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Catastrophic Health Expenditure: An Experience from Health Insurance Program in Nepal

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Abstract

High expenditure due to health care is a noted public health concern in Nepal and such expenditure is expected to reduce through the access to health insurance. This study determines the factors affecting household's catastrophic health care expenditure in Kailali district, where the government health insurance program was first piloted in Nepal. A cross-sectional survey was conducted from January to February 2018 among 1048 households (6480 individuals) after 21 months of the execution of the social health insurance program. For the sample selection, wards were selected in the first stage followed by the selection of the households. Overall, 17.8% of the households reported catastrophic health expenditure using a threshold of more than 10% of out-of-pocket payment to total household expenditure. The study found that households without having health insurance, low economic status, and head with low level of education were more likely to face catastrophic spending. The findings suggest a policy guideline in the ongoing national health insurance debate in Nepal. The government health insurance program is currently at expansion stage, so, increase in insurance coverage, and could financially help vulnerable households by reducing catastrophic health expenditure.

Keywords:

Catastrophic Health Expenditure;
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1- Introduction

Catastrophic health expenditure (CHE) is a condition of paying for health care that exceeds a defined level of household income or consumption [1, 2]. Households incurring CHE may have to sacrifice consumption of other items that are necessary for their well-being [3, 4]. Households facing CHE are likely to compromise their children's education [4], sell assets [5], and pushed into poverty [6]. Moreover, there is a rising concern about the economic and financial consequences of health care expenditure on household's members who face illness [7].

Household's health care expenditure constitutes a larger share (55.4%) of total health expenditure in Nepal [8]. This high level of health expenditure implies that health care can place a significant financial burden on households and financial protection is one of the core components of universal health coverage [9]. Individuals can drop below the poverty level when they pay for health care at the expense of meeting their basic needs.

Paying for health care due to health services may pose adverse impacts on household economy. Millions of households fight to finance their health care spending and numerous of them are driven below the poverty level by such spending [10]. In the absence of a financial safety net, health care should be purchased by out-of-pocket (OOP) [11]. Any OOP health care expenditure that surpasses a specified limit of household spending is catastrophic [1, 2]. For households living near to the poverty level, even low levels of health care expenditure may be sufficient to tip them into poverty. Further, financial protection from CHE is a key goal of universal health coverage (UHC), as proposed by sustainable development goals (SDGs) [12]. Evidence shows that the financial capacity of households to maintain their

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essential basic needs is threatened due to CHE [3].

For addressing the financial constraint in health services, Nepal's Government implemented the Social Health Insurance Program (SHIP) in 2016. However, the program has been facing many challenges and only small portions of the population are enrolled under this scheme [13, 14]. Despite the fact that research on CHE has been substantially studied around the world, very few research papers have been published in the context of Nepal. Further, there are no studies on CHE targeting to the site of Nepal. In this connection, this paper demonstrates the incidence and determinants of household CHE in the first introduced health insurance program, Kailali, Nepal.

2-Methods

2-1- Measurement Approaches of Catastrophic Health Expenditure

Two major approaches to measuring CHE are presented in the literature [15, 16]. Firstly, out-of-pocket (OOP) health expenditure as the proportion of household's total consumption expenditure that exceeds the pre-determined threshold, is catastrophic [16]. In the literature, when overall household expenditures are used as the denominator, 10% is the foremost common limit to express catastrophic payments [17]. The OOP health payment is the direct expense made by families at the point of the utilization of health services and the expense comprised fee for registration, diagnosis, consultation, surgical procedure, medication and cost of transportation [18]. In other words, OOP is the health expenditure incurred when seeking care through self-medication or going to health providers [19]. Secondly, OOP can be measured as the proportion of household's capacity to pay as put forwarded by Xu and his colleagues [2].

For this study, the first approach or method has been utilized. In this case, if, in the 30 days before the survey, a study household had spent more than 10% of its total expenditure on health care, that household was considered to have incurred catastrophic health expenditure in that period [1, 16]. This is generally considered an approximate threshold or limit beyond which a household is supposed to choose between health care and other essential basic needs [20].

2-2- Study Design and Setting

A cross-sectional household survey was conducted from January to February 2018 among 1048 households (6480 members) in Kailali district after 21 months of the implementation of SHIP in Nepal. Kailali is the district where SHIP was first implemented in Nepal. Kailali is home to approximately 142 thousand households with an average family size of 5.44 [21]. The district has significantly higher poverty level as compared to the national average (34% versus 24%) [22].

2-3- Sampling Procedure and Sample Size

A two-stage cluster sampling design was employed using United Nation's household survey [23], first stage being the selection of wards and second, being the selection of households. At the first stage, 26 wards comprising at least ten insured households from a list of wards were randomly selected. The rationale behind selecting only wards comprising at least 10 insured households was similar to the 2017 World Bank study regarding Nepal's SHIP [13]. Further, since Kailali had less than 5% of insurance enrolment, and as the main objective of the study was to find the effect of SHIP on health care expenditure, so wards with a relatively higher number of enrolments were selected. At the second stage, 41 households were randomly sampled from each ward. In each ward, about 25% of the insured households were selected such that comparison in health expenditure was meaningful. In other words, the case control ratio was approximately 1:3 and the design protocol was also approved during the process of ethical clearances. The information regarding ward level insurance enrolment was obtained from the local office, Social Health Security Development Committee (SHSDC), Kailali district, Nepal. The households from each ward were selected across the radius of ward office as per the latest census of Nepal. A flow chart of study sample is presented in figure 1.

The sample size was determined assuming 50% of the proportion of success of a key indicator, 95% desired level of confidence, 5% margin of error, 3 as design effect, and 7.5 % as non-response rate, the sample size was 1066 households. 50% is an optimum value for the proportion of success any key indicator. The value of design effect usually ranges from 1.5 to 4.5 [24], so, an average value was assumed. Non-response rate of 5% to 10% is most common for household surveys especially in developing countries [23]. Thus, an average value of 5% and 10% was assumed. The value of design effect depends on cluster size and the intra-class correlation coefficient [25]. Assuming the design effect as 3 and the intra-class correlation coefficient as 0.05, the cluster size was 41. In practice, the value of the intra-class correlation coefficient ranges from 0.05 to 0.50 [25]. A higher value indicates more similarity within the individuals' characteristic whereas smaller value indicates less similarity. Thus, less similarity has been assumed. Finally, using sample size as 1066 and cluster size as 41, the number of clusters or wards was 26.

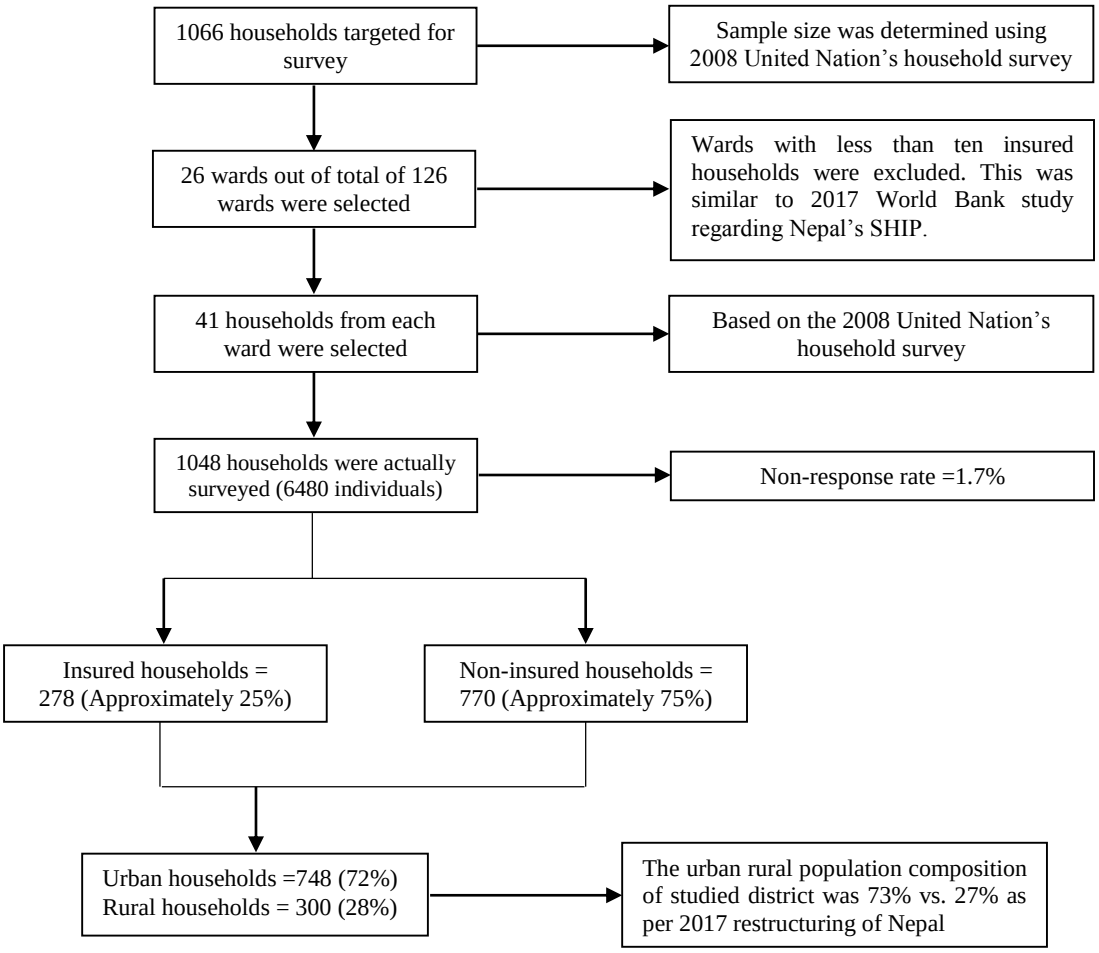

Figure 1. Flow chart of study sample.

2-4- Questionnaire Design and Data Collection Procedures

An initial version of a structured survey questionnaire was developed based on an extensive review of previous related studies and similar surveys conducted in Nepal. The final version of the instrument was prepared after incorporation of comments and feedbacks from subject experts, field testing to the potential respondents, presenting the questionnaire to a group of experts and Ph.D. thesis supervisors, suggestions from concerned ethical bodies and pilot testing the draft versions. Adopting these procedures, the instrument ensured reliability and all types of validity as well as contextualize it in Nepalese context. Household head or the most well-informed adult in a selected household was the qualified respondent in this study. Face to face interview was conducted from the respondents after their written consent. Seven enumerators were assigned in the fixed number wards. Supervision was insured by the author. Enumerators were given extensive training and they also had experiences of collecting the data of large-scale surveys. A simulation exercise among the enumerators was conducted in order to minimize the plausible error. The respondents were informed about the objective of the study and were guaranteed about the privacy of their responses.

2-5- Variables and Units of Analysis

The outcome or dependent variable in this section is CHE, categorized as to whether the household incurred CHE or not. Households were classified as incurring CHE when their out-of-pocket health expense was more than 10% of their total expenditure. Remaining other households were classified as not incurring CHE. The possible explanatory variables include different factors such as household, community, and illness characteristics as suggested by earlier research [18, 26]. Household economic status was constructed by summing all food as well as non-food expenditures and consumer durable items [27]. Full measurement of each of these variables is shown in Table 1. The expected relationship of each of the independent variables with the outcome variable has also been presented in the same table.

Household was the unit of analysis in this study. Household is defined as a group of peoples living together in the same dwelling part who share expenses for their basics of living, pool their revenue and possessions, and have family and emotional ties [20].

Table 1. Measurement of variables incorporated in the catastrophic health expenditure model.

Variables	Measurement of variables	Expected relationship
Catastrophic health expenditure (CHE)	The outcome or dependent variable indicating whether the household faced CHE (1) or not (0)	
Independent variables: Household characteristics		
Female headed household	A dichotomous measure whether the head of household was female (1) or male (0)	*Positive*
Head's age	A ratio measure indicating the age of head of household in completed years	*Indecisive*
Head's education	An ordinal measure indicating the level of education of household head with categories: No formal education, Primary, Secondary, Tertiary	*Negative*
Head's occupation	A nominal measure indicating the type of occupation of household head with categories: Not working, Informal work, Formal work	*Negative*
Head's caste/ethnicity	A nominal measure indicating caste/ ethnicity of household head with categories: Tharu, Brahmin/Chhetri, and Other castes	*Indecisive*
Household economic status	An ordinal aggregate index of consumption quintiles indicating the economic status of household constructed by summing all food as well as non-food household expenditures and consumer durable items in the household as per Deaton and Zaidi [27]. The categories are Poorest, Second, Third, Fourth, Wealthiest	*Negative*
Enrolment in health insurance	A dichotomous measure whether the household was enrolled in the government health insurance program of Nepal (1) or not (0)	*Negative*
Household size	A ratio/interval measure indicating the number of persons reported to be living in a household	*Positive*
Senior member	A dichotomous measure indicating whether the household had a senior member aged 65 years and above (1) or not (0)	*Positive*
Child member	A dichotomous measure indicating whether the household had a child member aged 5 years and below (1) or not (0)	*Positive*
Independent variables: Community and service accessibility factors		
Type of residence of household	A dichotomous measure indicating whether the household was from a rural municipality (1) or urban municipality (0) as per 2017 rural urban classification of Nepal.	*Positive*
Access to modern health facility	A dichotomous measure indicating whether the household was within half an hour travel time of access to any kind of modern health facility (1) or more than half an hour (0).	*Indecisive*
Independent variables: Illness characteristics		
No. of illness in the household	A ratio measure indicating the number of household members reported illness in the year previous to the survey	*Positive*
No. of chronic illness in the household	A ratio measure indicating the number of household members reported chronic illness in the year previous to the survey	*Positive*

2-6- Data Analysis

Data have been analyzed using univariate, bivariate and multivariate analysis. The initial analysis identifies the incidence or prevalence of CHE incurred in households due to health care expenditure. Cross-tabulation analysis has been carried out between each of socio-economic factors and CHE using Pearson's χ^2. Binary logistic regression was then applied to calculate the predicted probability of falling into the CHE category for different groups. Before logistic regression was applied, the multicollinearity among the independent variables was assessed and none were highly correlated. The fitted model displays the estimated adjusted odds ratios (ORs) along with 95% confidence interval (CI). Survey data were entered into Census and Survey Processing System (CSPro) version 7.0 software. Variables extraction and statistical analysis were performed with STATA 12.0 [28].

2-7- Ethical Approvals

The study was supported by the University Grants Commission (UGC) of Nepal under Ph.D. Fellowship (Award No. PhD-073/74-Edu-01). Ethical clearance was obtained from the Nepal Health Research Council (NHRC) (Regd. no.

398/2017) and Pokhara University Research Center (PURC), Nepal (Ref. No. 100/074/75). The data collection approval was also received from SHSDC, Nepal (Ref. No. 502). The study was approved by Kathmandu University School of Education (KUSOED), Nepal.

3-Results

3-1- Descriptive Statistics of the Sample

The analytical sample for this study was 1048 households with 98.3% response rate. The statistics showed that, overall, 187 of the 1048 households studied in the first piloted health insurance program in Nepal experienced CHE in the month prior to the survey. The incidence or prevalence of catastrophic health expenditure was 17.8% due to OOP health expenditure. Incidence in this study is the percentage of households spending more than 10% threshold of out-of-pocket payment to total household expenditure as suggested by van Doorslaer and his team [1].

Among the surveyed households, the majority (90%) were male headed households (Table 2). The median age of household head was 43 years ranging from 18 to 85 year. The median year of schooling of head was only 4 years. Nearly one in five heads (21%) were employed in formal sector. Majorities were Tharus (50%) and overwhelming majorities (94%) were Hindus. The second column of Table 2 and 3 show the characteristics of all plausible variables included in this study. The drivers of CHE are discussed in subsequent sections.

3-2- CHE by Head and Household Characteristics

Households facing CHE were assessed by bivariate analysis using chi-square test. Head characteristics like gender, education, caste/ethnicity were significantly related to incurring CHE. Female headed households were more vulnerable in experiencing CHE as compared to male headed households. For example, the percentage of households experiencing CHE was 27.5% among female headed households, whereas it was only 16.7% among male headed households (Table 2). Household characteristics such as household economic status, health insurance enrolment status were statistically significant of incurring CHE. The percentage of facing CHE was significantly lower among wealthiest groups (11.5%) as compared to the poorer groups (23.3%). The CHE was significantly lower in households with health insurance coverage (12%) as compared to households without having health insurance (23.3%). Interestingly, households with a child or senior member were not found at risk of facing CHE. The variables age and working status of household head were not associated with CHE. Further, household size did not have an effect on CHE.

3-3- CHE by Community and Illness Characteristics

The distribution of CHE according to community and illness characteristics have been presented in table 3. Living in a rural area was an important contributor to face CHE. For example, 19.4 % of rural households experienced CHE, whereas it was only 14% in urban areas. Both prevalence of illness and chronic illness among household members had higher chances of incurring CHE. Household access to modern health care facility has no effect on CHE.

Table 2. Households experiencing CHE according to head and household characteristics.

Explanatory variables	Number	Percent	Incidence of CHE (%)	
			Not incurred	Incurred
Head gender ***				
Male	939	(89.6)	83.28	16.72
Female	109	(10.4)	72.48	27.52
Head age				
Less than 30 years	89	(8.5)	82.02	17.98
30 to 59 years	807	(77.0)	82.53	17.47
60 or more years	152	(14.5)	80.26	19.74
Head education***				
No formal education	114	(10.9)	76.32	23.68
Informal education	311	(29.7)	84.89	15.11
Primary	220	(21.0)	83.18	16.82
Secondary	308	(29.4)	77.92	22.08
Tertiary	95	(9.1)	91.58	8.42
Head occupation				
Not working	90	(8.6)	75.56	24.44
Working in informal sector	740	(70.6)	83.38	16.62
Working in formal sector	218	(20.8)	80.73	19.27

Head caste/ethnicity* **				
Tharu	520	(49.6)	84.72	15.28
Brahmin/Chhetri	311	(29.7)	74.41	25.59
Other caste	217	(20.7)	80.34	19.66
Household economic status **				
Poorest	210	(20.0)	76.67	23.33
Second	210	(20.0)	82.38	17.62
Third	209	(19.9)	80.38	19.62
Fourth	210	(20.0)	82.86	17.14
Richest or wealthiest	209	(19.9)	88.52	11.48
Enrolment in health insurance* **				
Enrolled	278	(26.5)	87.77	12.23
Not enrolled	770	(73.5)	80.13	19.87
Household size				
4 or less	292	(27.9)	80.48	19.52
5 to 8	595	(56.8)	82.52	17.48
9 or more	161	(15.4)	83.85	16.15
Presence of senior member				
No	894	(85.3)	82.55	17.45
Yes	154	(14.7)	79.87	20.13
Presence of child member			0.0	
No	637	(60.8)	82.89	17.11
Yes	411	(39.2)	81.02	18.98

****p< 0.001, **p< 0.01, *p< 0.05.*

Table 3. Households experiencing CHE according to community and illness characteristics.

Explanatory variables	Number	Percent	Incidence of CHE (%)	
			Not incurred	Incurred
**Type of area of residence ** **				
Rural municipality	300	(28.6)	80.61	19.39
Urban municipality	748	(71.4)	86.00	14.00
Access to modern health facility				
Within half an hour	680	(64.9)	81.62	18.38
More than half an hour	368	(35.1)	83.15	16.85
Number of illnesses in the household * **				
One or none member	155	(14.8)	92.90	7.10
Two members	282	(26.9)	88.65	11.35
Three members	225	(21.5)	82.22	17.78
Four or more members	386	(36.8)	73.06	26.94
Number of chronic illnesses in the household * **				
None	389	(37.1)	95.37	4.63
One member	363	(34.6)	80.44	19.56
Two members	182	(17.4)	72.53	27.47
Three or more members	114	(10.9)	57.89	42.11

****p< 0.001, **p< 0.01, *p< 0.05.*

3-4- Results from Logistic Regression

The multivariate results of determinants of CHE model have been presented in Table 4. A number of factors are shown to be related to incurring CHE. In many cases, after adjusting for other explanatory variables, the associations between CHE and background characteristics are different from that of the unadjusted (bivariate) associations as

described in the previous sections. The relationship was insignificant at the multivariate level though it was significant at the bivariate level.

All the variables that were studied in bivariate analysis were further assessed simultaneously by logistic regression. Logistic regression produced a wide range of factors linked with CHE. Households headed by a female, having no formal education, and being Brahamin/Chhetri were more likely to experience catastrophic health expenditure. For example, female headed households were 2.12 times more likely to incur CHE as compared to male headed households. Households, where head's education level was tertiary level, were significantly less likely to incur CHE as compared to households with head education with no formal schooling. The caste/ethnicity of household head revealed a significant relationship to CHE, and Brahmin/Chhetri were more likely to incur CHE as compared to Tharu groups, a predominant caste group in the study site.

Health insurance status was closely related to catastrophe. Households without having insurance were at higher risk of CHE compared to those covered by the government health insurance. In other words, as expected, having no insurance is a risk factor for CHE. Economic status was inversely related to CHE , that is, wealthier households were more protected against CHE. The probability of facing CHE was decreased by wealth status of household. Prevalence of illness and chronic illness among household members increased the risk of catastrophe. Though not significant, urban households were more likely to escape catastrophic health expenditure than rural households

The variables such as type of residence, household size, having senior and child member in the household were not seen as a contributory factor for catastrophic expenditure. Similarly, the characteristics of household head like age, occupation status, religion were not associated with CHE after controlling for other potential confounders.

Table 4. Logistic regression analysis of determinants of CHE in the month prior to the survey.

Explanatory variables	Attributes or categories	ORs	95% confidence interval
Head gender	Male =R		
	Female	2.12**	1.14 - 3.93
Head age in years		0.99	0.97 - 1.01
Head education level	No formal education =R		
	Informal education	0.70	0.38 - 1.30
	Primary	0.75	0.38 - 1.47
	Secondary	0.99	0.50 - 1.97
	Tertiary	0.25***	0.09 - 0.72
Head occupation	Not working =R		
	Informal work	1.04	0.51 - 2.14
	Formal work	1.17	0.52 - 2.62
Head caste/ethnicity	Tharu =R		
	Brahmin/Chhetri	2.29***	1.34 - 3.89
	Other caste	1.18	0.64 - 2.17
Presence of senior member	No =R		
	Yes	1.10	0.65 - 1.86
Presence of child member	No =R		
	Yes	1.11	0.75 - 1.64
Enrolment in insurance	Not enrolled =R		
	Enrolled	0.43***	0.26 - 0.70
Household size	4 or less =R		
	5 to 8	0.75	0.47 - 1.18
	9 or more	0.47	0.23 - 0.99
Household wealth status	Poorest =R		
	2nd quintile	0.71	0.41 - 1.23
	3rd quintile	0.78	0.45 - 1.37
	4th quintile	0.58**	0.32 - 1.05
	Wealthiest	0.34***	0.17 - 0.69
Type of residence	Rural municipality =R		
	Urban municipality	0.97	0.62 - 1.54
Access to health facility	More than half an hour =R		
	Within half an hour	0.91	0.61 - 1.35
Number of illnesses in the household		1.14**	1.03 - 1.26
Number of chronic illnesses in the household		1.98***	1.67 - 2.34

** **p< 0.001, **p< 0.01, *p< 0.05, R= Reference category*

4-Discussion

Financing health is a complex issue that draws the attention of politicians, planners, providers and users since the user's share in health payments is crucial in terms of fairness of financing. Rates of CHE from health expenditures provide insight into the level of financial safety that a health financing system provides for the inhabitants of any nations. It also indicates the financial burden borne by households and the financial barriers that may reduce their access to health care. The results presented throughout this paper show the effects of socio-economic determinants on the probability of incurring CHE among households in Kailali district, where government implemented the health insurance scheme first time in Nepal. Each finding has been discussed to reconcile with the literature. The study also identifies areas for further research.

In this study, the rate of catastrophic health expenditure was 17.8% in the month prior to the survey. In other words, approximately one in every six households has been estimated to face catastrophic health expenditure. Using a similar definition of CHE, such rate was higher in an earlier study conducted in Kathmandu Valley of Nepal and the corresponding proportion was 13.8% [29]. Further, such rate was higher than those found in other low-income countries [3]. The rationale behind the high level of CHE could be the reason that this study was conducted in the first piloted health insurance program district of Nepal, where the health facilities are used more frequently. Further, in the multi-country analysis, Xu et al. (2003) found that the proportion of households incurring CHE from out-of-pocket expenditure varied widely between countries [2].

Logistic regression showed that socio-demographic factors such as gender, education, caste/ethnicity of the head of household exert an influence on the risk of CHE. Households headed by a male or by someone with higher education were less likely to suffer from CHE as reported in the previous study [30]. Education status of household head seems to reduce the probability of catastrophe only when it is above tertiary level and this finding corresponds with results found by van Doorslaer and his team [1]. This result is also in line to Grossman's theory, which suggests that educated households are likely to be more efficient in maintaining health, and hence are less likely to be vulnerable to serious health problems which lead to CHE [31]. This justifies that education is one of the important key drivers of CHE.

Social roles play an important role in determining gender equity of health in many developing countries [32]. According to this study, female headed households were more at risk of facing catastrophe. However, the question regarding the explanations for such gender differences in direct health care expenditure remains unanswered.

CHE rate was lower among enrollees and this rate was higher than rates in other developing countries [3]. Health insurance coverage was associated with lower CHE. Studies in other countries have also shown that health insurance protected enrollees by reducing CHE [33, 34]. However, the depth and height of Nepal's health insurance coverage are still low and service coverage is insufficient.

The study further depicted that economic well being reduced the probability of catastrophic spending. From the findings of this study, wealthier households were less likely to face CHE compared to poorer households ($p < 0.01$), which conforms to the literature on CHE in South Asia and elsewhere [1,2]. Thus, household economic quintile (a proxy for income) represented a key driver of CHE amongst households in the first implemented social health insurance program district of Nepal.

Despite the valuable concerns identified above, this study utilizes a cross-sectional design. Therefore, strong causal associations about the likelihood of CHE and its determinants cannot be perfectly inferred. Moreover, the study could not cover the provider's perspective on health insurance, so, a qualitative approach is suggested to capture supply-side factors. However, this may be the first pioneering study in the first government health insurance program district of Nepal that provides data on the existence of CHE that can be used as a policy instrument. Ongoing financing reforms should target the lower income groups and vulnerable households, and the internal referral system should be strengthened to overcome excessive spending for health care.

5- Conclusion

Though Nepal has achieved tremendous progress in the health segment, protecting vulnerable groups from health care related impoverishment still remains a key challenge. The study concludes that households with insurance coverage, wealthier groups, headed by a male member and head with higher level of education were less likely to suffer from catastrophic spending.

Since health insurance coverage was associated with lower expenditures, findings from this study could inform policy in the ongoing health insurance debate in Nepal and elsewhere. The health insurance is currently at the initial stage, and if implemented effectively, could help financially vulnerable households by covering CHE. The results of this study are expected to provide insights on this issue from the user point of view by showing that some population groups could be at risk of facing CHE.

More systematic monitoring of CHE will assist in steering the development of health care financing strategies in the context of Nepal. Thus, Nepal should focus on addressing the financial barriers facing vulnerable groups and on

developing efficient cost-control measures. A more integrated reform strategy is needed to enhance the depth, breadth, and height of health insurance coverage. National health financing frameworks should be designed not only to allow its citizens to access health services when they are needed but also to protect households from financial catastrophe, by covering direct out-of-pocket health expenditure. Therefore, in the long run, the aim of the Nepalese government should be to develop effective prepayment mechanisms in the entire country, such as through social health insurance.

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7- Conflict of Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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