional healer and ayurvedics
Elderly: All those with age ≥ 60 years
Household expenditure: Expenditure of over a period on goods and services without any special expenditure on funerals, festivals or weddings
Multi-morbidity: ≥2 co-morbid illness/CNCD
Poverty status: The income of 1.9 US $ per person per day (in US dollars) was treated to have poverty status. As of January 2020, $1 USD = **Rs114.0452~ Rs. 115** [14,15].

Ethical approval

It was obtained from Institutional Review Committee of B.P. Koirala Institute of Health Sciences (Code No. IRC/1359/018) that approved the methodology used for this article. The purpose of the study and procedures was explained and written informed consent was gained before commencing the interview. The participants were also being informed that their participation was voluntary. They were assured that their responses would be treated in confidence and anonymity through the use of strict coding measures. All information was kept confidential and consent forms was number coded for identification. The elderly capacity to provide the consent was assessed using 10-item questionnaire, University of California Brief Assessment of Capacity to Consent (UBACC) questionnaire by authors involved in data collection [16]. In case the participant lacked the decision-making capacity to understand and consent to participate in the study, the advance directives or surrogate decision makers were approached.

Results

The mean age of the participants was 69.7 ± 8.3 years. More than half of the participants (144, 51.4%) belonged to age group 60–69 years. The proportion of female participants was 56.4% (158). More than two-thirds of the participants (185, 66.1%) had informal education. The proportion of house makers and self-employed were 46.1% (129) and 34.3% (96) respectively. Majority of the participants were Hindu (189, 67.5%) followed by Kiranti (51, 18.2%). Half of the participants (178. 51.8%) were from Janajati ethnicity (**Table 1A**).

Majority of the participants (201, 71.7%) were married. The proportion of nuclear and joint family was 18.9% (53) and 78.6% (220) respectively. More than half of the participants (157, 56.0%) had family members less than five. About three-fifths (175, 62.5%) had no foreign employed family members. About 91.1% (255) had children up to six. Majority (243, 86.8%) lived with at least one member. About two-thirds (199, 71.1%) had monthly family income at least 30000 NRS. About one-fifths (6, 20.0%) lived below poverty status. (**Table 1B**).

About four-fifths (228, 81.4%) utilized allopathic only. The proportion of public and private health facilities used was 14.6% (41) and 45.4% (127) respectively. Less than one-thirds (81, 28.9%) had their no regular checkup for CNCD. The most common types of CNCD were hypertension (90, 32.1%), cardiovascular diseases (39, 13.9%) and diabetes mellitus (42, 15.0%). The mean duration of CNCD was 4.6 ± 3.9 years. About two-thirds of the participants (194, 69.3%) had CNCD ranging from 6 months to 5 years. (**Table 2**).

The median household, food and health expenditures were 95325 (72112.5–126262.5), 45000 (33000–60000) and 2100 (885.0–6107.5) NRS respectively. (**Table 3**).

The proportion of the participants with catastrophic health expenditure was 14.6% (**Fig 1**).

The single participants had 3.4 times higher odds of catastrophic health expenditure (AOR = 3.4, 95% CI = 1.2–9.6, P-value = 0.022) than those who are married. Those who were under poverty status had 0.4 lower odds of CHE (AOR = 0.4, 95% CI = 0.2–0.9, P-value = 0.024) than those who were above poverty line. Similarly, those who had cancer had 0.1 times lower odds of CHE (AOR = 0.1, 95% CI = 0.0–0.2, P-value = <0.001) than those without cancer (**Table 4**).

Discussion

In our study, the mean OOP healthcare expenditure for CNCD was NPR 12549.7 with a standard deviation of NPR 38226.3, and the median and inter-quartile range was NPR 2100 and NPR 5222.5 respectively. Looking at the trends of healthcare expenditure between 1995–1996 and 2010–2011, Nepal's out of pocket health expenditure increased seven folds, and stands at NPR 3278 [17]. It shows that there is a need to address the non-communicable disease OOP expenditure to protect the household from impoverishment. Our study has comparable finding from one study done in India. The median OOP expenditure from a Haryana state of India was INR 8000, which would be equivalent to NPR 12800 (assuming the average current exchange rate of 1 INR equals to 1.6 NPR) [18]. But another community-based study from West Bengal reported the median OOP health expenditure to be INR 3870. This lower expenditure in West Bengal might be because of taking into consideration the participants with health insurance [19].

In our study about 15% of elderly faced catastrophic health expenditure from OOP expenditure which was the higher than the Nepal living standard survey 2010–2011 which showed 13% of all household suffered CHE [20]. The CHE of rural elderly households with chronic disease patients was higher (30.6%) than the CHE of urban elderly households with chronic disease patients (22.0%) from a study done in China [21]. A study done in India showed that 15.8% of the elderly household incurred catastrophic health expenditure [22]. Based on the

Table 1. A: Socio-demographic and household characteristics of the participants (N = 280). B: Socio-demographic and household characteristics of the participants (N = 280).

Characteristics	Categories	Number of Household (N = 280)	Percentage (%)
Age	Mean ± SD (Range)	69.73 ± 8.34 (60–99)	
	60–69 years	144	51.43
	70–79 years	96	34.29
	≥80 years	40	14.28
Gender	Female	158	56.43
	Male	122	43.57
Educational status	Illiterate/Informal	185	66.07
	Up to Primary school	119	6.79
	Up to Secondary school	22	7.86
	Up to +12/high school	30	10.71
	Bachelor	14	5.00
	Master & above	10	3.57
Occupation	House maker	129	46.07
	Job (governmental or non-governmental)	16	5.71
	Self-employed	96	34.29
	Retired/Unemployed	39	13.93
Religion	Hindu	189	67.50
	Buddhist	28	10.00
	Islam	2	0.71
	Kiranti	51	18.21
	Christian	10	3.57
Ethnicity	Brahmin/Chhetri	68	24.29
	Janajati	145	51.78
	Dalit	56	20.00
	Madeshi	4	1.43
	Muslim	1	0.36
	Others (Thakuri, Sanyasi)	6	2.14
Characteristics	**Categories**	**Number of Household (N = 280)**	**Percentage (%)**
Marital status	Married	201	71.79
	Unmarried	2	0.71
	Separated	3	1.07
	Widowed	74	26.43
Type of family	Nuclear	53	18.93
	Joint	220	78.57
	Three generation family	7	2.50
Family members	<5	157	56.07
	5–10	119	42.50
	>10	4	1.43
Foreign employee	None	175	62.50
	1 person	83	29.64
	2 persons	18	6.43
	≥3 persons	4	1.43
No of children/off springs	0	3	1.07
	1–3	130	46.43
	4–6	125	44.64
	≥7	22	7.86

(*Continued*)

Table 1. (Continued)

Characteristics	Categories	Number of Household (N = 280)	Percentage (%)
Living with/without children	Alone/couple only	37	13.21
	With son/s	184	65.72
	With daughter/s	23	8.21
	All together	36	12.86
Family income (Rs.)	Mean± SD (Range)	65260.71± 103809.10 (10000–1000000)	
	≤30000	81	28.93
	30000–60000	122	43.57
	>60000	77	27.50
Poverty status	No	224	80.00
	Yes	56	20.00

repeated cross-sectional analysis of national survey data of India, the OOP expenditure was catastrophic for 17.9% [23].

After adjusting for confounders, we found out that marital status of elderly, poverty status and cancer co-morbid state had significant association with CHE. The single participants had 3.4 times higher odds of CHE (AOR = 3.4, 95% CI = 1.2–9.6, P-value = 0.022) than those who are married. This is comparable to a study from India but with lower strength, where single living elderly had 1.1 times higher odds of CHE than married one [24]. This might be due to the fact that single living elderly did not have either family members or any foreign employed family members to support financially for healthcare. There is an evidence from one study done in China that says the large family size protects against CHE [21].

Our study showed that 20% of elder participants were below poverty status. This is comparable to a study report on "Nepal Multidimensional Poverty Index 2021" that shows 17.4% of Nepal's population are multi-dimensionally poor. However, such participants under the

Table 2. Health utilization behavior and disease characteristics of the participants (N = 280).

Characteristics	Categories	Frequency	Percentage (%)
Types of health services used	Allopathic only	228	81.43
	Allopathic & Ayurveda	23	8.21
	Others (Traditional healer & homeopathic)	27	9.64
Types of health facilities used	Public hospital	41	14.64
	Private hospital	127	45.36
	Both	112	40.00
Regular checkup for CNCD	No	81	28.93
	Yes	199	71.07
Types of CNCD	Hypertension	90	32.14
	Diabetes Mellitus	42	15.00
	Cardiovascular disease	39	13.93
	COPD	33	11.79
	Cancer	8	2.86
	Multi-morbidity	68	24.29
Duration of CNCD	Mean± SD (Range)	4.56 ± 3.85 (0.50–20.00)	
	6 months to 1 year	90	32.14
	>1 to 5 years	104	37.14
	> 5 years	86	30.71

Table 3. Distribution of the Mean ± Standard Deviation (SD), Median Cost and Interquartile (IQR) of household, food and health expenditure among participants over past three months.

Parameters	Mean ± SD	Median (Min-Max)	Interquartile Range
THoE/EXP[1]	105698.43 ± 49630.38	95325 (26850–363600)	72112.50–126262.50
TFE/SE[2]	50337.86 ± 22950.13	45000 (6000–180000)	33000–60000
THE/OOP[3]	12549.74 ± 38226.34	2100 (10–412500)	885.00–6107.50
Allopathic medicine	12337.21 ± 38101.77	1910 (0–412500)	820.00–5825.00
Alternative medicine	212.54 ± 1256.24	0 (0–12500)	0–0
CTP[4]	55360.58 ± 34948.71	48450.00 (8400–258600)	34177.50–69307.50

[1]Total Household Expenditure/ Expenditure.

[2]Total Food Expenditure/Subsidence Expenses.

[3]Total Health Expenditure/ Out-of-pocket expenses.

[4]Capacity to pay.

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poverty line had 0.4 lower odds of CHE (AOR = 0.4, 95% CI = 0.2–0.9, P-value = 0.024) than those who were above poverty line. One possible reason for this explanation could be that they already lack budget to spend on their healthcare maintenance. Similarly, those who had cancer had significantly lower odds of CHE (AOR = 0.1, 95% CI = 0.0–0.2, P-value = <0.001) than those without cancer. The explanation for these elderly with cancer is also same. They are already financially deprived to spend on their health ailments. But what might be the actual cause of low CHE in participants with cancer, needs a prospective study to propose a definite hypothesis.

In univariable analysis, the other co-morbid conditions like hypertension, diabetes and cardiovascular diseases posed higher odds of CHE in our study but these data were not statistically significant. Meanwhile, a study from Nepal depicted that in households belonging to the poorest quintile, one or more episodes of diabetes (rate ratio, RR: 2.4; 95% CI: 1.2–4.8), asthma (RR: 2.1; 95% CI: 1.3–3.4) or heart disease (RR: 2.2; 95% CI: 1.3–3.9) were associated with a
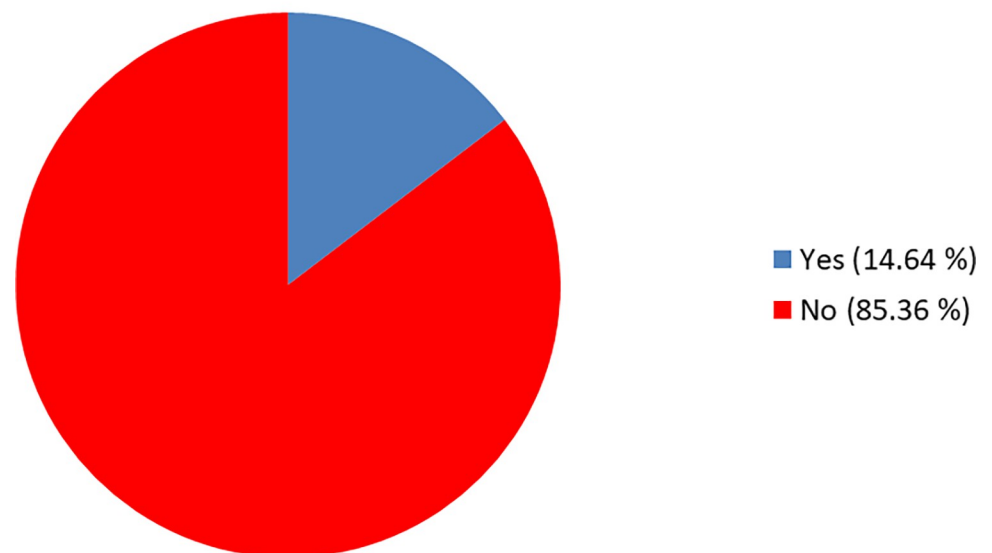

Fig 1. Catastrophic health expenditure of participants.

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Table 4. Multivariate analysis showing factors associated with out-of-pocket expenditure with or without catastrophic health expenditure (CHE) of chronic non-communicable diseases.

	Multivariable model		
Parameters	**AOR**	**95% CI**	**P–value**
Marital status			
Married	1 (Ref.)		
Single[1]	3.38	1.19–9.60	**0.022**
Poverty status			
No	1 (Ref.)		
Yes	0.40	0.18–0.89	**0.024**
Types of health facilities used			
Public	1 (Ref.)		
Private	0.52	0.16–1.65	0.263
Both	1.06	0.31–3.70	0.922
HTN			
No	1 (Ref.)		
Yes	1.38	0.58–3.25	0.466
CVD			
No	1 (Ref.)		
Yes	2.28	0.63–8.27	0.212
Cancer			
No	1 (Ref.)		
Yes	0.03	0.01–0.22	**<0.001**

[1]**Single: Unmarried + widowed + separated.**

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significantly increased risk of catastrophic expenditure [13]. Similarly, the studies from 15 European countries indicated that diagnosed diabetes mellitus and cardiovascular diseases were significant predictors for catastrophic health expenditure among older people. But cancer was not found to be a significant predictor for catastrophic health expenditure [25]. In contrast, Australian elder who had cancer and diabetic were more likely to face a financial burden than other diseases like hypertension and depression [26].

The most important strength of our study was the most vulnerable participant of the household i.e., the elderly with CNCD who are not entitled to insurance coverage. We had taken the recommended WHO cut-off of 40% of OOP healthcare expenditure to capacity to pay, to determine the CHE. Similarly, this is the first study of its kind to assess the financial shocks in elderly with CNCD from the Eastern Nepal.

Our study has certain limitations. We were not able to assess the changes in financial circumstances over time or the extent to which the financial burdens are rising or falling with changing health conditions owing to the nature of study design i.e., cross-sectional study. There could be more financial burden to the household than revealed in the study as this study was limited to only elder people of the household. Similarly, the household income, expenditure and OOP healthcare expenditure were self-reported, and were not verifiable from another source. So, the reporting bias might had occurred. Additionally, the probability proportional to size (PPS) sampling technique with design effect would have been better adopted to avoid selection bias.

Conclusions

Elder populations have significant financial risks due to chronic health ailments compared to the general population which calls for financial risk protection mechanisms. Implementation

of awareness programme, and preventive strategies for chronic non-communicable diseases could prevent catastrophic health expenditure. There should be the provision for mandatory social health insurance programme for elderly to avoid out-of-pocket healthcare expenses. Similarly, the development of exemption scheme for vulnerable elderly who are more likely to face catastrophic expenditure from all available health facilities could help to reduce health related financial shock.

Supporting information

S1 Table.
(DOCX)

S1 Dataset.
(XLSX)

S1 Questionnaires.
(DOCX)

Author Contributions

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References

1. Pallegedara A. Impacts of chronic non-communicable diseases on households' out-of-pocket health-care expenditures in Sri Lanka. Int J Health Econ Manag. 2018 Sep 1; 18(3):301–19. https://doi.org/10.1007/s10754-018-9235-2 PMID: 29322278

2.   Kruk ME, Nigenda G, Knaul FM. Redesigning Primary Care to Tackle the Global Epidemic of Noncommunicable Disease. Am J Public Health. 2015 Mar; 105(3):431–7. https://doi.org/10.2105/AJPH.2014.302392 PMID: 25602898

3.   O'Donnell O, Doorslaer E, Rannan-Eliya R, Lanka S, Garg C, Hanvoravongchai P, et al. Explaining the incidence of catastrophic expenditures on health care: Comparative evidence from Asia. undefined. 2005 [cited 2022 May 8]; Available from: https://www.semanticscholar.org/paper/Paying-Out-of-Pocket-for-Health-Care-in-Asia%3A-and-Doorslaer/33f0929e27552123e24fdf70726d03ae8f0e7d90.

4.   Mwangi J, Kulane A, Van Hoi L. Chronic diseases among the elderly in a rural Vietnam: prevalence, associated socio-demographic factors and healthcare expenditures. Int J Equity Health. 2015 Nov 17; 14(1):134.

5.   Kazibwe J, Tran PB, Annerstedt KS. The household financial burden of non-communicable diseases in low- and middle-income countries: a systematic review. Health Res Policy Syst. 2021 Jun 21; 19:96. https://doi.org/10.1186/s12961-021-00732-y PMID: 34154609

6.   Van Minh H, Tran BX. Assessing the household financial burden associated with the chronic non-communicable diseases in a rural district of Vietnam. Glob Health Action. 2012 Dec 20; 5: https://doi.org/10.3402/gha.v5i0.18892 PMID: 23273250

7.   World Health Organization. World health statistics 2017: monitoring health for the SDGs, sustainable development goals. World Health Organization; 2017 [cited 2022 May 9]. 116 p. Available from: https://apps.who.int/iris/handle/10665/255336.

8.   Xu K, Evans DB, Kawabata K, Zeramdini R, Klavus J, Murray CJL. Household catastrophic health expenditure: a multicountry analysis. Lancet Lond Engl. 2003 Jul 12; 362(9378):111–7. https://doi.org/10.1016/S0140-6736(03)13861-5 PMID: 12867110

9.   K.C. B, Heydon S, Norris P. Access to and quality use of non-communicable diseases medicines in Nepal. J Pharm Policy Pract. 2015 Aug 31; 8(1):21. https://doi.org/10.1186/s40545-015-0041-7 PMID: 26328058

10. Ranabhat CL, Subedi R, Karn S. Status and determinants of enrollment and dropout of health insurance in Nepal: an explorative study. Cost Eff Resour Alloc. 2020 Oct 1; 18(1):40. https://doi.org/10.1186/s12962-020-00227-7 PMID: 33013204

11. Census Nepal 2021. [cited 2022 May 9]. Available from: https://censusnepal.cbs.gov.np/Home/Index/EN.

12. धरान उपमहानगरपालिकाको वस्तुगत बिबरण. धरान उपमहानगरपालिका, नगर कार्यपालिकाको कार्यालय. [cited 2022 May 9]. Available from: https://www.dharan.gov.np/?page_id=505.

13. Saito E, Gilmour S, Rahman MM, Gautam GS, Shrestha PK, Shibuya K. Catastrophic household expenditure on health in Nepal: a cross-sectional survey. Bull World Health Organ. 2014 Oct 1; 92 (10):760–7. https://doi.org/10.2471/BLT.13.126615 PMID: 25378730

14. Poverty & Equity. World Bank Group. [cited 2022 May 11]. Available from: https://databank.worldbank.org/data/download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/SM2020/Global_POVEQ_NPL.pdf.

15. US Dollar to Nepalese Rupee Spot Exchange Rates for 2020. [cited 2022 May 11]. Available from: https://www.exchangerates.org.uk/USD-NPR-spot-exchange-rates-history-2020.html.

16. Jeste DV, Palmer BW, Appelbaum PS, Golshan S, Glorioso D, Dunn LB, et al. A new brief instrument for assessing decisional capacity for clinical research. Arch Gen Psychiatry. 2007 Aug; 64(8):966–74. https://doi.org/10.1001/archpsyc.64.8.966 PMID: 17679641

17. Ghimire M, Ayer R, Kondo M. Cumulative incidence, distribution, and determinants of catastrophic health expenditure in Nepal: results from the living standards survey. Int J Equity Health. 2018 Feb 14; 17(1):23. https://doi.org/10.1186/s12939-018-0736-x PMID: 29444686

18. Sharma D, Prinja S, Aggarwal AK, Bahuguna P, Sharma A, Rana SK. Out-of-pocket expenditure for hospitalization in Haryana State of India: Extent, determinants & financial risk protection. Indian J Med Res. 2017 Dec; 146(6):759–67.

19. Dalui A, Banerjee S, Roy R. Determinants of out-of-pocket and catastrophic health expenditure in rural population: A community-based study in a block of Purba Barddhaman, West Bengal. Indian J Public Health. 2020 Jul 1; 64(3):223. https://doi.org/10.4103/ijph.IJPH_848_20 PMID: 32985421

20. Gupta I, Chowdhury S. Correlates of out-of-pocket spending on health in Nepal: implications for policy. WHO South-East Asia J Public Health. 2014 Dec; 3(3):238–46. https://doi.org/10.4103/2224-3151.206746 PMID: 28612808

21. Wang Z, Li X, Chen M. Catastrophic health expenditures and its inequality in elderly households with chronic disease patients in China. Int J Equity Health. 2015 Jan 20; 14(1):8. https://doi.org/10.1186/s12939-015-0134-6 PMID: 25599715

22. Pandey P, Singh SK. Catastrophic health expenditure among geriatric population of Lucknow district, India. J Geriatr Ment Health. 2017; 4:42–7.

23. Selvaraj S, Farooqui HH, Karan A. Quantifying the financial burden of households' out-of-pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample Survey data, 1994–2014. BMJ Open. 2018 May 1; 8(5):e018020. https://doi.org/10.1136/bmjopen-2017-018020 PMID: 29858403

24. Shukla M, Soni S, Kumar M. Out of Pocket Expenditure on Health among Elderly in a Rural populationof Katihar District, Bihar. National Journal of Research in Community Medicine. 2016 Nov 1; 5(4):202–6.

25. Arsenijevic J, Pavlova M, Rechel B, Groot W. Catastrophic Health Care Expenditure among Older People with Chronic Diseases in 15 European Countries. PLOS ONE. 2016 Jul 5; 11(7):e0157765. https://doi.org/10.1371/journal.pone.0157765 PMID: 27379926

26. Islam MM, Yen L, Valderas JM, McRae IS. Out-of-pocket expenditure by Australian seniors with chronic disease: the effect of specific diseases and morbidity clusters. BMC Public Health. 2014 Sep 27; 14 (1):1008. https://doi.org/10.1186/1471-2458-14-1008 PMID: 25260348