Original Article

J Nepal Health Res Counc 2019 Jul-Sep;17(44): 394-401

DOI https://doi.org/10.33314/jnhrc.v17i3.2327

Prevalence of Selected Chronic Non-Communicable Diseases in Nepal

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ABSTRACT

Background: The burden of non-communicable diseases has increased in the last few decades in low-and middle-income countries including in Nepal. There is limited data on population based prevalence of non-communicable diseases. Hence, this study aims to determine the nationwide prevalence of selected chronic non-communicable diseases in Nepal.

Methods: A nationwide cross-sectional population-based study was conducted from 2016 to 2018. Data was collected electronically on android device inbuilt with research and monitoring software from 13200 eligible participants aged 20 years and above. Data was cleaned in SPSS version 20.0 and analyzed using Stata version 13.1.

Results: The overall prevalence of selected non-communicable diseases was found to be chronic obstructive pulmonary disease 11.7% (95% CI: 10.5-12.9), diabetes mellitus 8.5% (95% CI: 7.8-9.3), chronic kidney disease 6.0% (95% CI: 5.5-6.6) and coronary artery disease 2.9% (95% CI: 2.4-3.4) in Nepal. Prevalence of non-communicable diseases varied across provinces. Higher prevalence of chronic obstructive pulmonary disease (25.1%, 95% CI: 18.1-33.8) in Karnali Province, diabetes (11.5%, 95% CI: 9.8-13.4) in Province 3, chronic kidney disease (6.8%, 95% CI: 5.6-8.1) in Gandaki Province and coronary artery disease in Gandaki (3.6%, 95% CI: 2.2-5.7) and Sudurpaschim Province (3.6%, 95% CI: 2.1-6.1) was observed.

Conclusions: The study reported substantial proportion of adult population was found to have chronic non-communicable diseases in Nepal. The findings of this study may be useful for revising/updating multi-sectoral action plans on prevention and control of non-communicable diseases in Nepal.

Keywords: Chronic kidney disease; chronic obstructive pulmonary disease; coronary artery disease; diabetes mellitus; non-communicable disease.

INTRODUCTION

Non communicable diseases (NCDs) have been the important public health issues and one of the major global health challenges of the 21st century. Burden of NCD is greatest within low- and middle- income countries, where 78% of all NCD deaths and 85% of premature deaths occurred in 2018.[1] NCDs are the leading causes of death and disability worldwide. The major NCDs responsible for these deaths included cardiovascular; cancers; chronic respiratory diseases; and diabetes.[2] The changing pattern of unhealthy lifestyle has a risk for NCDs.[3] Unhealthy diet, and lifestyle stems up NCDs where disadvantaged people are hardest hit with mortality rate inversely proportional to the country's gross national income.[4] However, population based prevalence of major NCDs is still scarce in Nepal. While the NCD STEP wise approach to Surveillance (STEPS) survey 2013 provides a comprehensive nationwide population based evidence on the NCDs risk factors, this

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study aims to provide comprehensive population-based evidence on NCDs themselves.

METHODS

This was a nationwide cross-sectional population-based study conducted from 2016 to 2018 among 13,200 eligible participants of age 20 years and above in 400 clusters of 72 districts of Nepal. The sample size was calculated by considering the prevalence of raised blood glucose (p=4%) from NCD risk factors STEPS survey Nepal 2013.[5] Taking Z value of 1.96 at 95% confidence level and margin of error (d) of 20% for p, an initial sample size of 2,305 was calculated. Adding a design effect of 2, further adjusting the sample size across 3 domains (terai, hill and mountain) and adding further 20% non-response rate, an optimum sample size of 12965 was obtained. This number was then rounded off to a total of 13,200 such that 33 individuals could be enrolled from each of the 400 clusters across the country. A ward of then village development committees (VDCs) and municipalities was considered as cluster which made the primary sampling unit (PSU) of the sample design. From each cluster, 33 households were chosen using a systematic random sampling technique. In case, the selected ward did not have enough households, geographically adjacent two wards were combined with the selected ward to make the combined wards a sampling unit. From each household one eligible participant who was 20 years and above was selected using KISH method.

The study was conducted in two steps: day 1 (questionnaire) and day 2 (physical measurements and laboratory investigations). Information on socio-demographic and behavioral risk factors was collected through face-to-face interviews using an interviewer-administered questionnaire. In this study, World Health Organization (WHO) Rose Angina questionnaire was adopted to identify the presence of coronary artery disease (CAD). Similarly, chronic obstructive pulmonary diseases diagnostic questionnaire (COPD-CDQ) was used to screen the participants for spirometry. Furthermore, anthropometric measurements were taken; fasting and 2-hour post prandial blood and urine samples were also collected. In addition, ECG and spirometry were performed among eligible participants.

Diabetes mellitus (DM) was defined as those having raised fasting glucose (≥126mg/dL) or raised post prandial blood glucose levels (≥200mg/dL) or if the participant is currently on medication to treat DM. A participant is said to have COPD if the spirometry report suggests the ratio of FEV1 to FVC to be less than 0.7. A participant is said to have chronic kidney disease (CKD) if higher microalbumin creatinine ratio (uACR) was detected (uACR is greater than or equal to 30 mg/g) or e-GFR was less than 60 ml/min/1.73 m^2 at baseline and at three-month follow up. CAD was defined using the following criteria:

Definate CAD is defined as documented history of chest pain suggestive of angina or infarction and previously diagnosed CAD including self-reported admission for myocardial infarction, percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) surgery.

Probable CAD is defined as presence of Rose defined angina pectoris and ECG suggestive of CAD as evidenced by the presence of electrographic changes (1. Inferior or anterior septal or anterior lateral or extensive anterior Q/QS wave; and/or2. Elevated or depressed ST segment; and/or 3. Inverted T wave).

Possible CAD is defined as affirmative response to Rose questionnaire after excluding any obvious cause of pain due to local factors. ECG was not suggestive of CAD.

Research and monitoring (REMO) software was used to collect digitally. Data analysis was performed in Stata version 13.1.

Android mobile phones inbuilt with data collection software (REMO) were used to collect data digitally. Data was extracted by the core team involved in data management through server using specific username and password. Data cleaning was performed in SPSS version 20.0. The cleaned data was then exported to Stata version 13.1 for analysis. Descriptive results for each of the outcome variables using complex sample analysis considering the clusters, strata and weight was produced. Bivariate analyses were used to assess the association between explanatory variables and the outcome variable.

RESULTS

In the present study, majority (41.3%) of participants were between the ages of 40 to 59 years. More than half (57.9%) of the participants were female. About one-third (32.7%) of the participants belonged to upper caste ethnic group. Majority (88.3%) of the participants were Hindu. One-fourth of the participants had completed secondary and higher educational level (Table 1).

Table 1. Distribution of participants by age, sex, ethnicity, religion and education.

Characteristics (N=12557)	n	%
Age		
20-39	4562	35.5
40-59	5186	41.3
60 years and above	2809	23.3
Sex		
Male	4908	42.2
Female	7649	57.9
Ethnicity		
Upper caste group	4263	32.7
Disadvantaged janjati	2656	20.7
Relatively advantaged janjati	2077	17.0
Disadvantaged non-dalit terai caste	1900	17.0
Dalit	1298	9.6
Religious minorities	363	2.9
Religion*		
Hindu	11052	88.3
Buddhist	772	5.6
Muslim	440	3.8
Christian	119	0.9
Kirat	160	1.2
Others	10	0.1
Education		
Illiterate/no formal schooling	6820	53.1
Below secondary (<10 years)	2839	22.3
Secondary and above (≥10 years)	2898	24.6

**Refused to disclose their religion=4*

Majority (88.2%) of the participants were currently married or living together. A total of 36.0 % of participants were engaged in agricultural profession. Participants from Province 3 comprised of one fourth of the study population. Similarly, more than half of the participants were urban residents (Table 2).

Table 2. Distribution of participants by marital status, occupation, province and place of residence.

Characteristics (N=12557)	n	%
Marital status*		
Never married	470	4.4
Currently married/living together	10972	88.2
Separated/divorced	108	0.6
Widowed	990	6.8
Primary occupation*		
Agriculture(commercial)	4573	36.0
Homemaker	3766	29.2
Self-employed/business	1487	12.4
Unemployed	679	5.4
Labour	510	3.8
Non-government employee	492	4.2
Government employee	449	3.6
Retired	375	3.2
Student	210	2.1
Province		
Province 1	2185	17.6
Province 2	2083	18.4
Province 3	3223	24.7
Gandaki Province	1337	9.6
Province 5	2070	15.9
Karnali Province	601	4.8
Sudurpaschim Province	1058	9.1
Place of residence		
Rural	6300	48.5
Urban	6257	51.5

**Refused to disclose marital status=17, refused to disclose occupation=16*

Overall prevalence of diabetes mellitus was 8.5 % (95% CI: 7.8 - 9.3). The prevalence of diabetes mellitus was higher (13.3%) in age group of 60 years and above (95% CI: 11.6 -15.2). Prevalence was higher in male 11.0% (95% CI: 9.8 - 12.3) in compared to female (6.7%, 95% CI: 6.0 - 7.6). Participants with secondary and higher educational attainment had higher (10.2%, 95% CI: 8.9 - 11.7) prevalence of DM. Prevalence of DM was also reported higher among widow (9.4%, 95%CI: 7.2-12.1), government and non government employee (14.4%, 95% CI: 11.8 - 17.3), and in Province 3 (11.5%, 95% CI: 9.8 - 13). Likewise, urban residents had higher (11.3%, 95% CI: 10.2 - 12.7) prevalence of DM (Table 3). The prevalence of DM at national and province levels is presented in Figure 1.

CKD was prevalent among 6.0% (95% CI: 5.5 - 6.6) of the participants. Prevalence of CKD was highest (11.5%) among participants aged 60 years and above (95% CI: 10.1-13.1). CKD was more prevalent among male participants (6.5%, 95% CI: 5.7 - 7.4) compared to females. Participants who were illiterate or with no formal schooling had higher (7.0%, 95% CI: 6.3 - 7.8) prevalence of CKD. Prevalence of CKD was higher among individuals who were widows 11.1% (95% CI: 8.8 - 13.8%) and government and non-government employee 5.7% (95% CI: 4.2 - 7.7). Similarly, participants from Gandaki Province had higher prevalence of CKD 6.8% (95% CI: 5.6 - 8.1). Likewise, CKD prevalence was higher among urban participants 6.5% (95% CI: 5.7 - 7.4) (Table 3). The

prevalence of CKD at National and province levels is presented in Figure 1.

Prevalence of COPD was 11.7% (95% CI: 10.5-12.9) among total participants. Higher (21.5%, 95% CI: 19.3 - 24.1) prevalence of COPD was reported in participants aged 60 years and above. COPD was more prevalent among male participants (12.6%, 95% CI: 11.2 - 14.1). Prevalence of COPD was higher among participants with no formal education or illiterate 15.8% (95% CI: 14.1 - 17.6). Similarly, higher prevalence of COPD was reported among participants who were widows 18.0% (95% CI: 14.5 - 22.2), homemakers or unemployed or retired 13.3% (95% CI: 11.6 - 15.1) and residents of Karnali Province 25.1% (95% CI: 18.1 - 33.8) (Table 3). The prevalence of COPD at National and province levels is presented in Figure 1.

Overall prevalence of CAD was 2.9% (95% CI: 2.4-3.4) among the participants. Prevalence of definite CAD was (0.5%, 95% CI: 0.3-0.7) with probable CAD (0.3%, 95% CI: 0.2-0.4) and possible CAD (2.1%, 95% CI: 1.8-2.6). CAD was more prevalent in age group 60 and above (definite: 1.2%, 95% CI: 0.8-1.8; probable: 0.4%, 95% CI: 0.2-0.8 and possible: 2.8%, 95% CI: 2.1-3.7). Female had higher prevalence of probable and possible CAD (probable: 0.3%, 95% CI: 0.2-0.5 and possible: 2.5%, 95% CI: 2.0-3.1) while definite CAD was higher (0.6%, 95% CI: 0.4-0.9) in male. Possible CAD was more prevalent (2.5%, 95% CI: 1.9-5.6) among self-employed/business/agriculture whereas probable CAD was equally prevalent and higher among self-employed/business/agriculture (0.3%, 95% CI: 0.1-0.4), labour (0.3%, 95% CI: 0.0-1.8) and homemaker/unemployed/retired (0.3%, 95% CI: 0.2-0.5). The proportion of definite CAD was also higher (0.6%, 95% CI: 0.4-0.9) among homemaker/unemployed/retired people. Likewise, the proportion for possible and probable CAD was slightly higher (possible: 2.3%, 95% CI: 1.8-3.1 and probable: 0.3%, 95% CI: 0.2-0.5) among rural participants in compared to urban (possible: 2.0%, 95% CI: 1.5-2.6 and probable: 0.2%, 95% CI: 0.1-0.3) whereas the prevalence for definite CAD was higher (0.8%, 95% CI: 0.6-1.2) among urban participants (Table 5). The prevalence of CAD at National and province levels is presented in Figure 1.

The prevalence of chronic NCDs by province is presented in Figure 1.

Table 3. Prevalence of DM, CKD and COPD by socio-demographic characteristics.

Characteristics		Prevalence of DM		Prevalence of CKD		Prevalence of COPD
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Age						
20-39	4046	3.1(2.4-3.8)	4336	2.6 (2.1-3.2)	3080	6.7 (4.9-7.7)
40-59	4723	10.4 (9.4-11.6)	5034	5.8 95.1-6.7)	3824	10.5 (9.1-12.1)
60 years and above	2508	13.3(11.6-15.2)	2739	11.5(10.1-13.1)	2041	21.5 (19.3-24.1)
Gender						
Male	4325	11.0 (9.8-12.3)	4708	6.5 (5.7-7.4)	3807	12.6 (11.2-14.1)
Female	6952	6.7 (6.0-7.6)	7401	5.7 (5.1-6.4)	5138	11.0 (9.6-12.4)
Education level						
Illiterate/no formal schooling	6128	8.0 (7.1-9.0)	6607	7.0 (6.3-7.8)	4876	15.8 (14.1-17.6)
Below secondary (<10 years)	2548	7.8 (6.6-9.3)	2742	5.4 94.5-6.5)	2064	9.0 (7.6-10.6)
Secondary and above (≥10 years)	2601	10.2 (8.9-11.7)	2760	4.5 (3.7-5.6)	2005	5.2 (4.2-6.5)
Marital status*						
Never married	416	2.2 (1.0-4.5)	445	2.3 (1.3-4.1)	343	4.9 (2.9-8.3)
Currently married/cohabiting	9855	8.7 (8.0-9.6)	10584	5.8 (5.3-6.4)	7842	11.6 (10.4-12.9)
Separated/divorced	93	8.2 (3.1-19.7)	101	7.3 (3.7-13.7)	78	13.0 (6.4-24.6)
Widowed			962	11.1 (8.8-13.8)	671	18.0 (14.5-22.2)
Primary occupation*						
Government and non government employee	820	14.4 (11.8-17.3)	895	5.7 (4.2-7.7)	683	6.3 (4.5-8.90
Self-employed/ business/ agriculture (commercial)	5448	7.4 (6.5-8.4)	5874	5.6 (4.7-6.3)	4438	12.1 (10.7-13.6)
Labour	446	5.1 (3.4-7.5)	484	4.6 (3.1-6.9)	381	7.9 (5.4-11.2)
Student	191	0.9 (0.2-4.4)	200	0.5 (0.1-3.5)	158	2.8 (1.1-6.8)

Homemaker/unemployed/ retired	4358	9.5 98.4-10.8)	4641	7.2 (6.2-8.2)	3275	13.3 (11.6-15.1)
Place of residence						
Rural	5663	5.5 (4.7-6.4)	6107	5.6 (4.9-6.3)	4611	11.7 (10.0-13.6)
Urban	5614	11.3(10.2-12.7)	6002	6.5 (5.7-7.4)	4334	11.7 (10.1-13.4)
Total	11277	8.5 (7.8- 9.3)	12109	6.0 (5.5-6.6)	8945	11.7 (10.5-12.9)

**Refused to disclose religion=3, Refused to disclose marital status=11, refused to disclose occupation=10; **Percent and confidence interval not provided for n≤25*

Table 4.Prevalence of CAD.

Characteristics		Possible	Probable	Definite
	n	% (95%CI)	% (95%CI)	%(95%CI)
Age				
20-39	4562	1.7 (1.3-2.2)	0.2 (0.1-0.4)	0.2 (0.1-0.4)
40-59	5186	2.1 (1.7-2.7)	0.2 (0.1-0.4)	0.3 (0.2-0.6)
60 years and above	2809	2.8 (2.1-3.7)	0.4 (0.2-0.8)	1.2 (0.8-1.8)
Gender				
Male	4908	1.6 (1.2-2.1)	0.2 (0.1-0.4)	0.6 (0.4-0.9)
Female	7649	2.5 (2.0-3.1)	0.3 (0.2-0.5)	0.4 (0.2-0.7)
Education				
Illiterate/no formal schooling	6820	2.9 (2.3-3.7)	0.4 (0.2-0.6)	0.5 (0.3-0.7)
Below secondary (<10 years)	2839	1.6 (1.1-2.2)	0.3 (0.1-0.6)	0.4 (0.2-0.8)
Secondary and above (≥10 years)	2898	1.0 (0.6-1.5)	-	0.6 (0.3-1.0)
Marital status*				
Never married	470	1.8 (0.8-4.0)	-	0.4 (0.1-1.4)
Currently married/cohabiting	10972	2.1(1.7-2.6)	0.3 (0.2-0.4)	0.5 (0.3-0.7)
Separated/divorced	108	2.4 (0.9-6.7)	-	-
Widowed	990	2.2 (1.5-3.4)	0.6 (0.3-1.4)	0.9 (0.3-2.2)
Primary occupation*				
Government and non-government employee	941	1.5 (0.8-2.7)	0.1 (0.0-0.5)	0.3 (0.1-0.9)
Self-employed/business/ agriculture(commercial)	6060	2.5 (1.9-5.6)	0.3 (0.1-0.4)	0.5 (0.3-0.7)
Labour	510	2.0 (0.9-4.4)	0.3 (0.0-1.8)	0.1(0.0-0.5)
Student	210	0.6 (0.1-4.1)	-	-
Homemaker/unemployed/retired	4820	1.9 (1.5-2.5)	0.3 (0.2-0.5)	0.6 (0.4-0.9)
Place of residence				
Rural	6300	2.3 (1.8-3.1)	0.3 (0.2-0.5)	0.1(0.1-0.2)
Urban	6257	2.0 (1.5-2.6)	0.2 (0.1-0.3)	0.8 (0.6-1.2)
Total	12557	2.1 (1.8-2.6)	0.3 (0.2-0.4)	0.5 (0.3-0.7)

**Refused to disclose religion=4, Refused to disclose marital status=17, refused to disclose occupation=16; **Percent and confidence interval not provided for n≤25*

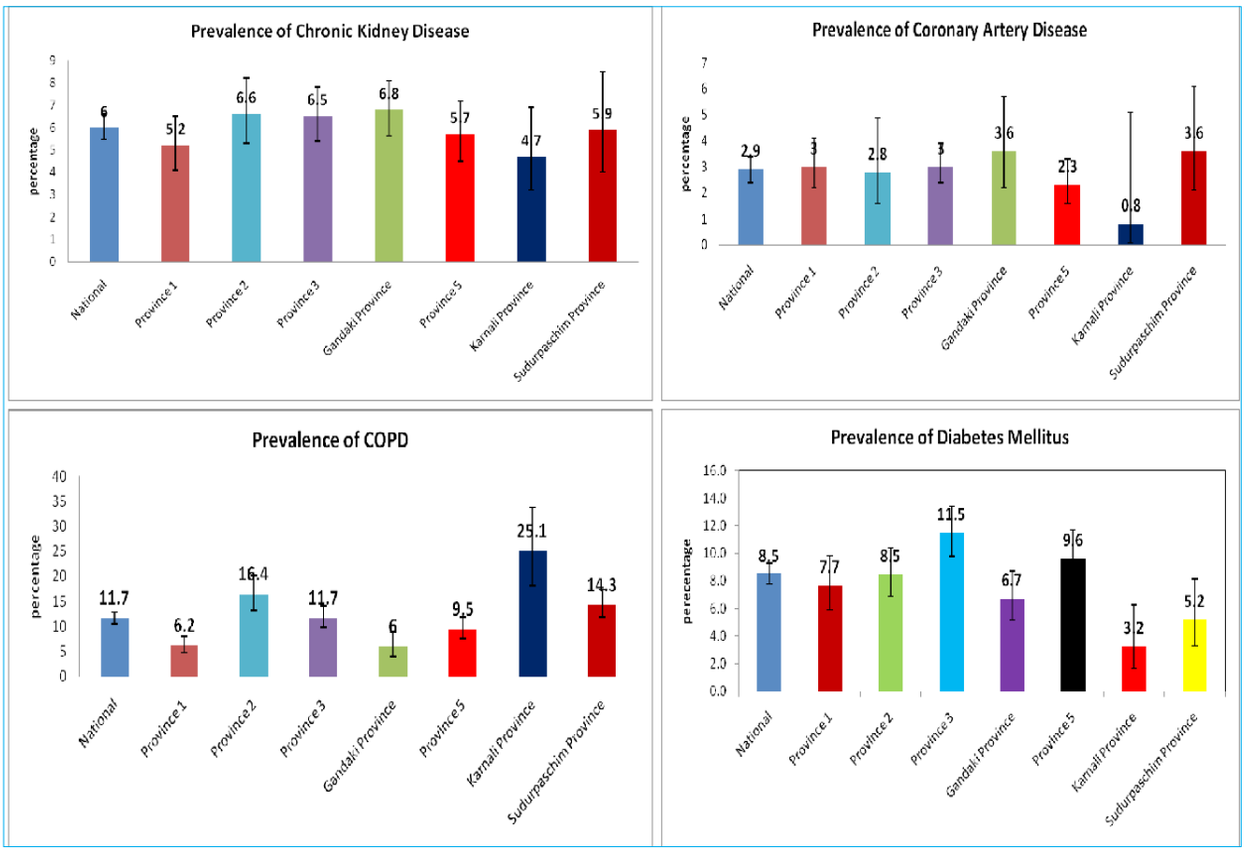

Figure 1. Population based prevalence of major NCDs in Nepal (2016-2018).

DISCUSSION

This comprehensive nationwide population based study on the prevalence of selected chronic non-communicable diseases such as CAD, diabetes, COPD and CKD shows high prevalence in Nepal. Our study demonstrated that these NCD are public health problems in Nepal with at least one in nine people[3] (20 years) have COPD, about one in eleven people have DM, one in sixteen people have CKD and at least one in thirty people have CAD .

This study found that, the overall prevalence rates of COPD, DM, CKD and CAD were 11.7%, 8.5%, 6.0% and 2.9%, respectively. The prevalence of COPD (11.7%) in the present study is within the range found in other studies.[6-8] The reported prevalence of DM in our present study is in line with the WHO estimates for diabetes in Nepal which reported a prevalence of 9.1% in the year 2016. The prevalence of chronic kidney disease was lower (6.0%) in Nepal in comparison to a study conducted in 12 countries (14·3%) in general population, a study conducted in India (17.0%) [9] and a study conducted in eastern Nepal (10.6%).[10] However, the study conducted in eastern Nepal was community based screening of CKD through house to house visits enrolling all above 20 years eligible individuals of selected households of selected wards of a municipality. This study revealed the overall confirmed CAD prevalence to be 0.5% which is less than findings of a study conducted in India. [11] However, the prevalence of CAD was based on the physician diagnosed CAD, limiting its generalization.

Different community and facility based disease specific surveys on NCDs in Nepal also concluded that the prevalence of these diseases is high.[5,12-14] The Nepal Burden of Disease 2017 study also demonstrated that ischemic heart disease and COPD are top causes contributing significantly to the burden of disease [15] indicating the importance of prevention and control of NCDs in Nepal through multi-sectoral collaboration.

The overall prevalence of selected NCD is higher among male, urban residents, those having lower educational attainment, participants who were homemaker/ retired, government and non-governmental employees. This variation might be explained by rapid urbanization, lack of awareness, and lifestyle change by unhealthy nutrition, tobacco and alcohol consumption, lack of exercise and biological characteristics. Interestingly, our study documents a widespread variation in the

prevalence of NCD among the various provinces

Age is a well-established risk factor for NCD.[16-18] As expected, as age increases the prevalence of NCDs increases linearly in our present study, which is consistent with the findings of other study. [19]

Our study has several strengths and limitations. This study was first comprehensive study on prevalence of selected NCDs in Nepal using larger samples, applied standard tools, coverage of different ecological regions and provinces; however, the cross-sectional nature of the study did not allow in establishing a causal relationship between these risk factors. The association between prevalence of selected chronic NCDs and related risk factors is not carried out in the present article.

CONCLUSIONS

The prevalence of selected chronic non-communicable diseases in Nepal is found to be high. Urgent tackling of NCDs appropriately should be high priority of Government of Nepal to prevent Nepalese population from not only worsening their health condition but also preventing from national financial catastrophes. There is an urgent need to develop effective programmes on prevention and control of these NCDs in Nepal. Hence, the findings of may be useful for updating/revising multi-sectoral action plan as well as to develop annual work plan and budget for prevention and control of NCDs in Nepal.

ACKNOWLEDGEMENTS

We are grateful to the Steering Committee and Technical Working Group members for their valubale suggestions and advice. We are also thankful to Ms. Jasmine Maskey, Dr Aishana Joshi and Mr Baburam Acharya , then Research Officers of NHRC for their contribution in the beginning phase of the study. We are also grateful to Mr. Anaraj Tiwari, Central Beauro of Statistcis for his input on sampling design. Finally, we are thankful to whole data collection team and research partcipants to our study.

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