

Undiagnosed and Uncontrolled Hypertension and Access to Health Care among Residents of an Urban Area of Eastern Nepal: a Cross-sectional Study

Kasaudhan SM,¹ Ghimire A,¹ Sharma SK,² Baral D,¹ Jha N,¹ Singh SB¹

¹School of Public Health and Community Medicine,

²Department of Internal Medicine,

BP. Koirala Institute of Health Sciences,

Dharan, Nepal.

Corresponding Author

Smriti Mayur Kasaudhan

School of Public Health and Community Medicine,

BP. Koirala Institute of Health Sciences,

Dharan, Nepal.

E-mail: smritimayur@gamil.com

Citation

Kasaudhan SM, Ghimire A, Sharma SK, Baral D, Jha N, Singh SB. Undiagnosed and Uncontrolled Hypertension and Access to Health Care among Residents of an Urban Area of Eastern Nepal: a Cross-sectional Study. *Kathmandu Univ Med J.* 2022;79(3):273-9.

ABSTRACT

Background

The burden and complication of hypertension is increasing as most of the people living with hypertension are unaware of their condition and those who are already diagnosed with it do not have their blood pressure under control.

Objective

To assess the prevalence of undiagnosed and uncontrolled hypertension among residents of Itahari sub metropolitan city of eastern Nepal, along with its associated socio demographic and behavioral risk factors and access to health care services.

Method

Cross sectional study was conducted in five wards of Itahari, among 1161 participants, using population proportionate to sample size sampling technique. Face to face interview was conducted with participants for data collection applying semi-structured questionnaire and physical measurement like blood pressure, weight and height.

Result

Prevalence of hypertension was 26.5% including undiagnosed 11.0% and previously diagnosed 15.5%. Among diagnosed, 76.6% had uncontrolled blood pressure and 56.70% were taking anti-hypertensive medicine, and 7.8% were under Ayurvedic medicine. More than 70% participants preferred private health facility for treatment and 22.7% had faced financial barrier to seek healthcare. About 64% of participants did not visit health services or had visited only once in past six months. Increasing age, Body Mass Index (BMI), smoking status and positive family history were found to be significantly associated with hypertension at < 0.05 level.

Conclusion

Prevalence of hypertension is high and awareness regarding available health services in local primary health center and its utilization is lacking among participants. Regular screening program for hypertension and awareness program to disseminate the knowledge of availability of primary health center should be conducted.

KEY WORDS

Health care access, Undiagnosed hypertension, Urban area

INTRODUCTION

Non-communicable diseases (NCD) have become the major health challenge of 21st century causing about 70% of all deaths globally. The leading causes of NCD death in 2015 were cardiovascular disease.¹ One of the key risk factor for that is hypertension (HTN). Hypertension is a preventable illness which, many modifiable factors contribute to high prevalence rate. Hypertension is more prevalent in low and middle income countries. It is an iceberg disease, because of weak health system the number of people with hypertension who are undiagnosed, untreated and uncontrolled are also higher in low and middle income countries compared to high income countries.²

Globally hypertension is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke. Total prevalence of hypertension worldwide in adults aged 25 and above was approximately 40% in 2008, the number rose from 600 million in 1980 to 1 billion in 2008. The burden of hypertension in South East Asia (SEA) continue to rise. Around a third of adult population in SEA have hypertension with nearly 1.5 million deaths annually. According to 2016 NDHS, 17% of women and 23% of men age 15 years above have hypertension in Nepal. A study comparing prevalence of hypertension in the same community in 1981 and 2006 reported a threefold increase in prevalence.³

Although hypertension prevention strategies are known, a better approach to hypertension control requires an understanding of potential barriers and enablers to translation at the individual, societal, and health system levels.⁴ This study aims to assess the prevalence of undiagnosed and uncontrolled hypertension among residents of Itahari sub metropolitan city of eastern Nepal, along with its associated socio demographic and behavioral risk factors and access to health care services.

METHODS

It was a community based cross sectional study conducted over a period of one year among 1161 permanent residents of Itahari Sub metropolitan city between age group of 20 to 59 years. The sample size was calculated based on the prevalence of undiagnosed hypertension in eastern Nepal as 14.4% (12) considering 95% CI and 85% power. Total sample size of 1161 individuals included 10% of additional individuals to overcome non-response. Total of 26 wards of Itahari were arranged according to highest density area to lowest density area, systematic random sampling was done to select five wards from the total. Population proportionate to sample size technique was used in ward to allocate number of respondents from each ward. Respondents were enrolled from each household by door to door survey until the sample size was met.

Data collection was done using a pre-tested semi-

structured questionnaire to elicit information from each study participant for: demographic characteristic, lifestyle related factors, history of hypertension, medication and life style modification, history of diabetes and medication, availability of health services, affordability of health services and utilization of health services. Aneroid Sphygmomanometer and stethoscope were used for blood pressure measurement. Participants were asked to sit quietly for at least 5 minutes in a chair with feet on the floor, back supported and arm supported heart level. Caffeine, exercise and smoking were avoided for at least 30 minutes prior to measurement. Two measurements were taken 5 minutes apart. Average of the two readings was taken. Hypertension was diagnosed according to "The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure" (JNC 7) criteria or being previously diagnosed as having hypertension determined by sighting documentation such as treatment record book or by the history of the participants taking medicines for high blood pressure. Bathroom scale weighing machine for weight measurement and un-stretchable measuring tape for height measurement were used.

Ethical clearance received from the Institutional Review Committee (IRC) of BP. Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal. Informed consent was obtained from all the subjects before taking informations. Confidentiality was maintained during and after study and the information were not disclosed to anyone. The data were cleaned, coded and entered in Microsoft Excel and transferred into SPSS 11.5 version for statistical analysis. Descriptive and Inferential Statistics were applied. Significance was set at 0.05 level.

RESULTS

Mean age was 41.06±12.33 years. Majority of them (63%) were female, married (88.3%), following Hindu religion (88.8%) and from Bhramin/Chhetri Ethnicity (46.6%) (Table 1).

Total prevalence of hypertension in our study population was 26.5% including undiagnosed 11.0% and previously diagnosed 15.50% respectively. Among previously diagnosed, 76.6% had uncontrolled hypertension and only 23.3% had achieved controlled blood pressure (Fig. 1).

Among previously diagnosed hypertensive 56.70% were currently taking anti-hypertensive medicine, 7.8% were under Ayurvedic medicine. Rest all were were not taking any medication and were just trying to control their blood pressure with life style modification. Among those under medication 36.2% had achieved controlled blood pressure (Fig. 2).

The prevalence of HTN has increased with increasing age in this study with maximum percentage of HTN (42.0%) seen

Table 1. Socio demographic profile of respondents

Characteristic	Categories	No. of Participants	Percentage
Age in years	20-30	314	27
	31- 40	264	22.70
	41-50	231	19.90
	51-59	352	30.30
	60-69	200	17.40
Gender	Female	732	63
	Male	429	37
Religion	Hindu	1031	88.8
	Kirat	94	8.10
	Others	36	3.10
Ethnicity	Bhramin/ chettri	539	46.40
	Janjati	465	40.10
	Dalit	105	9.00
	Others	52	4.50
	Marital status	Unmarried	62
	Married	1025	88.30
	Widow/ separated	74	6.40
Education	Illiterate	258	22.20
	Informal	174	15.00
	Formal	729	62.80
Occupation	Agriculture	74	6.4
	Unskilled worker	93	8
	Skilled worker	102	8.8
	Professional	73	6.3
	Business	151	13
	Student	44	3.8
	Unemployed	84	7.2
	Home maker	512	44.1
	Migrant worker	17	1.5
	Others	11	0.9
Poverty index	Below poverty line < 1.9 US Dollar/day	516	44.4
	Above poverty line ≥ 1.9 US Dollar/day	645	55.6
Family member	≤ 5	858	73.9
	> 5	303	26.1

Mean family members± SD (IQR) 4.7 ± 1.9 (2)

in age group of 51 to 59 years. HTN was more among male ($p < 0.01$) and among those who were either widow/divorce or separated ($p=0.004$). HTN was seen more in participants belonging to religion muslim/Buddhist/Christian (44.4%). The association of BMI, tobacco use, alcohol consumption, physical activity, positive family history, diabetes with hypertension was found to be statistically significant ($p < 0.001$) (Table 3). In multivariate analysis model Age, BMI, alcohol use, family history were identified as significant factors associated with hypertension (Table 4).

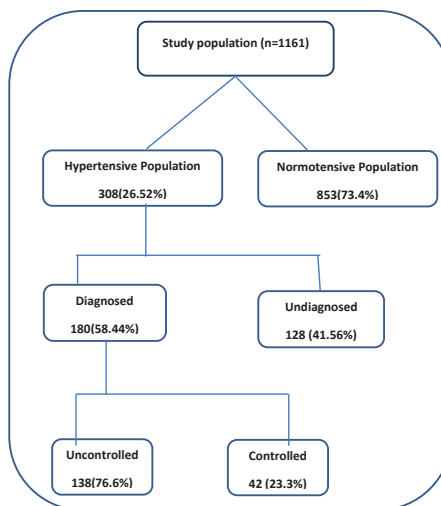


Figure 1. Flow chart showing hypertensive status

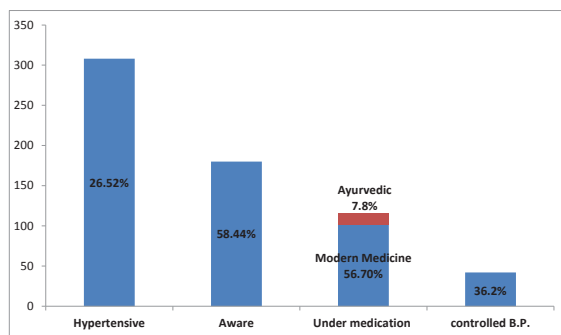


Figure 2. Medication and controlled B.P. among hypertensive

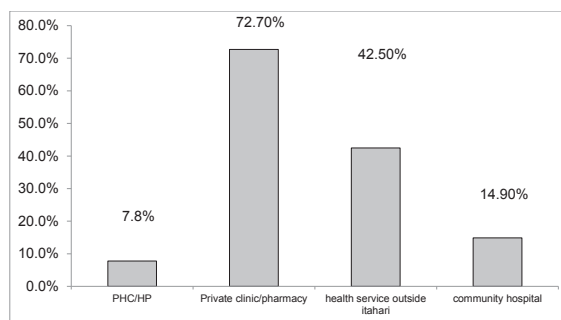


Figure 3. Preferred health facility for seeking care (n=308), multiple response

Access to health care among hypertensive

Almost all (99.0%) hypertensive participants were aware about availability of private clinics and hospitals but only 58.0% were aware about the existence of PHC in Itahari. Maximum participants preferred to go to private clinic (72.7%) followed by health service outside Itahari (42.5%) and only about 8% preferred to go to Itahari PHC for treatment (Figure 3).

The financial barrier to health care in the past 12 month preceding the interview was reported by 22.7% of participants in past one year. Maximum hypertensive 70%

Table 2. Association of socio demographic characteristic with hypertension

Characteristic	Category	Group		p value
		Normal	Hypertension	
Age in years	20-30	293 (93.3)	21(6.7)	< 0.001
	31-40	206 (78.0)	58 (22.0)	
	41-50	150 (64.9)	81 (35.1)	
	51-59	204 (58.0)	148 (42.0)	
Mean age in Years ± SD		38.74±12.42	47.37±9.65	<0.01
Gender	Female	572 (78.1)	160 (21.9)	< 0.01
	Male	281 (64.5)	148 (34.5)	
Religion	Hindu	771 (78.4)	260 (25.2)	0.002
	Kirat	62(66.0)	32 (34.0)	
	Others	20 (55.6)	16 (44.4)	
Ethnicity	Dalit	79 (75.2)	26 (24.8)	0.06
	Janjati	323 (69.5)	142 (30.5)	
	Bhramin/ chhetri	414 (76.8)	125 (23.2)	
	Others	37 (71.2)	15 (28.8)	
Occupation	Labour/ farmer	125 (74.9)	42(25.1)	< 0.001
	Skilled worker	82 (68.9)	37 (31.1)	
	Business/ professional	146 (65.2)	78 (34.8)	
	Students	42 (95.5)	2 (4.5)	
	Unemployed	62 (65.3)	33 (34.7)	
	Home maker	396 (77.3)	116 (22.7)	
Marital status	Unmarried	50 (80.6)	12 (19.4)	0.004
	Married	759 (74.0)	266 (26.0)	
	Widower/ separated	44 (59.5)	30 (40.5)	
Total family member	≤5	636 (74.1)	222 (25.9)	0.3
	>5	217 (71.6)	86 (28.4)	
	Total	853 (73.5)	308 (26.5)	
Poverty index	Below poverty line	383 (74.2)	133 (25.8)	0.6
	Above poverty line	470 (72.9)	175 (27.1)	
Median income/month(IQR) (MIN-MAX)		30000 (24000-50000-150000)	30000 (23750-30000-150000)	0.2
Literacy	Illiterate	175 (67.8)	83 (32.2)	0.005
	informal	122 (70.1)	52 (29.9)	
	Formal	556 (76.3)	173 (23.7)	

were diagnosed in private facility and 30% had not made even a single visit to any health facility in past 6 months for their hypertension (Table 5).

Table 3. Association of HTN with studied factors

Characteristic	Category	Group		p value
		Normal	Hypertension	
BMI	< 18.5	66 (95.7)	3 (4.3)	<0.01
	18.5- 22.9	289 (86.5)	45 (13.5)	
	23-24.9	166 (83.8)	32 (16.2)	
	25-29.9	269 (64.4)	149 (35.6)	
	>30	63 (44.4)	79 (55.6)	
Smoking status	Never smoker	637 (77.8)	182 (22.2)	<0.001
	Current smoker	136 (67.3)	66 (32.7)	
	Past smoker	80 (57.1)	60 (42.9)	
Median pack year (IQR) (MIN-MAX)	3.7 (8.5) (0.04-48.7)	4.2(6.3) (0.19-27.6)	0.9	
Smokeless tobacco use	Never	662 (78.0)	187 (22.0)	<0.001
	Current	175 (61.2)	111 (38.8)	
	Past	16 (61.5)	10 (38.5)	
Alcohol consumption	Never	576 (80.1)	143 (19.9)	<0.001
	Consumed in 12 month	226 (63.1)	132 (36.9)	
	Past	51 (60.7)	33 (39.3)	
Alcohol category	Cat I	142 (63.1)	83 (36.9)	0.4
	Cat II	16 (59.3)	11 (40.7)	
	Cat III	45 (58.4)	32 (41.6)	
Fruits and vegetable intake	Inadequate <5 servings	817 (73.5)	294 (26.5)	0.8
	Adequate ≥5 servings	36 (72.0)	14 (28.0)	
Salt intake	≤ 5 gm/ day	121 (64.0)	68 (36.0)	0.001
	> 5 gm/ day	732 (75.3)	240 (24.7)	
Level of Physical activity	Low <600 MET	39 (52.7)	35 (47.3)	<0.001
	Moderate	156 (68.4)	72 (31.6)	
	High	658 (76.6)	201 (23.4)	
Sedentary time	≤ 5hrs	608 (74.6)	207 (25.4)	0.1
	>5 hrs	245 (70.8)	101 (29.2)	
Family history	Present	189 (65.2)	101 (34.8)	<0.001
	Absent	664 (76.2)	207 (23.8)	
Diabetes	Present	46 (55.4)	37 (44.6)	<0.001
	Absent	807 (74.9)	271 (25.1)	

DISCUSSION

Prevalence of HTN in our study was similar to other studies conducted in Nepal. Different studies conducted in different part of Nepal in past 14 years reported the total

Table 4. Binary logistic regression analysis of relationship between respondents characteristic with Hypertension (n=1161)

Characteristic	Categories	β	p-value	Adjusted Odds Ratio	95% C.I. for AOR	
					Lower	Upper
Age in years	20-30			REF		
	31-40	1.101	<0.001	3.008	1.632	5.544
	41-50	1.913	<0.001	6.774	3.679	12.473
	51-59	2.219	<0.001	9.197	4.899	17.268
BMI	< 18			REF		
	18-22.9	1.276	0.044	3.581	1.035	12.389
	23-24.9	1.654	0.011	5.230	1.469	18.615
	25-29.9	2.611	<0.001	13.611	3.987	46.466
Alcohol consumption	> 30	3.428	<.001	30.810	8.691	109.217
	Never			REF		
	Consumed in 12 month	0.450	0.026	1.568	1.055	2.332
Family history	Past	0.309	0.316	1.362	0.745	2.490
	Absent			REF		
	Present	0.673	<0.000	1.961	1.373	2.800

Table 5. Utilization of health service by individuals with history of hypertension (n=180)

Characteristic	Category	No. of participants	Percentage
Place of diagnosis	Government facility	18	10.0
	Private facility	135	75.0
	Teaching hospital	20	11.10
	Pharmacy	7	3.90
Number of times health care visited in past 6 months	None	54	30.0
	1-5	77	42.7
	6-10	36	20.0
Type of health service utilized in past 6 month	> 10	13	7.3
	None	54	30.0
	PHC/HP	9	5.0
	Private facility	78	43.3
	Medical college	24	13.3
	Community hospital	15	8.4

prevalence to be between 18 to 41.0%. A pooled analysis of population based measurement studies. revealed global age standardized prevalence of raised blood pressure to be 24.1%.⁴ The magnitude of undiagnosed and uncontrolled hypertension was also found to be high in various other studies. A study conducted by Koju et al. in a semi urban area of Nepal, reported that 69.9% of hypertensive were unaware of their hypertension and only 18% of diagnosed were taking medication.⁵

According to the 2017 High Blood Pressure clinical Practice guidelines, SBP between 130-139 or DBP between 80–89 are categorized as stage I HTN.⁶ So according to that 40.2% of our study participants would add up to hypertension making total prevalence to be 66.7%. This finding has significant implication in terms of number of population, resources and cost needed to treat this group.

In this study, “**Rule of halves**” somewhat exists as only about half of them were aware about their disease and among them half were under medication. People were not taking any medication despite the need as there is a general perception among people that once the medication is started it cannot be discontinued and need to be taken for life long, thus people are hesitant to start medication. And also those who have started medicine do not adhere to it.

Researches in Nepal and other countries have reported that men have higher prevalence of hypertension than female.⁷⁻⁹ Observed gender difference in hypertension is due to both biological and behavioral factor (smoking, alcohol, physical activity etc).¹⁰ Our study also reported significant association between male gender and hypertension at $p < 0.05$ level.

Obesity is a common and preventable predictor of diabetes and hypertension. It is generally thought that accumulation of visceral and ectopic fat in a number of tissues and organs alters the metabolic and hemodynamic pathways, leading to the development of hypertension in obese people.¹¹ Increase of BMI was significantly associated with hypertension in this study. A study of baseline data of 9 countries collected in 5 years reported that each standard deviation higher of BMI was associated with 1.42 and 1.28 times higher probability of hypertension for men and women respectively aged 40 to 69 years.¹² Smoking and smokeless tobacco major predictor of HTN were also found to be significantly associated with hypertension in bivariate analysis. Other studies also have similar findings.^{8,13,14} The result of this study was more than that of national prevalence of current drinkers 17.4% and harmful drinkers 2.0% (STEPS Survey 2013) possibly because about 40% of study population were of Janajati ethnicity in which mostly alcohol intake is culturally acceptable. Alcohol was found to be independent predictor of hypertension in logistic regression. There was 1.5 fold increase risk of hypertension among those who have drunk in past 12 months as compared to non-drinkers. These results are in line with many other studies which have shown positive association.¹⁵⁻¹⁸ Physical activity was found to be significantly associated with hypertension in univariate analysis. Those with low level of physical activity had maximum cases of HTN as compared to those with moderate and high level activity ($p < 0.001$). This result is in line with other studies which have shown similar findings. Dhungana et al. has identified physical activity as an independent predictor of HTN, those without sufficient physical activity were 1.6 times increased risk of having HTN other studies have shown similar association.^{17,18} Positive family history has been proved to be strongly associated with HTN. Our study also show significant relation between family history and HTN.¹⁹

Prevalence of diabetes mellitus in this study population was found to be 7% which was less than country prevalence 2016 of 9.1% (WHO, Diabetes country Profile 2016.) Hypertension is often reported to be one of the most common co-morbid conditions in those suffering from diabetes. The coexistence of hypertensive and diabetes might be because of sharing common risk factors like smoking, alcohol, unhealthy diet, physical inactivity. In this study, proportion of hypertension was more in DM population (44.6%) than non-diabetic (25.1%) which was statistically significant ($p < 0.001$).

Access to health care

In an attempt to ensure equitable access to healthcare services, Government has been raising their expenditures and around 80.0% of government health spending is allocated to public service providers. As such most free health care services are provided at health post, primary

health care centers and district hospitals.²¹ One of the modifiable factors that contributes to high prevalence rate of hypertension is inadequate access to health care. Worldwide detection, treatment and control of HTN are inadequate owing to weakness in health system, particularly at primary health care level.²² People of developing countries like Nepal are also ignorant about disease and unaware for the need to do regular health assessment including measurement of blood pressure. Our study site Itahari sub metropolitan city has PHC as the highest level of available public health facility.

About their choice of health facility for treatment, more than 70.0% preferred going to private facility in city which includes private clinics/hospitals/ pharmacy followed by health facility outside Itahari (42.5%) Only about 8.0% mentioned public facility ie. PHC as their preferred health facility. This result is in line with study conducted by Thapa et al. using data from Nepal Living Standard Survey 2010/11 which showed among urban residents public primary facilities (SHP, HP, PHC, mobile clinics) was the preferred health facility for 5.5% of participants whereas private clinics and hospitals was the choice for 70.0% of participants.²³

Participants were asked in past 12 months they couldn't see doctor due to cost or if they had to stop drugs or instruction given by doctor for their illness due to economic difficulties. This financial barrier to health care was reported by 22.7% of participants in past one year. In a study conducted by Parikh et al. on diabetic patients of USA to access the prevalence and consequences of financial barrier, 13.7% reported financial barrier to health care.²⁴ But in this study financial barrier for any illness acute or chronic were asked.²⁴

CONCLUSION

More than one fourth of the adults suffered from hypertension. Among the diagnosed ones more than three fourth had uncontrolled hypertension. Regular screening program for HTN should be conducted in community.

Only half of the people were aware about existence of Primary Health Care Center in their city. Visiting private facilities was popular among them. About one quarter of them faced financial problem for health care. Among those who had history of hypertension, 30% had not made even a single visit to any health care facility in past six month.

Access to health care could be improved by raising awareness on hypertension among the urban population and unwanted complications could be prevented for the benefit at individual, household and community level.

ACKNOWLEDGEMENT

We acknowledge Community Health System Innovation (COHESION) Project supported by Swiss Agency for Development and Cooperation (SDC) and Swiss National Science Foundation (SNSF) for providing opportunity

and motivating us to study on hypertension among residents in an emerging city, Itahari. We also acknowledge the feedback and support of David Beran, COHESION PI, Division of Tropical and Humanitarian Medicine, University of Geneva in preparing this manuscript.

REFERENCES

1. WHO. WHO | Noncommunicable diseases [Internet]. WHO. World Health Organization; 2017 [cited 2018 Jan 11]. Available from: <http://www.who.int/mediacentre/factsheets/fs355/en/>
2. WHO. A global brief on Hypertension World Health Day 2013. Geneva; 2013.
3. 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 J* [Internet]. 2012;64(2):128-31. Available from: [http://dx.doi.org/10.1016/S0019-4832\(12\)60045-5](http://dx.doi.org/10.1016/S0019-4832(12)60045-5)
4. Echouffo-Tcheugui JB, Kengne AP, Erqou S, Cooper RS. High Blood Pressure in Sub-Saharan Africa: The Urgent Imperative for Prevention and Control. *J Clin Hypertens*. 2015;17(10):751-5.
5. Koju R, Manandhar K, Gurung R, Pant P, Bedi T. Prevalence of Hypertension in Semi-Urban area of Nepal. *Nepal Hear J*. 2013;7(1):35-9.
6. Pk W, Whelton PK, Carey RM, Aronow WS, Ovbiagele B, Casey DE, et al. 2017 ACC / AHA / AAPA / ABC / ACPM / AGS / APhA / ASH / ASPC / NMA / PCNA Guideline for the Prevention , Detection , Evaluation, and Management of High Blood Pressure in Adults A Report of the American College of Cardiology / American Heart Association T. 2017.
7. Ministry of Health Nepal. Nepal Demographic and Health Survey 2016 Key Indicators. 2016;68. Available from: <https://dhsprogram.com/pubs/pdf/PR88/PR88.pdf>
8. 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. *Int J Hypertens* [Internet]. 2016 [cited 2018 Jan 10];2016:1656938. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27293880>
9. Davies AR, Miranda JJ, Gilman RH, Smeeth L. Hypertension among adults in a deprived urban area of Peru - undiagnosed and uncontrolled? *BMC Res Notes*. 2008;1(Cvd):2.
10. Everett B, Zajacova A. Gender differences in hypertension and hypertension awareness among young adults. *Biodemography Soc Biol* [Internet]. 2015 [cited 2018 Jan 15];61(1):1-17. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25879259>
11. Poirier P, Giles T, Bray G, Hong Y, Circulation JS, 2006 undefined. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss. *Am Hear Assoc* [Internet]. [cited 2018 Jan 15]; Available from: <http://circ.ahajournals.org/content/113/6/898.short>
12. Patel SA, Ali MK, Alam D, Yan LL, Levitt NS, Bernabe-Ortiz A, et al. Obesity and its relation with diabetes and hypertension: a cross-sectional study across 4 geographical regions. *Global heart*. 2016 Mar 1;11(1):71-9. Available from: <https://pubmed.ncbi.nlm.nih.gov/27102024/>
13. Koju R, Manandhar K, Risal A, Steiner TJ, Holen A, Linde M. Undertreated hypertension and its implications for public health in Nepal: Nationwide population-based survey. *Kathmandu Univ Med J*. 2015;13(49):3-7.
14. Bolinder GM, Ahlborg BO, Lindell JH. Use of smokeless tobacco: blood pressure elevation and other health hazards found in a large-scale population survey. *J Intern Med* [Internet]. 1992 Oct [cited 2018 Jan 16];232(4):327-34. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/1402636>
15. Ministry of Health Nepal, New ERA, ICF. Nepal Demographic and Health Survey 2016. Kathmandu; 2017.
16. Chataut J, Chataut CJ. Prevalence and Risk Factors for Hypertension in Adults Living in Central Development Region of Nepal The Prevalence of and Risk Factors for Hypertension in Adults Living in. *Kathmandu Univ Med J* [Internet]. 2011 [cited 2018 Jan 10];33(1):13-8. Available from: <http://www.kumj.com.np/issue/33/13-18.pdf>
17. 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(33):13-8.
18. Wang F, Tiwari VK, Wang H. Risk Factors for Hypertension in India and China: a Comparative Study. *Heal Popul Perspect Issue*. 2014;37(1 & 2):40-9.
19. Ranasinghe P, Cooray DN, Jayawardena R, Katulanda P. The influence of family history of hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. *BMC public health*. 2015 Dec;15(1):1-9. Available from: http://pubmedcentralcanada.ca/pmcc/articles/PMC4475303/pdf/12889_2015_Article_1927.pdf
20. WHO. World Health organisation- Diabetes country profiles. 2016.
21. Saito E, Gilmour S, Yoneoka D, Gautam GS, Rahman MM, Shrestha PK, et al. Inequality and inequity in healthcare utilization in urban Nepal: a cross-sectional observational study. *Health Policy Plan*. 2016;31(7):817-24.
22. WHO. Global Status Report on Non Communicable Diseases. 2014.
23. Thapa AK, Adhikari SR. Characteristics of morbidity and choice of health care facilities in Nepal. *JAAR*. 2015;2(2):47-55.
24. Parikh PB, Yang J, Leigh S, Dorjee K, Parikh R, Sakellarios N, et al. The Impact of Financial Barriers on Access to Care, Quality of Care and Vascular Morbidity Among Patients with Diabetes and Coronary Heart Disease. *J Gen Intern Med*. 2014;29(1):76-81.