

Research Article

Prevalence of hypertension and its associated risk factors in a sub-urban area of central Nepal

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ABSTRACT

Background: Burgeoning burden of non-communicable diseases (especially hypertension) along with communicable diseases has made the situation more worrying in an economically constraint countries like Nepal. Studies are therefore necessary to assess the actual burden of disease; however nominal studies have focused this situation especially in semi urban areas of Nepal. This study was therefore conducted with the main aim of assessing the prevalence of hypertension in suburban area of central Nepal and to find the associated risk factors.

Methods: A cross sectional study was conducted in a sub urban area of Changanarayan municipality of Nepal utilizing consecutive convenience sampling method. A total of 240 consenting participants aged ≥ 18 were enrolled in the study. Data was collected using questionnaire and measurements of blood pressure, waist/hip circumference, height and weight were taken. Chi square test was used to assess the strength of relationship between the categorical variables with p value taken significant at ≤ 0.05 . Only values with significant association were used to obtain the Odds Ratios (OR) via binary logistic regression.

Results: The prevalence of hypertension and pre-hypertension was found to be 20.4% and 35.4% respectively. Further, study illustrates the significant association ($p \leq 0.05$) of age, gender, family type, presence of co-morbidities, smoking, alcohol intake habits, habit of adding salt, BMI and waist/hip ratio with hypertension.

Conclusions: Results of high prevalence of hypertension and its association with several factors indicates the necessity for timely detection, treatment and control of hypertension using various strategies.

Keywords: Hypertension prevalence, Sub urban area of Nepal, Non-communicable disease, Risk factors

INTRODUCTION

Non communicable diseases (NCDs) are one of the leading causes of mortality and morbidity worldwide afflicting more in developing countries. In 2012, of the total 56 million deaths worldwide, NCD accounted for more than 50% (i.e. 38 million deaths). Of these, more than 70% (28 million deaths) of NCD deaths occurred in low and middle income countries.¹

It is interesting to note that, cardiovascular diseases (CVDs) alone lead to 46.2% of NCD deaths followed by

cancer, respiratory diseases and diabetes.² Among cardiovascular diseases, the number of people with hypertension in developed countries is expected to increase by 24% from 333 million to 413 million while in developing countries by 80% from 639 million to 1.15 billion between 2000 and 2025.³ This data depicts that almost three-quarters of the hypertensive population worldwide will be in developing countries by the year 2025 with the increment of global prevalence of hypertension by 9% in men and 13% in women between 2000 and 2015.³ In Nepal, the scenario of hypertension is not different from other developing countries.

The burden of hypertension is increasing rapidly in Nepal leading to about 55% out of pocket spending for NCD related health care expenses.⁴

A systematic review study conducted on the prevalence of hypertension worldwide reports that there is wide variation in the prevalence around the world. India was the country with the lowest prevalence (3.4% in men and 6.8% in women) whereas Poland had highest prevalence (68.9% in men and 72.5% in women).⁵ According to WHO (2008), the prevalence of hypertension is highest in the African region (46%) and it is lowest in Americas (35%), whereas, the lower prevalence of hypertension is reported in high income countries (35%) than in lower income countries (40%). A national health survey conducted in a representative group of Chinese, Malay and Indian residents revealed that Malays had the highest prevalence of hypertension (32.3%) followed by Chinese (26%) and Indians (23.7%).⁵

When it comes to Nepal, the prevalence of hypertension in various parts varies between studies which ranged between 3.3% and 44.9%.⁶⁻¹⁴ Furthermore a repeat cross sectional study done in a rural Kathmandu revealed that prevalence of hypertension tripled from 6% in 1980 to 18% in 2006.¹² This figure indicates that there is a burgeoning burden of hypertension in Nepal.

Majority of studies have reported the high prevalence of hypertension in urban areas than in rural areas. In Pakistan, hypertension among 15 years or older was estimated to be 23% in urban and 18% in rural; in Sri Lanka, it was estimated to be 17.2% in urban and 16.7% in rural among the age group of 35 years and above; while several studies done in India reported the prevalence rate of 20 to 40% in urban and 12-17% in rural areas; in Singapore 26% among urban and 18% in rural population, in Nepal, 9.9% in urban Kathmandu, 6.6% in rural Kathmandu, 8.1% in Plains, 5.4% in mountain region among the adults of 21 years or older.^{5,15-18}

Several studies have been conducted focusing on rural or urban area; however nominal studies have focused to assess prevalence of hypertension in semi urban areas. This study was therefore conducted with the main aim of assessing the prevalence of hypertension in suburban area of central Nepal and to find the associated risk factors.

METHODS

Setting and sample selection

The study setting selected was a suburban area located in Changunarayan municipality of Nepal which was previously a Village Development Committee and has recently been declared as the Municipality in the year 2014. Changunarayan Municipality is located around 18.7 Km North West of the capital city Kathmandu occupying total 27.92 Square Kilo meter.¹⁹ A total of 240

consenting participants aged ≥ 18 were enrolled in the study using consecutive convenience sampling method. Exclusions included pregnant women and adults not willing to participate in the study. Data collection was done for the period of two months between April and May, 2015 with researchers visiting household during day time from 10 am to 2:30pm daily on weekdays excluding public holidays.

Tools for data collection

Questionnaire

Researcher themselves administered the pre-tested questionnaire which was formulated through comprehensive literature review and consultation with subject experts and thus its content validity was maintained. The questionnaire collected data on socio-demographic characteristics and potential risk factors of hypertension. Blood pressure, height, weight, waist circumference, hip circumference were also recorded.

Measurements

An adult size aneroid sphygmomanometer and stethoscope was used to measure blood pressure (AHA guideline was followed for blood pressure measurement).²⁰ Blood pressure was measured in an upper bare arm after the participants had been seated in an upright position and relaxed for about 5 minutes with their feet flat on the floor. Three blood pressure readings were taken in left arm, each 1 minute apart and the findings of the three systolic and diastolic readings were averaged to obtain a single final reading. The definition given by JNC 7 was taken to classify hypertension.²¹

Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or taking antihypertensive drugs. Pre-hypertension was defined as systolic blood pressure ≥ 120 mmHg but < 140 mmHg and/or Diastolic blood pressure ≥ 80 mmHg but < 90 mmHg.²¹ Height, waist circumference and hip circumference were measured by flexible measuring tape. Height was measured without shoes, to the nearest 0.5 cm with participants standing erect against the wall with heels together and touching the wall, and head held high in upright position.

Weight was measured to the nearest 0.5 Kg with a manual round dial flat, SecaTM weighing scale with participants on minimum clothes and without footwear. Body Mass Index (BMI) was calculated as weight (Kg) divided by height in (m^2). BMI is classified as (≥ 23 : obesity) and < 23 (Normal) as per the criteria given by WHO for Asian population.²² Waist circumferences were measured in cm by measuring tape, approximately at the midpoint between the lower margin of last palpable rib and the top of iliac crest at the end of the normal expiration. Hip circumference was measured at the widest diameter of the hip. The waist circumference was

classified according to the International Diabetes Federation's criteria for ethnic or country specific value which indicates that for men ≥ 90 cm is obese and for women ≥ 80 cm is obese.²³ Similarly, for waist/hip ratio, criteria given by WHO for Asian population is used that indicates that for male ≥ 0.90 cm is obese and for female ≥ 0.85 cm is obese.²⁴

Ethical consideration

The proposal was reviewed and approved by institutional review board of Nepal medical college. No major risks were involved in the study. Verbal consent was taken prior to data collection and confidentiality procedures were incorporated throughout the study and thereafter.

Statistical Analysis

All statistical analysis was performed using the Statistical Package for Social Sciences Version 20.0. Frequencies, percentage, mean, standard deviation was calculated. Chi

square test was used to assess the strength of relationship between the categorical variables with p value taken significant at ≤ 0.05 . Only those risk factors with p value ≤ 0.05 were used to obtain the Odds Ratios (OR) via binary logistic regression.

RESULTS

Demographic status

Respondents' age ranged between 18 and 88 years with mean age of 42.10 ± 16.38 years and majority of the respondents fall in the age group 25-34 years (Table 1). The prevalence of hypertension among those below 50 years of age was 9.8% whereas it was 42.9% in ≥ 50 years of age. Study participants with age ≥ 50 have 6.5 times (OR=6.5; 95% CI=2.944-14.676) more chance of developing hypertension than those with age less than 50 and was found to be statistically significant ($p=0.000$) (Table 3). This trend reflects the increasing number of hypertensive cases with ageing.

Table 1: Descriptive information of the independent variables (n=240).

Variables	Total n (%)	Hypertensive n (%)	Non hypertensive n (%)
Age group (in years)			
18-24	30 (100)	1 (3.3)	29 (96.7)
25-34	65 (100)	7 (10.8)	58 (89.2)
35-44	49 (100)	5 (10.2)	44 (89.8)
45-54	40 (100)	9 (22.5)	31 (77.5)
55-64	29 (100)	13 (44.8)	16 (55.2)
65 and over	27 (100)	14 (51.19)	13 (48.1)
Mean Age: 42.10 ± 16.38			
Sex			
Male	88 (100)	24 (27.3)	64 (72.7)
Female	152 (100)	25 (16.4)	127 (83.6)
Marital Status			
Unmarried	34 (100)	3 (8.8)	31 (91.2)
Married	188 (100)	41 (21.8)	147 (78.2)
Widow	18 (100)	5 (27.8)	13 (72.2)
Family Type			
Joint	121 (100)	31 (25.6)	90 (74.4)
Nuclear	119 (100)	18 (15.1)	101 (84.9)
Educational Status			
Illiterate	61 (100)	16 (26.2)	45 (73.8)
Able to read and write	28 (100)	9 (32.1)	19 (67.9)
Primary Level	18 (100)	4 (22.2)	14 (77.8)
Secondary Level	67 (100)	10 (14.9)	57 (85.1)
Higher Secondary Level	30 (100)	3 (10.0)	27 (90.0)
Bachelor and above	36 (100)	7 (19.4)	29 (80.6)
Occupational Status			
Homemaker	82 (100)	18 (22.0)	64 (78.0)
Service	39 (100)	6 (15.4)	33 (84.6)
Business	17 (100)	4 (23.5)	13 (76.5)
Agriculture	67 (100)	12 (17.9)	55 (82.1)
Retired	13 (100)	7 (53.8)	6 (46.2)
Students	22 (100)	2 (9.1)	20 (90.9)

Co-morbidities			
Yes	78 (100)	24 (30.8)	54 (69.2)
No	162 (100)	25 (15.4)	137 (84.6)
Presence of diabetes mellitus			
Yes	5 (100)	3 (60.0)	2 (40.0)
No	235 (100)	46 (19.6)	189 (80.4)
Dietary pattern			
Non-vegetarian	179 (100)	33 (18.4)	146 (81.6)
Vegetarian	61 (100)	16 (26.2)	45 (73.8)
Frequency of consuming fruits and vegetables			
At least once a week	28 (100)	5 (17.9)	23 (82.1)
3-5 days per week	130 (100)	24 (18.5)	106 (81.5)
Everyday	82 (100)	20 (24.4)	62 (75.6)
Smoking habits			
Current	47 (100)	12 (25.5)	35 (74.5)
Past	16 (100)	7 (43.8)	9 (56.2)
Never	177 (100)	30 (16.9)	147 (83.1)
Alcohol intake habits			
Current	26 (100)	11(42.3)	15 (57.7)
Past	1 (100)	0 (0.0)	1 (100)
Never	213 (100)	38 (17.8)	17 (82.2)
Habit of adding salt			
Yes	164(100)	40 (24.4)	124 (75.6)
No	76 (100)	9 (11.8)	67 (88.2)
BMI			
≥23	116 (100)	31 (26.7)	85 (73.3)
<23	124 (100)	18 14.5)	106 (85.5)
Waist circumference			
Obesity	102 (100)	26 (25.5)	76 (74.5)
Normal	138 (100)	23 (16.7)	115 (83.3)
Mean Waist circumference: Male: 83.38±10.72 Female: 81.05±14.74			
Waist/Hip ratio			
Obesity	143 (100)	35 (24.5)	108 (75.5)
Normal	97 (100)	14 (14.4)	83 (85.6)
Mean Waist/hip ratio Male: 0.93 ± 0.10 Female: 0.87 ± 0.11			
Stress			
Yes	48 (100)	13 (27.1)	35 (72.9)
No	192 (100)	36 (18.8)	156 (81.2)

Table 2: Classification of blood pressure as per JNC VII criteria (n=240).

Gender	Normal n (%)	Pre-hypertension n (%)	Hypertension n (%)	Total n (%)
Male	23 (26.1)	41 (46.6)	24 (27.3)	88 (36.7)
Female	83 (54.6)	44 (28.9)	25 (16.4)	152 (63.3)
Total n (%)	106 (44.2)	85 (35.4)	49 (20.4)	240 (100)

Moreover, the number of hypertensive cases was slightly higher among male counterparts (27.3%) than in female (16.4%) and the difference was found to be statistically significant ($p=0.045$). Furthermore, the odds ratio revealed that male respondents had nearly twice the chance of developing hypertension than the female counterparts ($OR= 1.85$; $95\% CI=0.846-4.071$). Number of hypertensive cases were significantly lower in

unmarried respondents (8.8%) than in married (21.8%) and widow (27.8%) respectively.

Notably, respondents belonging to joint family had significantly ($p=0.044$) higher proportion (25.6%) of hypertensive cases than those belonging to nuclear family (15.1%). Further, the odds of developing hypertension among participants of joint family was found to be nearly

twice (OR=1.933; 95% CI=1.012-3.690) than the participants belonging to nuclear family (Table 3).

Literacy level was high with majority of respondents (74.58%) having either formal or informal education.

Table 3: Binary logistic regression between the independent variables and hypertension (n=240).

Variable	n (%)	Hypertensive number (%)	χ^2	p value	Odds ratio (95% CI)
Age (in years)					
≥ 50	77 (100)	33 (42.9)	35.138	0.000*	6.573 (2.944-14.676)
<50	163 (100)	16 (9.8)			Reference
Gender					
Male	88 (100)	24 (27.3)	4.020	0.045*	1.855 (0.846-4.071)
Female	152 (100)	25 (16.4)			Reference
Family history of hypertension					
Yes	51 (100)	15 (29.4)	3.225	0.080	
No	189 (100)	34 (18.0)			
Family Type					
Joint	121 (100)	31 (25.6)	4.066	0.044*	1.933 (1.012-3.690)
Nuclear	119 (100)	18 (15.1)			Reference
Co-morbidities					
Yes	78 (100)	24 (30.8)	7.622	0.006*	1.527 (0.691-3.377)
No	162 (100)	25 (15.4)			Reference
Presence of diabetes					
Yes	5 (100)	3 (60.0)	4.924	0.026*	6.163 (1.001-37.96)
No	235 (100)	46 (19.6)			Reference
Habits					
Smoking habit					
Current/Past	63 (100)	19 (30.2)	4.990	0.025*	2.116 (1.087-4.119)
Never	177 (100)	30 (16.9)			Reference
Alcohol consumption habit					
Current/Past	27 (100)	11 (40.7)	7.734	0.005*	2.244 (0.831-6.060)
Never	213 (100)	38 (17.8)			Reference
Habit of adding salt					
Yes	164 (100)	40 (24.4)	5.033	0.025*	2.401 (1.099-5.248)
No	76 (100)	9 (11.8)			Reference
Diet					
Non vegetarian	179 (100)	33 (18.4)	1.701	0.192	
Vegetarian	61 (100)	16 (26.2)			
Physical Activity					
Sedentary	104 (100)	24 (23.1)	0.799	0.376	
Moderate/Heavy	136 (100)	25 (18.4)			
BMI (Kg/m²)					
≥ 23	116 (100)	31 (28.7)	5.497	0.019*	2.700 (1.224-5.960)
<23	124 (100)	18 (14.5)			Reference
Obesity (on the basis of waist circumference)^a					
Obesity	102 (100)	26 (25.5)	2.810	0.094	
Normal weight	138 (100)	23 (16.7)			
Obesity (on the basis of waist/hip ratio)^b					
Obesity	143 (100)	35 (24.5)	3.587	0.058*	1.921 (0.971-3.802)
Normal	97 (100)	14 (14.4)			Reference
Stress					
Yes	48 (100)	13 (27.1)	1.641	0.200	
No	192 (100)	36 (18.8)			

Pearson Chi Square (χ^2) Test *: p value significant at ≤0.05 level; aWaist Circumference: Overweight: ≥90 cm in male and ≥80 cm in female; bWaist/hip ratio: Obesity: ≥ 0.90 in male and ≥ 0.85 in female.

The prevalence of hypertension was found to be highest among those who were just able to read and write (32.1%) followed by illiterate (26.2%) while, those with higher secondary level of education had the lowest prevalence (10.0%) of hypertension.

The study revealed highest prevalence rate (53.8%) of hypertension among retired participants, followed by participants involving in business (23.5%) and homemaker (22.0%) respectively; while, students had least prevalence (9.1%) of hypertension. In this study, prevalence of hypertension was slightly higher among participants with family history of hypertension (29.4%) than those with no family history of hypertension (18%), however, it was not statistically significant ($p=0.080$).

The overall prevalence of hypertension in this study, according to JNC 7 criteria was found to be 20.4%. Out of 240 respondents, only 44.2% had normal blood pressure level. Further, it is noteworthy that, the number of pre-hypertensive cases was quite high (35.4%) which is alarming as those respondents can turn into hypertensive cases in near future (Table 2).

Co-morbidity

Prevalence of hypertension among participants with some disease condition (co-morbidity) was higher (30.8%) than participants without co-morbidities (15.4%). The odds ratio revealed that the presence of co-morbidity can increase the chance of developing hypertension by 1.5 times (95% CI= 0.691-3.377; $p=0.006$). Further, findings showed that three (60%) out of five diabetic participants had hypertension and it demonstrated a statistically significant result ($p=0.026$). The odds of developing hypertension among those participants with concomitant diabetes was found to be six times more than those without diabetes (95% CI= 1.001-37.96) (Table 3).

Habits

Current cigarette smokers comprised 47 (19.6% of total 240 participants), 16 (6.7%) were past smokers while 177 (73.8%) never smoked (Table 2). Regarding alcohol consumption, 213 (88.8%) reported to have never consumed alcohol, while 10.8% were current and 0.4% was past alcohol consumers. Hypertension was found to be significantly high ($p=0.025$) among participants who smoked (current/past) (30.2%) than those who never smoked (16.9%).

The odds ratio further supported this as it showed that the likelihood of developing hypertension among those with smoking habit was 2.11 times more than those who never smoked [95% CI=1.087-4.119]. Likewise, drinking alcohol (current/past) was found to be significant risk factor of hypertension ($p=0.005$) with 40.7% prevalence of hypertension among alcohol consumers against 17.8% of those who never consumed alcohol. The chance of developing hypertension among alcohol consumers was

found to be 2.44 times more than those who never consumed alcohol [95% CI= 0.831-6.060]. Habit of adding salt was another potent risk factor identified in this study revealing significant association ($P=0.025$) with an increased likelihood of hypertension by nearly 2.40 times [OR= 2.40; 95% CI= 1.099-5.248] (Table 3).

Dietary pattern

A total of 179 (74.6%) of participants were non-vegetarian while 61 (25.4%) were vegetarian. Of the total 240 participants, 130 (54.2%) consumed fruits and vegetables for 3-5 days per week, 82 (34.2%) consumed it every day while 28 (11.7%) consumed it only about once a week. Interestingly, the prevalence of hypertension among vegetarians was found to be higher (26.2%) than the non-vegetarians (18.4%), though it was statistically insignificant ($p=0.192$) (Table 3).

Physical activity

Majority of respondents 104 (43.3%) reported to involve in sedentary physical activity. Moderate and heavy work related activity was undertaken by 128 (53.3%) and 8 (3.3%) respondents respectively. Prevalence of hypertension was slightly higher (23.1%) in participants involved in sedentary activity than moderate/heavy kind of physical activity (18.4%), with no statistical significance ($P=0.376$).

Body mass index (BMI)

The mean BMI was 22.59 ± 4.173 in males and 23.63 ± 5.180 in females. On the basis of BMI given by World Health Organization for Asian population, of the total 240 participants, 116 (48.3%) were overweight and 124 (51.7%) had normal weight. Prevalence of hypertension was found to be significantly high ($P=0.019$) among participants with BMI ≥ 23 in comparison to those with BMI less than 23 with an OR of 2.70 [95% CI = 1.224-5.960].

Waist circumference

The mean waist circumference was 83.38 ± 10.72 cm in males and 81.05 ± 14.74 cm in females. Participants with normal weight comprised of 138 (57.5%) while those with obesity comprised of 102 (42.5%). The prevalence of hypertension among those with obesity was 25.5% in comparison to 16.7% of participants with normal weight; however, no statistical association was observed ($p=0.094$) (Table 3).

Waist-Hip ratio

Mean waist-hip ratio was 0.93 ± 0.10 cm in males and 0.871 ± 0.113 cm in females. More than 50% of respondents, i.e. 143 (59.6%) had central obesity while 97 (40.4%) had normal weight. About 24.5% of the participants with central obesity had hypertension while

14.4% of the participants with normal weight had hypertension which was found to be marginally significant statistically ($p=0.058$). Further the likelihood of developing hypertension among obese participants was nearly twice than those with normal weight ($OR=1.921$; 95% CI: 0.971-3.802) (Table 3).

Stress

Majority (80%) of the respondents reported to have no stress, while only one fifth (20%) of respondents reported to have stress. The prevalence of hypertension among respondents with stress was higher (27.1%) than without stress (18.8%), however it was not statistically significant ($p=0.20$).

DISCUSSION

The present study conducted in a suburban area of Nepal, showed increased prevalence rate of hypertension classified as 20.4% hypertensive cases and 35.4% pre hypertensive cases. Studies on prevalence of hypertension in Nepal especially in suburban area are limited but few studies reported hypertension prevalence ranged from 3.3% to 44.9% which is somewhat consistent with our study finding.⁶⁻¹⁴

Furthermore a repeat cross sectional study done in a rural Kathmandu reported prevalence of 18% in 2006 which tripled from 6% in 1980.¹² This rise in hypertension could be true for many other urbanizing areas of Nepal, provided the similar social development and demographic transition. Nevertheless, other studies conducted in south Asian countries have well documented similar prevalence of hypertension.^{5,25,26}

Correlates of hypertension in this study included age, gender, family type, co-morbidities, presence of diabetes mellitus, smoking habit, alcohol intake, habit of adding salt, body mass index and waist/hip ratio affirming that these could be the risk factors for development of hypertension in this population. These associations are well established in various studies conducted at national and international level.^{9,10,12,25,27-33} Hypertension prevalence increased with advancing age (Table 1) in this study which is consistent with findings from number of other studies.²⁷⁻³³

Majority of the respondents (152) in this study were female. This may be because, male population were not available at the time of data collection as they were out of the house for their job, while majority of the female population were homemaker, and were available at the time of data collection. Hypertension prevalence tended to be higher in male groups (16.4%, $p=0.045$) and this reported prevalence was consistent to the findings from various other studies.^{28,34,35}

In contrast to these findings, evidence also supports that there is an increasing trend in the prevalence of

hypertension to be more in women than that of the male counterparts.^{30,31,37} Although, surplus of evidence from number of research studies points out the possibility of strong association between gender difference and prevalence of hypertension, debates still exists for no such association as well.^{9,30,31,36}

Family history of hypertension is a well-known risk factor of hypertension, yet in this study no significant association ($p=0.080$) was found between heredity and hypertension. However, the prevalence of hypertension was found to be slightly higher among those with family history of hypertension (29.4%) compared to those who did not have a family history of hypertension (18%).

This finding opposes to that of the largest study conducted in Nepal, which revealed a strong correlation ($r=0.115$, $P<0.01$ between family history and hypertension.¹¹ Present study finding keeps up with the finding of another study which revealed that the people staying in family size more than six had nearly two times the chance of developing hypertension.³⁰ However, the possible explanations to this is not given.

Diabetes is considered as one of the major concomitant risk factors of hypertension.^{10,11,29,30,32,37} Compared to normotensive, studies have depicted that hypertensive subjects were more likely to have diabetes.^{10,11} Consistently, this study showed a strong association between diabetes and hypertension ($p=0.026$).

The finding of this study coincides with various other studies to supports that the consumption of smoking and alcohol can lead to hypertension.^{10,12,30,31,25,26,38} According to the study done by Benowitz sodium absorption was higher (107 mmol/day) among the smokers in comparison to non-smokers.³⁹ This may be why smokers might have been found to be more hypertensive in this study.

However, Koju et al found that the prevalence of hypertension had no association with smoking consumption.³² Interestingly, in a study by Manandhar et al high prevalence of hypertension was found to be in non-smokers group in comparison to smokers group though the groups were not statistically significant ($p=0.196$).⁹

Increased salt intake more than 5 gram/day is another crucial risk factor of hypertension which has been reported in some studies.^{12,28,40} Present study found that adding extra salt in diet has nearly two times likelihood of developing hypertension. Studies have found that the increased consumption of non-vegetarian diet, consumption of animal fat are linked to hypertension and consumption of fruits and vegetables were found to be beneficial in preventing hypertension.^{9,37} Present study finding suggests no association between the dietary pattern and hypertension which is further supported by the study findings of Shanthirani et al and Chataut et

al.^{25,28} Present study finding revealed no association between physical activity and hypertension. However several other studies have found that there is increased risk of hypertension among those who perform less physical activity or have sedentary life style.^{10-12,28,25} A significant positive correlation ($r=0.04$, $P<0.01$) was found between high BP and physical inactivity in the study by Sharma et al. In particular, similar association was identified in the study by Shanthirani et al, where the odds of developing high BP among those performing less physical activity was found to be 2.21, ($p<0.001$) than those performing heavy physical activity.^{11,28}

Present study finding keeps up with the several studies to support that an increased BMI increases the risk of hypertension.^{9,10,12,25,37,26,27-29} An interesting finding by Joshi et al revealed that a unit increase in BMI can lead to increase in systolic blood pressure by 0.2 mmHg in both gender and diastolic blood pressure by 0.08 mmHg (0.12 mmHg in males and 0.06 mmHg in females).¹⁰ Several studies have found a positive association between obesity and hypertension.^{8,10,30,38} The odds of developing hypertension was found to be 5 times (OR=5.07; 95% CI= 2.79 -9.21) and nearly three times more (OR =2.9; 95% CI=1.9- 4.4) in obese than in non-obese as stated in the studies by Joshi et al and Wamala et al respectively.^{10,31}

In line with these findings, odds of developing hypertension was found to be nearly two times (OR=1.921; 95% CI: 0.971-3.802) more in obese (waist/hip ratio defined obesity) than in participants with normal weight in this study suggesting that this might act as a risk factor for development of hypertension. However, waist circumference showed no statistical association ($p=0.094$) with hypertension in this study.

Findings of prevalence of hypertensive and pre-hypertensive cases and its associated risk factors in this study, indicates the necessity for primary and secondary prevention strategies for timely detection, treatment and control of hypertension. Further, detailed study focusing on important risk factors is of paramount importance especially in a resource poor setting like Nepal.

CONCLUSION

Although, it was previously considered that hypertension is more common in developed countries, the scenario is not the same in present context, as the prevalence of hypertension is high even in developing countries like Nepal. This study conducted in a sub urban area also reveals high prevalence of hypertension and is significantly correlated with age, gender, family type, comorbidities, presence of diabetes mellitus, smoking habits, alcohol intake, habit of adding salt, BMI and waist/hip ratio. Besides, the number of people in pre-hypertension stage is quite alarming as they may turn into the hypertensive cases very soon, if prompt preventive measures are not implemented. This points the need for

screening program at large scale to identify hypertensive cases left undiagnosed in community. Further, informative health education programmes regarding the preventive measures should be started focusing these population to aware them about burden of hypertension. This strategy will not only curtail the risk factors of hypertension but eventually it will prove beneficial for controlling other chronic non communicable diseases as well.

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