Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in South-eastern Nepal: A cross-sectional study

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Abstract

Background: Hypertension is one of the major risk factors for the rising burden of cardiovascular diseases (CVDs) in developing region. It has also been recognized as one of the major public health problems in the developing countries since the early seventies and the rate is increasing not only in urban areas but in rural areas with low socio-economic condition.

Methods: A cross sectional study was conducted in Jogidaha Village Development Comittee(VDC) and Triyuga Municipality of Udaypur district of South-Eastern Nepal. A total of 430 participants of age 18-59 years were selected. Semi-structured questionnaire (WHO NCD STEPS instrument) was used to collect information on demographic variables and associated risk factors with use of show cards. Clinical and anthropometric measurement were done. Primary outcome was prevalence of hypertension. Bivariate and multivariate analysis were performed to show strength of association among various risk factors with hypertension.

Results: The prevalence of hypertension was found to be 25.1%. Prevalence of overweight and obesity was found to be 49.8%. Hypertension was significantly associated with age (AOR=1.09, CI=1.05-1.10) and gender (male >female; AOR= 2.12,CI =1.22-3.68). Similarly, increased waist-hip ratio(7.12; CI 2.87-17.67),alcohol consumption(OR=2.82, CI=1.77-4.52), and use of tobacco products (OR =1.8,CI=1.02-3.20) showed significant association with hypertension.

Conclusion: There is high prevalence of hypertension in rural districts of South-Eastern Nepal. A community-based preventive approach with early detection and treatment and life-style modification is needed to reduce the burden of disease and make sustainable changes.

Keywords: Hypertension, Risk factors, Rural Nepal.

Introduction

Hypertension (HTN) among cardiovascular diseases (CVDs) is one of the major components of non-communicable disease and is emerging as a major health problem throughout the world.[1] About 1/4th adults worldwide are estimated to have high blood pressure.[2] It is expected that non-communicable diseases will account for 7 out of every 10 deaths in the developing country with respect to half at present.[3] Hypertension is one of the major risk factors for the rising burden of CVD in developing region. It has also been recognized as one of the major public health problem in the developing countries since the early seventies.[4] The silent killer has a potential contribution for heart attacks, strokes and kidney failure.[5] A study revealed that 69% of people who had a first heart attack and 77% of people who had a first stroke had co-existence of high blood pressure.[6] Similarly, hypertensive persons are more predisposed to develop to a modern day epidemic, diabetes.[5]

20

Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in
South-eastern Nepal: A cross-sectional study

The early systemic HTN study in Nepal was done in early eighties by Mrigendra Samjhana Medical Trust. [7] The then used World Health Organization (WHO) criteria (160/95mmHg) were used to diagnose HTN.[8] The prevalence of HTN at that period in different sector of the country was found to be 5.3% in mountains, 6% in rural Kathmandu, 8.1% in terai plains and 9.9% in urban Kathmandu.[7] Similarly study done by Vaidya et al. in Dharan municipality of Eastern Nepal showed the prevalence of HTN to be 22.7%.[9] Studies had shown that the prevalence of HTN in adult population was around 20% in urban population.[10] Survey done in the Sunsari district of eastern Nepal in the early nineties showed the prevalence of HTN to be 5.1% in adult.[11] A study done by author himself in 2012 among industrial workers in the eastern Nepal showed the prevalence of HTN to be 33.6%.[12] The rate of hypertension and its complications are decreasing in developed countries whereas it is increasing in developing countries. [13-16] Although hypertensive illness is more prevalent in urban areas; it is also seen in people of rural areas with low socioeconomic condition.[16-17]

However, awareness, treatment and control rates are very poor[18] among the people of rural South-eastern Nepal. This study aims to estimate the prevalence and associated risk factor of hypertension among people of age group of 18-59 at in Udayapur district in Sagarmatha zone of southeastern Nepal.

Materials and methods

A cross sectional study was conducted in Jogidaha VDC and Triyuga municipality in Udaypur district of South-Eastern Nepal from 27th November -10th December 2016. Jogidaha VDC has 9 wards, with population of 6,665 and 1,451 household and Triyuga municipality has 17 wards with population of 70,000 and 15,926 household and is the largest municipality of Udaypur district. All the residents of Jogidaha VDC and Triyuga municipality in Udayapur district of age 18-59 years were taken as a sampling frame. We randomly selected 4 wards from both the study site and went to individual houses and performed convenient sampling. In case where more than one member of the age group were present in the household, we selected the youngest member of the family. In case of a diagnosed case of HTN in that family, we prioritized hypertensive cases for assessment.

Individuals of age 18-59 years, residing in Jogidaha VDC and Triyuga municipality of Udayapur district of South-Eastern Nepal were included in the study. Those who were pregnant, mentally disabled, and who refused to give consent were excluded from the study.

Sample Size

In a similar study from the available literature,[19] the prevalence of hypertension in age group ≥18 was 20.4%. Taking Permissible Error (PE) at 20%, the sample size (n) is 391. Considering 10% non-response rate the total sample size was taken 430.

$n = Z^2PQ/L^2$,
where P=20.4, Q= (100-20.4), L=20%*20.4
Therefore, we get, n=391
Adding 10% of calculated sample, we get, final sample size to be 391+40= 431~430

Methods of Data Collection

The data was collected using a semi-structured questionnaire that was used to elicit information from each study participant for the following variables:
(i) Socio-demographic characteristics such as age, ethnicity, marital status, education and occupation;

(ii) Lifestyle-related factors such as dietary habits, salt intake, physical activity, tobacco and alcohol consumption;
Each question was structured to gather as much information as possible without increasing the duration of the interview, which usually lasted about 30 minutes.

Blood pressure was measured with an aneroid sphygmomanometer. Participants were asked to sit quietly and rest for 15 minutes with legs uncrossed. Three readings of the systolic and diastolic blood pressure were obtained, which were taken at the start, at the middle and at the end of the interview (with at least 3 minutes rest between each reading). The mean of the second and third reading was calculated. Hypertension was defined as having systolic blood pressure ≥140 mm Hg and/ or diastolic blood pressure ≥90 mm Hg during the study, or being previously diagnosed as having hypertension determined by sighting documentation such as a treatment record book or by the history of the participant taking medicine for high blood pressure.[20]

Height was measured in meter. Standing height was measured with the subject standing upright. Heels were slightly separated touching the vertical board and the weight borne evenly on both feet. Heels, buttocks and scapulae were brought in contact with a vertical surface such as wall. The head was so positioned that the subject looked directly forwards with the Frankfurt plane (the line joining floor of external auditory meatus to the lower margin of orbit) and the bi-auricular plane being horizontal. The head piece was firmly kept over the vertex to compress the hair. The height was then recorded using measuring tape.[21]

Weight was taken using bathroom scale. The scale was kept on a flat surface and the subject was requested to step on it on bare feet without holding on to anything. It was validated on daily basis with known weights.[22]

Waist and hip circumferences were measured with the subject standing keeping arms by the sides and asked to breathe normally. The following points were marked on the right side: (i) the subcostal margin in the mid-axillary line, (ii) the highest point of the iliac crest in the mid-axillary line. The center of these two points was marked. At this point the waist circumference was measured with a measuring tape. The measurement was made up to the nearest millimeter. Adequate care was taken to ensure that the subject was breathing normally at the time of measurement.[23] Hip circumference was measured at the level of the greater trochanters with the subject standing and breathing normally in a manner similar to that during measurement of the waist circumference. [23]

Analysis

All data were entered in Microsoft XP Excel spread sheet and converted into SPSS (Statistical Package for Social Sciences) Version 17 program for statistical analysis. Data was summarized using frequency distribution tables, cross tabulation, pie chart for presentation of data. The significance of proportion was used by examining Chi-square test. Multivariate analysis was done using logistic regression. The probability of significance was set at 5% level of significance at 95% confidence interval.

Ethical Consideration

This study was conducted after the approval of submitted proposal, by the Departmental Research Unit which is a part of Ethical Committee of BPKIHS. Approval for conducting the study was obtained after informed consent from the study participants.

Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in South-eastern Nepal: A cross-sectional study

21

Operational definition

Municipality: Municipality is town with a minimum population of 20,000 (10,000 for those within hilly regions) It has minimum annual income of NPR 40 lakhs, and is semi-urban area possessing electricity, road, drinking water, communication and similar other basic facilities.[24]

VDC: A village development committee (VDC) in Nepal was the lower administrative part of its Ministry of Federal Affairs and Local Development. Each district had several VDCs, similar to municipalities but with greater public-government interaction and administration. There are currently 3,157 village development committees in Nepal. Each VDC was further divided into several wards depending on the population of the district; the average being nine wards. The Village Development Committee (VDC) was dissolved on March 10, 2017 to be replaced by Gaunpalika (Rural-multiplicity).[24]

Janajati: Janajati/Adivasi is the collective term for the indigenous peoples of mainland South Asia and a large percentage of the Nepalese population. Population belonging to the ethnic minority belong to this group in Nepal. Ethnicity is based on the caste system. There are 120 castes and languages in Nepal. It is complex to analyze the caste and ethnicity and their independent effect on health.[25]

Disadvantaged Janjati: The relatively disadvantaged (Janjati) group includes the indigenous groups who are socially and economically marginalized.[26]

Relatively advantaged janjati: Those janjatis who are socially and economically benefited.

Upper caste group: The relatively advantaged category included Brahmin, Chhetri, Thakuri and Sanyasi castes. Ethnicity was based on the caste system. There are 120 castes and languages in Nepal. It is complex to analyse the caste and ethnicity and their independent effect on health.[27]

Professional and semi-professional: Professional-Involved in decision making process, policy, execution e.g. Doctors, senior administrative officers, senior lecturers, professors, college principles, advocates, estate planters, auditors, newspaper editors, expert musicians, architect, managing directors of industrial and business firms, managers etc. Semi-professional-Occupation requiring post high school or college education e.g. engineers, lecturers, insurance inspectors etc.

Skilled and semi-skilled: Skilled worker-Complicated work requiring long training e.g. carpenter, mason, mechanic, car driver, telephone operator etc. Semi-skilled worker-Work requiring some training e.g. assistant operator or electrician, factory workers, laboratory attendant, bookbinder, waiter or bearer, etc.[28]

Results

The mean age ± S.D. of the participants was 35.35±11.751 years with most of the participants (26.3%) falling under the age group of 18-25 years. Among them, 74.2% were female. Most of them (85.6%) were married. Around half of them (46.5%) came from upper caste groups while the least (2.1%) from relatively advantaged Janajati group. Similarly, around one-fourth (25.8%) had completed their secondary level education while only 13.7% were found to be illiterate. About 47.0% of the total participants

were unskilled workers while 25.3% were farmers, 14.0% were skilled and semi-skilled manpower, 7.2% were professional and semi-professional manpower and 6.5% were unemployed.

Table 1: Socio-demographic characteristics of the Participants (n=430):

Socio-demographic Characteristics	Frequency	Percentage
Age:		
i) 18-25	113	26.3
ii) 26-33	99	23.0
iii) 34-41	78	18.1
iv) 42-49	69	16.0
v) 50-59	71	16.5
Sex:		
i) Male	111	25.8
ii) Female	319	74.2
Marital status:		
i) Never married	49	11.4
ii) Married	368	85.6
iii) Others	13	3.0
Ethnicity:		
i) Dalit	27	6.3
ii) Disadvantaged janajati	164	38.1
iii) Disadvantaged non-dalit terai caste groups	20	4.7
iv) Religious minorities	10	2.3
v) Relatively advantaged janajati	9	2.1
vi) Upper caste groups	200	46.5
Education:		
i) Illiterate	59	13.7
ii) Informal education	83	19.3
iii) Less than primary school	24	5.6
iv) Primary school completed	93	21.6
v) Secondary school	111	25.8
vi) +2/PCL	47	10.9
vii) Bachelor and above	13	3.0
Occupation:		
i) Farmer	109	25.3
ii) Professional and semi-professional	31	7.2
iii) Skilled and semi-skilled	60	14.0
iv) Unemployed	28	6.5
v) Unskilled	202	47.0

Table 2: Behavioral risk factors of the Participants:

Behavioral Risk Factors	Frequency	Percentage
Current tobacco smokers: n=430		
vi) Yes	62	14.4
vii) No	368	85.6
Current smokeless tobacco users: n=430		
iii) Yes	83	19.3
iv) No	347	80.7
Average number of times smokeless tobacco used (per week): n=83		
iv) 0-50	64	77.1
v) 51-100	15	18.1
vi) >100	4	4.8
Ever consumed an alcoholic drink: n=430		
vii) Yes	110)	25.6
viii) No	320	74.4
An alcoholic drink within the past 12 months: n=110		
viii) Yes	93	84.5
ix) No	17	15.5
Consumed an alcoholic drink within the past 30 days: n=93		
vi)	68	73.1
vii)	25	26.9
Largest number of standard alcoholic drink on a single drinking occasion: n=65		
i) 1-10	38	58.5
ii) 11-20	20	30.8
iii) >20	7	10.7
Ate fruits in a typical week: n=430		
i) No fruits per week	247	57.4
ii) 1-2 days per week	63	14.7
iii) >2 days per week	120	27.9
Total servings of fruit: n=430		
i) 0 serving	247	57.4
ii) 1-2 servings	63	14.7
iii) >2 servings	120	27.9
Salt added before or during eating food: n=428		
i) Always	84	19.36
ii) Often	15	3.5
iii) Sometimes	54	12.6
iv) Rarely	72	16.8
v) Never	203	47.4
Salt added in cooking or preparing foods: n=430		
i) Always	417	97.0
ii) Often	13	3.0
Processed food high in salt: n=428		
i) Always	25	5.8
ii) Often	39	9.1
iii) Sometimes	162	37.9

Behavioral Risk Factors	Frequency	Percentage
iv) Rarely	108	25.2
v) Never	94	22.0
Too much salt in diet causes a serious health problem or not: n=430		
i) Yes	279	64.9
ii) No	76	17.7
iii) Don't know	75	17.4
Lowering of salt in diet: n=430		
i) Very important	73	17.0
ii) Somewhat important	107	24.9
iii) Not so important	170	39.5
iv) Don't know	80	18.6
Salt used: n=430		
i) Salt with two children logo	421	97.9
ii) Others	9	2.1
Amount of salt consumed: n=387		
i) <5 g/day/person	35	9.0
ii) >5 g/day/person	352	91.0
Vigorous-intensity activity: n=430		
i) Yes	128	29.8
ii) No	302	70.2
Number of days in a typical week involving vigorous-intensity activities: n=128		
i) 1 day per week	10	7.8
ii) 1-2 days per week	26	20.3
iii) >2 days per week	92	71.9
Moderate-intensity activity: n=430		
i) Yes	287	66.7
ii) No	143	33.3
Number of days in a typical week involving moderate-intensity activities: n=286		
i) <2 days per week	13	4.5
ii) >2 days per week	273	95.5
Time spent sitting or reclining in a typical day: n=430		
i) 0-6 hours	366	85.1
ii) >6 hours	64	14.9

While accessing the behavioral risk factors for HTN, it was found that only 14.4% were current tobacco smokers while 19.3% were current smokeless tobacco users, most of who (77.1%) used smokeless tobacco products 0-50 times per week. Only about 25.6% of the participants had ever consumed an alcoholic drink out of whom 84.5% had at least an alcoholic drink within the past 12 months while 73.1% had consumed an alcoholic drink within the past 30 days. Among the alcoholics within the last 30 days, the largest number of standard alcoholic drink on a single drinking occasion was found to be 1-10 (58.5%). About 57.4% used to eat no fruits at all in a typical week while 14.7% used to eat fruits on 1-2 days per week and 27.9% on >2 days per week. Out of the total 430 participants, only 27.9% used to have >2 servings of fruits. Most participants (47.4%) never added salt before or during eating food while 97.0% used to add salt while cooking foods. Only 5.8% of the participants always consumed processed food high in salt while 37.9% participants only sometimes

Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in South-eastern Nepal: A cross-sectional study

23

consumed such food items.

About 64.9% thought too much salt in diet could cause serious health problem while 17.7% thought otherwise and 17.4% had no idea about it. Most of them (39.5%) thought lowering of salt in their diet was not so important while only 17%, that is the least, thought it was very important. Almost all of them (97.9%) used salt with two children logo. Out of them, 91.0% consumed salt >5 gram/day while only 9.0% consumed <5 gram/day. Regarding physical activities, only 29.8% did vigorous-intensity activity, out of them, 71.9% did such activity >2 days in a typical week. Similarly, 66.7% used to perform moderate-intensity activity, out of them, 95.5% had been doing such activities >2 days in a typical week. Most of them (85.1%) spent less than 6 hours a day for taking rest while the remaining (14.9%) spent more.

Table 3: Physical parameters of the Participants:

Physical Parameters	Frequency	Percentage
BMI (for Asian population): n=430		
i) Underweight (<18.5 kg/m²)	56	13.0
ii) Increased but acceptable risk (18.5-23 kg/m²)	160	37.2
iii) Increased risk (23-27.5 kg/m²)	140	32.6
iv) Higher risk (>27.5 kg/m²)	74	17.2
Waist-Hip Ratio (male): n=111		
i) Normal (<0.9)	45	40.5
ii) Obese (≥0.9)	66	59.5
Waist-Hip Ratio (female): n=319		
i) Normal (<0.85)	134	42.0
ii) Obese (≥0.85)	185	58.0
JNC Classification: n=430		
i) Normal	203	47.2
ii) Pre-hypertension	159	37.0
iii) Hypertension stage 1	45	10.5
iv) Hypertension stage 2	23	5.3

While measuring the physical parameters, 13.0% were found to be underweight, 37.2% to have BMI under increased but acceptable risk, 32.6% under increased risk and 17.2% under higher risk categories according to BMI for South Asian population.[29] Out of the 111 male participants, 59.5% were found to be obese while among 319 females, 58.0% were found to be obese. According to JNC-7 classification, 47.2% were found to have normal BP, 37.0% were found to be pre-hypertensive and 10.5% and 5.3% were found to be in stage 1 and 2 respectively.[30] The overall Hypertension cases(self-reported and measured) was found to be 25.1% as shown in figure 1.
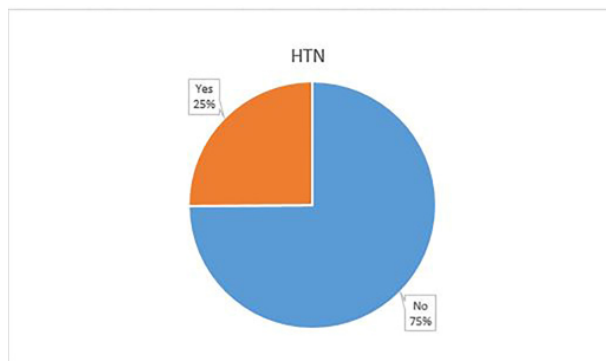

Figure 1: Prevalence of Hypertension (self-reported and measured) (n=430)

Taking the age group of 18-25 years as reference, the people falling under the age group of 26-33 years were 1.51 times more likely to develop HTN (OR=1.51, CI=0.54-4.23). However, it is found to be statistically insignificant. Likewise, the people falling under the age group of 34-41 were 8.02 times more vulnerable to develop hypertension than the reference age group (OR=8.02, CI=3.27-19.64), while those of 42-49 years age group were likely to develop HTN by 13.10 times (OR=13.10, CI= 5.33-32.19) and those of 50-59 years age group by 13.15 times (OR=13.15, CI=.37-32.21). Males were 3.29 times more likely to develop HTN than females (OR=3.29, CI=2.06-5.26). Also, current tobacco smokers were more prone to developing HTN than non-smokers by 1.8 times (OR=1.8, CI=1.02-3.02).

Likewise, current smokeless tobacco users were 2.93 times more likely to develop HTN than non-users (OR=2.93, CI=1.76-4.85). Those who had ever consumed an alcoholic drink were more likely to develop HTN by 2.82 times (OR=2.82, CI=1.77-4.52). Obese males were more likely to develop HTN by 7.12 times (OR=7.12, CI=2.87-17.67). Similarly, obese females were more likely to develop HTN by 2.55 times (OR=2.55, CI=1.35-4.80).

Table 4: Association of various Risk factors with hypertension (n=430):

Variables	Hypertension			Odd's Ratio	Confidence Interval (CI)
	Yes No		Total		
Age:					
i) 18-25	7 (6.2)		106 (93.8)	113 (100)	1	
ii) 26-33	9 (9.1)		90 (90.9)	99 (100)	1.51	0.54-4.23
iii) 34-41	27 (34.6)		51 (65.4)	78 (100)	8.02	3.27-19.64
iv) 42-49	32 (46.4)		37 (53.6)	69 (100)	13.10	5.33-32.19
v) 50-59	33 (46.5)		38 (53.5)	71 (100)	13.15	5.37-32.21
Sex:					
i) Female	60 (18.8)		259 (81.2)	319 (100)	3.29	2.06-5.26
ii) Male	48 (43.2)		63 (56.8)	111 (100)		
Current tobacco smokers:					
i) No	86 (23.4)		282(76.6)	368 (100)	1.80	1.02-3.20
ii) Yes	22 (35.5)		40 (64.5)`	62 (100)		
Current smokeless tobacco users:					
i) No	72 (20.7)		275 (79.3)	347 (100)	2.93	1.76-4.85
ii) Yes	36 (43.4)		47 (56.6)	83 (100)		
Ever consumed an alcoholic drink:					
i) No	63 (19.7)		257 (80.3)	320 (100)	2.82	1.77-4.52
ii) Yes	45 (40.9)		65 (59.1)	110 (100)		
Waist-Hip Ratio (male):					
i) Normal	8 (17.8)		37(82.2)	45 (100)	7.12	2.87-17.67
ii) Obese	40 (60.6)		26 (39.4)	66 (100)		
Waist-Hip Ratio (female):					
i) Normal	15 (11.2)		119 (88.8)	134 (100)	2.55	1.35-4.80
ii) obese	45 (24.3)		140 (75.7)	185 (100)		

Table 5: Multivariate analysis of association between various risks factors and Hypertension:

Significant Variables*	Significant Values	AOR	95% CI
i) Age	0.000	1.09	1.05-1.10
ii) Sex	0.008	2.12	1.22-3.68

*Adjusted for age, sex, current smoker, smokeless tobacco

Binary logistic regression showed that as age increases, there is an increased risk of developing hypertension by 1.09 time (AOR=1.09, CI=1.05-1.10). Similarly, males were more likely to develop hypertension compared to females by 2.12 times (AOR=2.12, CI=1.22-3.68).

Discussion

As per the cross sectional study done in South-Eastern Nepal, the prevalence of hypertension found was 25.1%.The association of behavioral risk factors, biological risks, physical and demographic variations were studied coherently. The outcome of the measured blood pressure (15.8%) in the study was in proximity to a similar study done by Dhungana et al, in a similar setting where the prevalence was found to be 12.3%.[31] However it showed variability with respect to a study done by Adhikari et al following the same study design, which showed the prevalence of 22.3% in the urban and rural settings of central Nepal.[32] Similarly, its prevalence was lesser than WHO (27.8%),[33] and NCD Steps Survey, 2013 (25.7%)[20,33] The inconsistency in the finding could be attributed to the predominance of the female participants in the survey, age variability and working population before comparing the outcomes. A uniform standard survey needs to be carried out to know the actual prevalence nationwide.

One of the known behavioral risk factors found in our survey population was smoking and alcohol consumption which was found to be 14.4% and 25.6% respectively. The findings of smoking was found to be in proximity with the data of similar study conducted by Aryal et al (19%)[34] and Nationwide NCD Risk Factor Survey,2013 (18.5%).[20] Similarly, the alcohol intake prevalence was(25.6%) comparable to the study done by Adhikari et al which is (24%).[32] but inconsequent with the STEPS survey 2013 which is (17.4%).[20] The inconsistency in our findings could be due to the variations in ethnic group, and the predominance of lower socioeconomic class people with 47% unskilled workers influencing the drinking practices.

The classification of BMI in our study was done following the Asian Classification,[35] according to which the prevalence of increased risk (BMI:23-27.5 kg/m2)and higher risk (BMI >= 27.5 kg/m2) was found to be 49.8%.The other study done by Dhungana et al in 2014 showed prevalence of overweight and obesity to be 37.4%,[31] that by Nationwide NCD Risk Factor

Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in
South-eastern Nepal: A cross-sectional study

25

Survey, 2013 25.6%,[20] Shrestha et al on 2014 to be 31.9%.[36] All of the studies show an increasing trend of BMI. However, most of the studies followed WHO classification unlike the Asian classification implemented in our study.

More than half (57.4%) did not take any fruits at all in a typical week.27.9% of the respondents had fruits on greater than two days of a typical week. Similar data was found showing the infrequent consumption of fruits in a study done by Dhungana et al which showed that 96.6% had less than five servings of fruits and vegetables per day.[31] Daily fruit consumption is less practiced in our setting and people consume fruits mostly during illness, fasting, and religious ceremonies.

The vigorous intensity of physical activity was carried out by 29.8% of respondents. This is in contradictory with NCD Steps Survey 2013 where 85.0% had high physical activity. This can be explained by the fact that NCD Steps Survey used MET minutes/week to classify physical activity which was not done in our study. This could be the possible limitation in our study.

Significant association was found with increasing age, gender (male >female; OR= 3.29, CI =2.06-5.26), tobacco smoker (OR =1.8 ,CI=1.02-3.20),smokeless tobacco users (OR=2.93, CI= 1.76-4.85), alcohol users (OR=2.82, CI=1.77-4.52), waist hip ratio (male : OR=7.12, CI=2.87-17.67; female: OR=2.55, CI=1.35-4.8) in bivariate analysis. After adjusting for potential confounder it was found that age and sex were found to be statistically significant. This could be co-related to the similar findings in study done by Shrestha et al and Koju et al.[1,36]

Policy and program implications

This study will add on the existing knowledge of hypertension studies done in different parts of Nepal. However, very few studies has been done in the rural setting of eastern Nepal. As per the new constitution of government of Nepal, country has been divided into seven provincial state and Udaypur district comes under province number 1. Hence, the present study will help the provincial Government to formulate better policy, awareness and treatment plan for control of hypertension in eastern Nepal.

Strengths

1. The study has followed a validated questionnaire based on the WHO NCD STEPS instrument version 2.2. So, the study has a standardized approach in data collection.
2. The study was carried out in rural setting in order to find the risk factor for cardiovascular disease and HTN in rural areas.
3 Show cards have been shown to the participants while filling the questionnaire to avoid discrepancies in data collection.

Weaknesses

1. The study was carried out in only two VDCs so it may not be a representative of the general population of Udayapur district.
2. The results of this study cannot be generalized to individuals older than 60 years in whom the risk factor as well as disease burden is higher than that reported in this population.
3 Information bias by the informants on the consumption of alcoholic beverages, fruits, vegetables and their daily activities.
4 The study might have encountered higher number of house maker (females) and missed the working population as time for data collection was 9am-3pm (i.e., office/working hours).

Limitations

1. Biochemical assessment: Blood sugar, Total cholesterol, triglycerides, HDL and LDL were not done.
2. Only self-reported hypertension cases were taken into considerations in order to find out the true picture of diagnosed as well as undiagnosed hypertension. Self-reported hypertension cases may already had altered their risk behavior which may not give a true picture of associated risk factors for hypertension.
3 The study population may not be a complete representative of all the people of Udayapur district.

Conclusion

The prevalence of hypertension in Udaypur district of South-Eastern Nepal was found to be high. Similarly the associated risk factors such as smoking, alcohol, and smokeless tobacco was consumed by higher proportion of the participants. Although the result of the study could not be generalized to whole of the population in Udaypur Districts, it represents similar kind of disease burden and its associated risks factors. Newly formed provincial government should urgently reform policy to aware and treat this emerging problem.

Abbreviation

PAF: Population Attributable Factor, DALYs: Disability adjusted life years, VDC: Village Development committee, CVD: Cardio-vascular Disease, HTN: Hypertension, WHO: World Health Organisation, BPKIHS: B.P Koirala Institute of Health Sciences PCL: CI: Confidence Interval OR: Odd ratios NCD: Non-communicable Disease BP: Blood Pressure BMI: Basal Metabolic Index, AOR: Adjusted Odds Ratio, PE: Permissible Error, SPSS: Statistical Package for Social Sciences, SD: Standard Deviation, JNC: Joint National Committee, HDL: High Density Lipoprotein, LDL: Low Density Lipoprotein

Competing interests: None

Authors' contributions

PP, DY and JT made substantial contributions to the conception or design of the work or the acquisition, analysis, and interpretation of data for the work. NT and PS revised the work critically. NJ, BA, UP gave final approval for publication. Editing on introduction was done by NK, SKY. Research question was generated by AC. Aims and objectives was created by SS. Materials and methods written by JT. Results were analyzed by ST. Discussions generated by AS, PP. Strengths, weaknesses and limitations written by RS and AD. Final check was done by PP.

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