Prevalence of hypertension and its associated factors among adults living in Pokhara metropolitan city

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ABSTRACT

Introduction: Hypertension is one of the silent killer diseases affecting multiple organs. Hypertension prevalence is increasing in developing countries. So, the present study was conducted to find out the prevalence and associated factors of hypertension among adults living in Pokhara metropolitan city. **Methods:** This was a community-based cross-sectional study conducted in Pokhara metropolitan city. Study participants were aged 18 to 70 years, residing permanently in the study sites. Wards, households, and respondents were selected randomly. Data was entered in Epi Data and analysed using SPSS 16 version. Descriptive statistics and inferential statistics at 5% level of significance were used. **Results:** Of the 293 participants, 60.8% were females, mean (standard deviation) of age was 41.7(14.6) years, 29.3% had no formal education, 35.1% were brahmins, and 41.2% were homemakers. Prevalence of hypertension was 35.5%. Age, gender, education, marital status, smoking, alcohol consumption, salt adding habit, presence of diabetes status, use of cholesterol drugs and body mass index were significantly associated with hypertension. In multivariate analysis, age, gender, alcohol consumption, salt adding habit and body mass index were identified as significant factors for hypertension. **Conclusions:** The study concluded that the prevalence of hypertension in Pokhara metropolitan city was alarming. There were greater number of pre-hypertension cases which are in turn at great risk of developing hypertension if not intervene timely. Therefore, community awareness program on hypertension and its preventive measures is must in preventing the dreadful complications.

Keywords: Associated Factors, hypertension, pokhara, prevalence.

INTRODUCTION

Non-communicable diseases (NCDs) are one of the leading causes of mortality and morbidity worldwide mostly affecting in developing countries. Among NCDs, cardiovascular diseases (CVDs) account the highest death, 17.9 million annually.[1] Out of the 16 million deaths under the age of 70 due to non-communicable diseases, 82% are in low and middle income countries and 37% were caused by CVDs.[2]

Hypertension is one of the important factors for cardiovascular disease. It affects one billion people worldwide, leading to heart attacks and strokes. In addition to coronary heart diseases and stroke, complications of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal haemorrhage and visual impairment.[3] Over the past decade, the prevalence of hypertension remained stable or decreased in economically developed countries and increased in economically developing countries. The pattern of results suggests that the most reliable estimate of the prevalence of hypertension to be approximately 30%.[4]

The prevalence of NCDs is increasing in Nepal as well. According to

NCD country profile, nearly 60% of total deaths in Nepal were estimated to be due to NCDs, and CVD accounted for 22% of these deaths. Hypertension, one of the major risk factors for CVD, was estimated to be present in 24.2% of Nepalese adults aged 30 years and above.[2] A study done in Nepal in rural Kathmandu depicted that prevalence of high blood pressure has been increased by three fold in 25 years from 6% in 1981 to 18% in 2006.[5]

The results of the 2016 Nepal Demographic and Health Survey (NDHS) showed that 17% of women and 23% of men age 15 and above have hypertension in Nepal and about 2% of women and men are taking anti-hypertensive medication to control their blood pressure. Likewise, the prevalence of hypertension is found to be more in Gandaki province in comparison to other province i.e. 23.8%.[6]

A study conducted in eastern Nepal revealed hypertension (35.3%) as a major risk factor for coronary artery disease.[7] Different studies done in Nepal have reported a prevalence of hypertension ranging from 18.8% to 41.8%.[8] A study done in rural community of western Nepal found overall prevalence of hypertension 41.5%.[9]

Different studies have yield different prevalence of hypertension in different area. Overall prevalence of hypertension was 58.41% with newly diagnosed cases of 33(10.4%) and previous cases of 151(47.9%) among retired army of Pokhara.[10] The age-adjusted prevalence of hypertension was 66.2% among the veterans of the Indian Gorkha regiments.[11] So far to researcher's knowledge, there is no any literature on prevalence of hypertension in general population of Pokhara metropolitan city. Hence, the researcher aimed to fulfil this gap and find out the prevalence and associated factors of hypertension in adults living in Pokhara metropolitan city. Furthermore, this study helps in identification of the factors associated in development of hypertension which helps in control and prevention of hypertension. The main objective of the study was to find out the prevalence and associated factors of hypertension in adults living in Pokhara metropolitan city.

METHODS

Study design and population: This was a community based descriptive cross sectional study conducted in adults living in Pokhara metropolitan city, Nepal. The study population consisted of adults aged between 18 years to 70 years. The study was conducted among the permanent residents of the area who are 18 years or more of age.

Sampling Methods: Cluster sampling technique was adopted for selecting the subject. At first, ward was taken as cluster, 30 clusters were included. Sampling interval was

obtained by dividing the total household by the number of cluster made i.e, 30.[12] From the sampling interval obtained random number was obtained by using decision analyst STAT software. The first random number generated was 111. After obtaining the first random number subsequent cluster was selected at every 3521 interval. After selecting 30 clusters, sample number from each cluster was determined by dividing total sample size by total number of cluster. From each of the 30 clusters, 10 household were surveyed. In each cluster researcher stood at the junction or chowk and rotate the pen. The house which the pointer points was the first house selected. Consequently, the houses opposite to the door of the selected house were surveyed till sample size reaches. In case, if there is more than one adult in a house then lottery method was used to select the sample from that house. Pregnant women, acutely ill and those not able to respond were excluded from the study.

Sample size: Sample size was 293 based on the sample size estimation formula ($n = Z^2pq/ L^2$). For estimation of sample size, prevalence of hypertension taken was 25.7%[13] with 5% allowable error.

Data collection techniques: Data were collected by face to face interview, anthropometric measurements, and blood pressure measurement was done. Four nursing students who had completed their B.Sc Nursing and were waiting for the job opportunity were recruited and trained for data collection tools for this study. Data was collected from 5th May to 15th June, 2020.

Interview: Nepali version of WHO STEP approach used by Nepal Health Research Council (NHRC) in STEP Survey 2013[13] was used. It consisted of three parts. Part I included socio demographic characteristics namely age, sex, education, occupation, ethnicity, marital status. Part II included behavioral characteristics specifying smoking habit, tobacco use, alcohol consumption, dietary pattern and physical activity and Part III included biological factors like height and weight measurement for Body Mass Index (BMI) calculation, diabetes and cholesterol history. Pretesting of the Nepali version tool was done for its feasibility and appropriateness among the 10% of the sample in the different cluster, which is not included in the study.

Anthropometric measurement: Height and weight were measured using tape measure and weighing machines respectively from which BMI was calculated.

Blood pressure measurement: Trained data enumerators measured blood pressure by using aneroid sphygmomanometer. Enumerators were recently passed out B.Sc Nursing Students. Before taking the measurements, respondents were requested to sit quietly and rest for 15

minutes with leg uncrossed. Three readings of the systolic and diastolic blood pressure were taken three minutes between each reading and the mean of second and third reading was used for analysis.

Data analysis procedure: Collected data were checked, organized, coded and entered in Epidata V.3.1 and was exported to Statistical package for the social sciences version 16.0 for analysis. The data were analysed by using descriptive statistics such as frequencies, percentage, mean and standard deviation. For inferential analysis, chi square test was used to assess the association between hypertension and different socio-demographic characteristics and biological and behavioural risk factors. In addition, binary logistic regression was used to identify different factors and odds ratio was also calculated to measure the odds of having hypertension in relation to various independent factors at 5% level of significance.

Ethical consideration: Data was collected after obtaining ethical approval from NHRC (Reference number 3043 and ERB number 262/2019) and Health Division of Pokhara metropolitan City. Written informed consent was kept in the first page of the interview schedule. The objective of the study, confidentiality and autonomy were declared before starting the survey.

RESULTS

Socio-demographic characteristics

Total number of study participants were 293 in which 24.2%-of the respondents was in the age group <30 years. The mean age of the adults was 41.7 ± 14.6. Of total, 60.8% were females 63.1% were from upper caste group followed by relatively advantaged janajatis 20.5%. Regarding marital status, 74.0% of them were married. Thirty percent respondents had completed high school, 31.1% were home-maker and 61.4% reported their household income was sufficient (Table 1)

Table1: Socio-demographic characteristics of respondents (N=293)

Characteristics	Number	Percentage
Age group in years		
<30	71	24.2
30-39	65	22.2
40-49	67	22.9
50-59	50	17.1
≥60	40	13.7
Mean age ± SD in years	41.7 ± 14.6	
Sex		
Male	115	39.2
Female	178	60.8

Characteristics	Number	Percentage
Ethnicity		
Upper caste group	185	63.1
Relatively advantaged janajatis	60	20.5
Disadvantaged Janajatis	27	9.2
Dalit	27	6.8
Disadvantaged terai caste group	1	0.3
Marital Status		
Unmarried	55	18.8
Married	217	74.0
Separated/Divorced	6	2.1
Widow/Widower	15	5.1
Educational Status		
No formal schooling Illiterate	35	11.9
Less than Primary	14	4.8
Primary completed	30	10.2
Secondary completed	45	15.4
High school completed	88	30.0
College/University	59	20.0
Post graduate and more	22	7.5
Occupation		
Government employee	14	4.8
Non-government employee	62	21.2
Self employed	64	21.8
Student	27	9.2
Home maker	91	31.1
Retired	14	4.8
Unemployed (able to work)	21	7.1
Household income		
Surplus	35	11.9
Sufficient	180	61.4
Insufficient	78	26.6

Biological and behavioural factors of adults

In this study 37.9% respondents were overweight, 14.7% respondents were current smokers and 24.6% were current drinkers. Almost all respondents had inadequate fruits and vegetable consumption as per WHO guidelines and 47.1% had habit of adding salt just before eating. Majority (87%) had adequate physical activity. Currently, 23.5% were on anti-hypertensive medications. Similarly, 12.3% respondents were in oral hypoglycaemic agents and 6.5% were using cholesterol drugs (Table 2).

Table 2: Biological and behavioural factors of adults (N=293)

Characteristics	Number	Percentage
BMI		
Underweight	4	1.4
Normal	110	37.5
Overweight	111	37.9
Obese	68	23.2
Current smoking		
Yes	43	14.7
No	250	85.3
Current drinker		
Yes	72	24.6
No	221	75.4
Fruits and vegetable consumption		
Inadequate	291	99.3
Adequate	2	0.7
Salt adding habit		
Yes	138	47.1
No	155	52.9
Physical activity		
Inadequate	38	13.0
Adequate	255	87.0
Known cases of Hypertension		
Yes	69	23.5
No	224	76.5

Presence of diabetes			
Yes		36	12.3
No		257	87.7
Use of cholesterol drugs			
Yes		19	6.5
No		274	93.5

Marital status				
Living with spouse	90(41.5)	127(58.5)	13.065	0.001*
Living single	14(18.4)	62(81.6)		
Household income				
Insufficient	30(38.5)	48(61.5)	0.409	0.523
Surplus/sufficient	74(34.4)	141(65.6)		

χ2: Pearson's chi square test, p value significant at <0.05

Prevalence of hypertension

The prevalence of hypertension was found to be 35.5 % where rate of hypertension was found to be more in male (51.9%) than female (48.1%). Among them, 23.5% were under treatment for hypertension and 45.4 percent respondents were in pre hypertension stage (Table 3).

Table 3: Prevalence and stages of hypertension (N=293)

Characteristics	Number	Percentage
Hypertension		
Yes	104	35.5
No	189	64.5
Stages of hypertension		
Normal	89	30.4
Pre hypertension	133	45.4
Stage 1	59	20.1
Stage 2	12	4.1

Factors associated with hypertension

Respondents with age more than 40, male, illiterate and living with spouses were more likely to have hypertension than their counterparts which was found to be statistically significant. However, there was no association of hypertension with ethnicity, employment status and household income (Table 4). Regarding the behavioural risk factors, hypertension was seen among respondents who were current smokers, current drinkers, those who had diabetes and cholesterol and those who were overweight/obese. These all were statistically significant. However, hypertension was seen more among physically inactive than physically active and it was not statistically significant (Table 5).

Table 4: Association between presence of hypertension status and socio-demographic variables (N=293)

Variables	Hypertension		χ2	p Value
	Yes Number (%)	No Number (%)		
Age group				
≥40	81(55.5)	65(44.4)	50.761	<0.001*
<40	23(15.6)	124(84.4)		
Sex				
Male	54(47.0)	61(53.0)	10.861	0.001*
Female	50(28.1)	128(71.9)		
Ethnicity				
Privileged	97(35.7)	175(64.3)	0.46	0.830
Underprivileged	7(33.3)	14(66.7)		
Education				
Illiterate	22(62.9)	13(37.1)	12.998	<0.001*
Literate	82(31.8)	176(68.2)		
Employment status				
Unemployed	55(35.9)	98(64.1)	0.029	0.866
Employed	49(35.0)	91(65.0)		

Table 5: Association between presence of hypertension status and various factors (N=293)

Variables	Hypertension		χ2	p-value
	Yes Number (%)	No Number (%)		
Current Smoking				
Yes	25(58.1)	18(41.9)	11.287	0.001*
No	79(31.6)	171(68.4)		
Current Drinking				
Yes	42(58.3)	30(41.7)	21.746	<0.001*
No	62(28.1)	159(71.9)		
Physical Activity				
Inadequate	17(44.7)	21(55.3)	1.629	0.202
Adequate	87 (34.1)	168(65.9)		
Salt Adding habit				
Yes	39(28.3)	99(71.7)	5.962	0.015*
No	65(41.9)	90(59.1)		
Presence of Diabetes				
Present	25(69.4)	11(30.6)	20.661	<0.001*
Not present	79(30.7)	178(69.3)		
Use of Cholesterol drugs				
Yes	16(84.2)	3(15.8)	21.059	<0.001*
No	88(32.1)	186(67.9)		
BMI				
Overweight/Obese	84(46.9)	95(53.1)	26.263	<0.001*
Normal	20(17.5)	94(82.5)		

χ2: Pearson's chi square test, p value significant at < 0.05

Multivariate analysis

Adjusted associated factors of hypertension: In multivariate model, age (β=1.593, p <0.001), sex (β=0.787, p = 0.036), alcohol consumption (β=0.963, p=0.018), salt adding habit (β=0.974, p=0.002) and BMI (β=1.055, p=0.003) were identified as significant factors associated with hypertension (Table 6). The chance of being hypertensive among more than 40 years age group was 4.9 times higher than less than 40. Similarly, being male increased the odd's of developing hypertension by 2.1 times than female. Likewise, current alcohol users had 2.6 times risk of developing hypertension than non users. The odds of being hypertensive is seen more in those who do not have salt adding habit by 2.6 times than those who had salt adding habit. In the same way, the likelihood of developing hypertension was seen more in overweight and obese by 2.8 times than those who had normal BMI.

Table 6: Multivariate analysis for hypertension (N=293)

Variables	Category	β	p value	AOR	95% CI for AOR
Age	<40			Ref	
	≥40	1.59	<0.001	4.92	2.39-10.10
Sex	Female			Ref	
	Male	0.78	0.03	2.19	1.05-4.58

Education	Literate			Ref	
	Illiterate	0.71	0.14	2.03	0.78-5.31
Marital status	Living single			Ref	
	Living with spouse	0.53	0.21	1.70	0.73-3.92
Smoking	No			Ref	
	Yes	0.54	0.23	1.72	0.69-4.25
Alcohol consumption	No			Ref	
	Yes	0.96	0.01	2.62	1.18-5.80
Salt adding habit	Yes			Ref	
	No	0.97	0.00	2.64	1.42-4.94
BMI	Normal			Ref	
	Overweight	1.05	0.00	2.87	1.43-5.76
Presence of diabetes	No			Ref	
	Yes	0.05	0.91	1.05	0.37-3.01
Use of cholesterol drugs	No			Ref	
	Yes	1.30	0.09	3.678	0.80-16.77
constant		-4.05	<0.001	0.01	

p-value significant at <0.05, AOR: Adjusted Odds' ratio, CI: Confidence Interval, Ref: Reference

DISCUSSION

The proportion of hypertension in this study was 35.5% and pre hypertension was 45.4% where 23.5% respondents are under treatment for high blood pressure. This finding was slightly higher than the study done in municipalities of Kathmandu (32.5%) and slightly lower than the study done in rural community of western Nepal (41.5%).[9,14] This difference in the finding could be because of different study population. This study was conducted in urban setting whereas study on Kathmandu municipalities was a peri urban setting and the later was in rural setting. Similarly, this finding was little higher with a recent finding done as a result of systematic review and metanalysis done in Nepal which depicted the prevalence of hypertension to be 28.4% in urban setting[15], 27.9% in a community based study in Northwest Ethiopia and 28.3% in urban Varanasi.[16,17] In contrast to this finding, higher prevalence of hypertension 58.4%[10] and 66.2%[11] was found among retired army and veterans of Indian Gorkha regiments respectively in Pokhara metropolitan city.

This study found greater number of adults were in pre-hypertensive stage which are at greater risk of hypertensive in near future if timely intervention is not done. Similar results was obtained from previous studies.[18,19] This study found increasing prevalence of hypertension with increasing age. Adults with age more than 40 were likely to have hypertension by 4.9 times than age less than 40. This finding is in line with the findings of previous studies.[9,10,14,16,17,19-23]

Regarding sex, the prevalence of hypertension was found to be more in male 51.9% than female 48.1 percent. This study revealed male increased the odd's of developing hypertension by 2.1 times than female. Similar finding was reported by other studies.[9,14,15,18-23] However, prevalence of hypertension in female was seen more than male in few other studies.[16, 21] Most of the studies done in Nepal showed same result i.e. male are more at risk than female, the later two contradictory result reported are of Africa[16,21] where females outnumbered the males. The study showed no any significant differences in developing hypertension regarding ethnicity. However, a study done in Kathmandu municipality showed hypertension was affected by ethnicity type.[14] Most of the studies haven't consider ethnicity as a variable in bivariate analysis.

The current study observed that there was significant association between hypertension status and education status. The finding was consistent with the finding of other studies.[9,14,20,21] This might be linked with the fact that illiterate people have no knowledge of checking their blood pressure. So they might be unaware of their rising blood pressure which results in delay in treatment. In addition, knowledge level might be significant on preventing hypertension by adopting healthy dietary habits and physical activities. Regarding employment status, no significant association was seen with hypertension. This finding was supported by another study in Kathmandu.[14] The current study revealed that hypertension was significantly associated with marital status in which living with spouse have more hypertension than those living single. This finding was in agreement with the finding reported by study done in NDHS, 2016 data[21] whereas contradicts with other study.[14] This might be because most of the unmarried people were of young age group in which there was less chance of developing hypertension.

Household income of the study participants had no significant association with hypertension and this finding was consistent with the finding of Kathmandu.[14] Most of the studies haven't considered this variable. Smoking is a well-known risk factor for hypertension. Present study revealed current smoking habit had a significant association with hypertension. Most of the studies have reported similar findings.[9,10,14,15,18-21,23-24] However, some study failed to demonstrate any significant association between hypertension and smoking consumption.[25]

Present study revealed alcohol consumption was found to have significant association to hypertension than alcohol non-users. The study found current alcohol users had 2.6 times risk of developing hypertension than non-users. This finding was in agreement with most of the other findings.[9,11,14-16,19-20,23-24,26-27] Present study finding revealed no significant association between physical activity and hypertension. This finding was supported by the study.[19] However, several other studies have found that there was increased risk of hypertension among those who performed less physical activity or had sedentary life style.[14,21,22,24]

Regarding BMI, almost all studies concluded that hypertension was found to be more among those who had high BMI.[5,11,14-16,19,20,22,26-28] Consistent with the finding, the current study showed the likelihood of developing hypertension was seen more in overweight and obese by 2.8 times than those who had normal BMI. The present study revealed that there was significant association of hypertension with salt taking habit. Contradictory to other study finding, the odds of being hypertensive was seen more in those who did not have salt adding habit by 2.6 times than those who had salt adding habit.[10] The hypertensive patients might be aware of their disease condition and might have perform the lifestyle modifications. Diabetes is one of the important risk factor of hypertension. The current study depicted prevalence of hypertension was found more in those adults who were diabetic and was statistically significant. The finding was in line with the findings of other studies.[14,19,28] Current study revealed that those who were having medicine for cholesterol control had high prevalence of hypertension than those who did not and the finding was statistically significant. This finding is supported by two other studies.[26,28] However, most of the studies haven't considered this variable into account.

Since the study design used is cross-sectional in nature, causal relationship between the variables could not be established. The study was conducted only in Pokhara metropolitan city. So, the findings may not be generalized in wider areas.

CONCLUSIONS

The study concluded that the prevalence of hypertension in Pokhara metropolitan city was alarming. There were increasing number of pre hypertension cases which were in turn at great risk of developing hypertension if not intervene timely. Hypertension was associated with age, sex, alcohol consumption, salt adding habit and BMI. Therefore, community awareness program should be conducted on regular basis regarding identification of risk factors and methods of prevention. Education package should include preventing the important risk factors and inculcating healthy health habits. Similarly, periodic health screening camps should be conducted on regular basis covering both rural and urban area for earlier identification and treatment to prevent from life-threatening complications and chronic debilitating morbidity.

REFERENCES

1. World Health Organization. Noncommunicable Diseases 2021. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases [Accessed on16th June 2021].

2. Africa Health Organization. Cardiovascular Diseases (CVDS) Factsheet 2016. Available from https://aho.org/fact-sheets/cardiovascular-diseases-cvds-fact-sheet/Available [Accessed on 16th June 2021].

3. World Health Organization. A global brief on hypertension: silent killer, global public health crisis. WHO; 2013. Available from https://www.who.int/publications/i/item/a-global-brief-on-hypertension-silent-killer-global-public-health-crisis-world-health-day-2013 [Accessed on 20th June 2021].

4. Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. Journal of Hypertension. 2004;22(1):11-9. DOI: 10.1097/00004872-200401000-00003 PMID: 15106785.

5. Vaidya A, Pathak RP, Pandey MR. Prevalence of hypertension in Nepalese community triples in 25 years: a repeat cross-sectional study in rural Kathmandu. Indian heart Journal. 2012;64(2):128-31. DOI: 10.1016/S0019-4832(12)60045-5.

6. Ministry of Health, Nepal; New ERA; and ICF. 2017. Nepal Demographic and Health Survey 2016: Key Indicators. Kathmandu, Nepal: Ministry of Health, Nepal. Available from https://www.

healthynewbornnetwork.org/hnn-content/uploads/ Nepal-DHS-2016-Key-Indicators.pdf

7. Kalra S, Narain S, Karki P, Ansari JA, Ranabhat K, Basnet N. Prevalence of risk factors for coronary artery disease in the community in eastern Nepal-a pilot study. J Assoc Physicians India. 2011;59:300-1. PMID: 21751607.

8. Dhitali SM, Arjun K. Dealing with the burden of hypertension in Nepal: Current status, challenges and health system issues. In Regional Health Forum 2013;17(1):44-52. Available from https://apps.who. int/iris/bitstream/handle/10665/205784/B4954. pdf?sequence=1#page=50

9. Kafle RC, Sharma D, Paudel N, Sapkota S, Alurkar VM. Prevalence and associated risk factors of hypertension in a rural community of Western Nepal: A Cross Sectional Study. Journal of Advances in Internal Medicine. 2018;7(1):11-6. DOI: 10.3126/ jaim.v7i1.19577

10. Ranjitkar S, Sharma S. Prevalence of Hypertension and its Associated Factors among Retired Army in Pokhara. Janapriya Journal of Interdisciplinary Studies. 2021;10(01):140 DOI: 10.3126/jjis. v10i01.42618

11. Sapkota A, Neupane D, Shrestha AD, Adhikari TB, McLachlan CS, Shrestha N. Prevalence and associated factors of hypertension among veterans of the Indian Gorkha regiments living in Pokhara Metropolitan City, Nepal. BMC health services research. 2021;21(1):1. DOI: 10.1186/s12913-021-06907 PMID: 34470648.

12. Newberry D. Survey trainer's guide for PVO Child Survival Project rapid knowledge, practice and coverage (KPC) surveys.1998 ed. Johns Hopkins University;1998 Available from https://pdf.usaid. gov/pdf_docs/PNACE292.pdf [Accessesd on 19th Feb 2020]

13. Aryal KK, Mehata S, Neupane S, Vaidya A, Dhimal M, Dhakal P, Rana S, Bhusal CL, Lohani GR, Paulin FH, Garg RM. The burden and determinants of non communicable diseases risk factors in Nepal: findings from a nationwide STEPS survey. PloS one. 2015;10(8):e0134834. DOI: 10.1371/journal. pone.0134834 PMID: 26244512.

14. Dhungana RR, Pandey AR, Bista B, Joshi S, Devkota S. Prevalence and associated factors of hypertension: a community-based cross-sectional study in municipalities of Kathmandu, Nepal. International

journal of hypertension. 2016;2016:1656938. DOI: 10.1155/2016/1656938 PMID: 27293880.

15. Huang Y, Guo P, Karmacharya BM, Seeruttun SR, Xu DR, Hao Y. Prevalence of hypertension and prehypertension in Nepal: a systematic review and meta-analysis. Global health research and policy. 2019;4(11):1-10. DOI: 10.1186/s41256-019-0102-6 PMID: 31165100.

16. Abebe SM, Berhane Y, Worku A, Getachew A. Prevalence and associated factors of hypertension: a crosssectional community based study in Northwest Ethiopia. PLOS one. 2015;10(4):e0125210. DOI: 10.1371/journal.pone.0125210 PMID: 25909382.

17. Priya M, Mishra C. Prevalence of hypertension in an area of urban Varanasi, India and its association with selected demographic factors. International Journal of Community Medicine and Public Health. 2016;3(6):1600-1605. DOI: 10.18203/2394-6040. ijcmph20161636

18. Chataut J, Khanal K, Manandhar K. Prevalence and associated factors of hypertension among adults in rural Nepal: a community based study. Kathmandu Univ Med J. 2015;13(4):346-50. DOI: 10.3126/kumj. v13i4.16835 PMID: 27423286.

19. Shrestha S, Devkota R. Prevalence of hypertension and its associated risk factors in a sub-urban area of central Nepal. International Journal Of Community Medicine And Public Health. 2016;3(9):2477-86. DOI: 10.18203/2394-6040.ijcmph20163057

20. Agho KE, Osuagwu UL, Ezeh OK, Ghimire PR, Chitekwe S, Ogbo FA. Gender differences in factors associated with prehypertension and hypertension in Nepal: A nationwide survey. PloS one. 2018;13(9):e0203278. DOI: 10.1371/journal.pone.0203278 PMID: 30212519.

21. Bonsa F, Gudina EK, Hajito KW. Prevalence of hypertension and associated factors in Bedele Town, Southwest Ethiopia. Ethiopian journal of health sciences. 2014;24(1):21-6. DOI: 10.4314/ejhs.v24i1.3 PMID: 24591795.

22. Chataut J, Adhikari RK, Sinha NP. Prevalence and risk factors for hypertension in adults living in central development region of Nepal. Kathmandu Univ Med J. 2011;9(1):13-8 DOI: 10.3126/kumj.v9i1.6255 PMID: 22610802.

23. Pyakurel P, Yadav DK, Thapa J, Thakur N, Sharma P, Koirala N, et al. Prevalence and associated risk factor

of hypertension among individuals of age 18-59 years in South-eastern Nepal: a cross-sectional study. Nepalese Heart Journal. 2019;16(1):19-26. DOI: 10.3126/njh.v16i1.23894

24. Basnet, S. Factors Associated With Hypertension Among Adult Patients In Pokhara. International journal of technology enhancements and emerging engineering research. 2015;3(11):4-10.

25. Koju R, Manandhar K, Gurung R, Pant P, Bedi TR. Prevalence of Hypertension in Semi-urban area of Nepal. Nepalese Heart Journal. 2010;7(1):35-9. DOI: 10.3126/njh.v7i1.8500

26. Khan RJ, Stewart CP, Christian P, Schulze KJ, Wu L, LeClerq SC, Khatry SK, West KP. A cross-sectional study of the prevalence and risk factors for hypertension in rural Nepali women. BMC public health. 2013;13(1):1-10. DOI: 10.1186/1471-2458-13-55 PMID: 23336578.

27. Manandhar K, Koju R, Sinha NP, Humagain S. Prevalence and associated risk factors of hypertension among people aged 50 years and more in Banepa Municipality, Nepal. Kathmandu Univ Med J. 2012;10(3):35-8. DOI: 10.3126/kumj.v10i3.8015 PMID: 23434959.

28. Shanthirani CS, Pradeepa R, Deepa R, Premalatha G, Saroja R, Mohan V. Prevalence and risk factors of hypertension in a selected South Indian population--the Chennai Urban Population Study. J Assoc Physicians India. 2003;51:20-7. PMID: 12693449.