Prevalence of Hypertension and Diabetes and Their Risk Factors among Rural Populations of Uttarakhand

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Abstract

Background: *Among the most common chronic non-communicable diseases worldwide, hypertension (HT) and Type 2 Diabetes mellitus (DM) are increasingly becoming a matter of public health importance. Limited studies on the prevalence of HT and DM have been performed in rural hilly regions of Uttarakhand state.*
Objectives: To estimate the prevalence of HT and DM and their association with some selected risk factors among adults in rural hilly areas of Uttarakhand.

Method*: The cross-sectional study was carried out from June 2014 to August 2014 with a randomly selected sample of 401 adults in hilly region of Nainital & Almora Districts of Uttarakhand. Demographic, anthropometric measures and lifestyle factors were obtained for all participants with the help of predesigned and pretested interview schedule. A subject with recorded systolic blood pressure of ≥ 140 mmHg or diastolic blood pressure of ≥ 90mmHg was considered hypertensive. Screening for DM was based on the following World Health Organization (WHO) criteria. Bivariate analysis was used to identify the association.*

Results*: The mean age of the study population was 46.6 years ± 16.1 years. Mean BMI of the participants was 22.7 ± 4.8. It was found that 27.7 per cent of the subjects were current tobacco users while 24.7 per cent were current alcoholic. The overall prevalence of HT and DM were 31.4% and 4.7% respectively. About 2.5% of the study subjects were suffering from both HT and DM. The risk factors for HT in this study included age, BMI, vegetarian diet and increase salt intake. Age was found to be a significant risk factor for DM in the present study.*

Conclusion*: A high prevalence of HT and DM in rural hilly areas of Uttarakhand need community outreach campaigns regularly for their early detection & proper health education.*

Keywords*: Hypertension, Diabetes, Prevalence, Risk factors, Adult*

1. INTRODUCTION

A total of 56 million deaths occurred worldwide during 2012. Of these, 38 million were due to Non-Communicable Diseases (NCDs).[1] Cardiovascular diseases, chronic obstructive pulmonary disease, cancer and diabetes mellitus (DM) were responsible for 82% of NCD deaths. Hypertension (HT) is an independent risk factor for cardiovascular disease and is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke.[2] Global prevalence of HT is about 40%.[3] HT is reported to be the fourth contributor to premature deaths in developed countries and the seventh in developing countries. The prevalence of HT is rapidly increasing in developing countries and it is rapidly becoming one of the leading causes of death and disability.

In India, the review of epidemiological studies suggests that the prevalence of HT has increased in both urban and rural subjects and presently is 25% in urban adults and 10-15% among rural adults.[4] WHO estimated the prevalence of DM in India in 2014 is 7.8%.[1] The prevalence of type 2 DM has risen from 1.2% to 11% over last three decades.[5] This growing prevalence is of great concern because of high morbidity and mortality and the cost associated with the treatment of the complications of diabetes.[6] A patient who suffers from type 2 DM has a 2 to 4 times greater risk of death from cardiovascular causes than the patient without DM. Four common risk factors for NCDs include alcohol, physical inactivity, tobacco and unhealthy diet. Limited studies have been conducted to explore the extent of HT and DM as well as their risk factors in hilly rural areas of Uttarakhand. With this background this study was planned in Nainital and Almora district of the state with the objective to estimate the prevalence of HT and DM and their association with some

selected risk factors among adults in rural hilly areas of Uttarakhand.

2. MATERIALS AND METHODS

The cross-sectional study was carried out from June 2014 to August 2014 in hilly region of Nainital & Almora Districts of Uttarakhand. In the first stage 12 Hilly Rural Census Block was selected from Census Blocks of Nainital & Almora District. In the second stage one village were selected from each Census block by simple random sampling. In selected villages subjects of 18 years and above were screened for HT & DM. Sample size was calculated to be 403 taking the prevalence of diabetes as 20 per cent based on the previous study, relative precision as 20% and considering sample wastage of 5%. So, within each selected village, we randomly selected 34 subjects except one village where only 29 subjects were selected. Of 403 study subjects, 2 participants were excluded from the study because lack of basic information and thus, 401 participants with all records were included in the study.

The participants were explained the objective of the study and an informed verbal consent was taken from each of the participants. Socio-demographic characteristics, lifestyle factors and other relevant information related to HT and DM like age, sex, pattern of salt intake, physical activity (30 min for more than three times per week), tobacco, alcohol, vegetable and fruits were obtained from the study subjects by interviewing them with the help of predesigned and pretested interview schedule.

A subject with recorded systolic blood pressure of ≥ 140 mmHg or diastolic blood pressure of ≥ 90mmHg was considered hypertensive. The blood pressure for each participant was measured using the auscultatory method with a standardized calibrated mercury column type sphygmomanometer in sitting position. Following a standardized protocol, two separate measurements were taken and the average of the two measurements was recorded after proper rest.[7] Screening for DM was conducted using capillary blood glucose measurement using glucometers, glucose strips and lancets. The first blood drop was discarded and the second drop was collected on the test strips and analyzed. Screening for DM was based on the following World Health Organization (WHO) criteria: A fasting blood sugar level 126 mg/dl or above and a random blood sugar level of 200mg/dl or above was considered diabetic.

Obesity was categorised according to Body Mass Index (BMI) criteria for Asian taking BMI <18.5 as underweight, 18.5-22.9 as normal, 23 to 24.9 as pre-obese and ≥ 25 as obese.[8] Weight of participants was measured using standard technique with a weighing machine having an accuracy of 0.1 kg. Height was measured in a standing position with shoes removed by using a wall mounted measuring tape. Current tobacco user was defined as a subject who used it in any form or one who had left it less than one year back. A non-tobacco user was defined as one who had never consumed it in his lifetime or one who had left it at least one year back. Similarly a current alcoholic was defined as a subject who consumed any amount of alcohol at least once in a week and/or one who had left alcohol consumption less than one year back. On the other hand, a non-alcoholic was defined as one who had never consumed alcohol in his lifetime or one who had left alcohol consumption at least one year back. The salt intake was calculated by asking for the average monthly consumption of salt by the whole family and dividing it by the number of persons in the family and then dividing it by 30 to calculate the average daily intake in g/person/day.[9] The JNC-7 has recommended a daily intake of salt of no more than 100 mEq/L, which is equivalent to 6 g/day of sodium chloride or 2.4 g/day of sodium.[10] Salt intake was thus classified into two groups, normal ≤ 6 g/day and increased >6 g/day.

SPSS version 22 was used to analyse the data. The results were presented in form of frequency and proportion. Bivariate analysis was used to identify the significant association between the characteristics and normal blood pressure, hypertension, non-diabetic and diabetic. The study was approved by the Ethics Committees of Government Medical College, Haldwani, Nainital, Uttarakhand.

3. RESULTS

Table 1 shows the demographic, anthropometric measures, lifestyle factors and morbidity of the study participants. The mean age of the study population was 46.6 years with a standard deviation of 16.1 years. Mean BMI of the participants was 22.7 ± 4.8. The mean systolic and diastolic pressure of the respondents were found to be 126 ± 20.6 and 79.8 ± 12.2 respectively. Approximately half and half of the study subjects represented male and female respectively. It was found that 27.7 per cent of the subjects were current tobacco users while 24.7 per cent were current alcoholics. About two third of the participants 140 (34.9%) had reported that they were doing regular exercise. Almost 40% of the subjects had salt consumption > 6gm/ day. It was found that about 42% of the subjects were strict vegetarian while rest 58% were consuming mixed food. Only 14% of the respondents were consuming fruits daily. Participants with normal BMI constituted only 36.2% of the total sample while participants with underweight, overweight and obese constituted 19.5%, 13.7%, and 30.7% respectively. The overall prevalence of HT and DM were 31.4% and 4.7% respectively.

Table 1: Characteristics of the study subjects (n=401)

Characteristics	Mean	SD
Age (years)	46.6	16.1
Weight (kg)	57.4	12.3
Height (cm)	158.5	12
Body Mass Index (BMI)	22.7	4.8
Systolic blood pressure (mmHg)	126.6	20.6
Diastolic blood pressure (mmHg)	79.8	12.2
Sex	Number	Percent

Male	201	50.1
Female	200	49.9
Current tobacco users		
No	290	72.3
Yes	111	27.7
Current alcohol drinking		
No	302	75.3
Yes	99	24.7
Physical activity		
No	261	65.1
Yes	140	34.9
Food habit		
Mixed	233	58.1
Vegetarian	168	41.9
Fruit intake		
Daily	56	14.0
Occasionally	345	86.0
Salt intake per day		
Normal	241	60.1
Increased	160	39.9
Body Mass Index for Asians		
Underweight (<18.5)	78	19.5
Normal (18.5 to 22.9)	145	36.2
Overweight (23 to 24.9)	55	13.7
Obese (≥ 25)	123	30.7
Blood pressure		
Normal	275	68.6
Hypertension	126	31.4
Blood glucose		
Normal	382	95.3
Diabetic	19	4.7
Prevalence of combined hypertension & diabetes mellitus	10	2.5

About 2.5% of the study subjects were suffering from both HT and DM. Out of 19 diabetic subjects, 10 (52.6%) were hypertensive while of 126 hypertensive participants, 10 (7.9%) were diabetic and this was found to be statistically significant.

In Table 2, findings show that age and BMI were significantly associated with hypertension (p=0.001). The bivariate analysis shows that, females were less hypertensive than male which was found insignificant (p=0.2).

Table 2: Bivariate analysis of Risk factors of hypertension

Characteristics	Hypertension Present		OR (95%CI)	P value
	No (n=275)	Yes(n=126)		
	No. (%)	No. (%)		
Age (years)			**1.04 (1.02 to 1.05)**	**0.001**
Body Mass Index (BMI)			1.02 (1.12 to 1.18)	0.001
Sex				
Male	133 (66.2)	68 (33.8)	1.2 (0.8 to 1.9)	0.29
Female	142 (71.0)	58 (29.0)	1	
Current tobacco users				
No	195 (67.2)	95 (32.8)	1	
Yes	80 (72.1)	31 (27.9)	0.8 (0.5 to 1.2)	0.3
Current alcohol drinking				
No	205 (67.9)	97 (32.1)	1	
Yes	70 (70.7)	29 (29.3)	0.8 (0.5 to 1.4)	0.5
Physical activity				
No	174 (66.7)	87 (33.3)	0.7 (0.5 to 1.2)	0.2
Yes	101 (72.1)	39 (27.9)	1	
Food habit				
Mixed	170 (73.0)	63 (27.0)	1	
Vegetarian	105 (62.5)	63 (37.5)	1.6 (1.05 to 2.4)	0.02
Fruit intake				
Daily	41 (73.2)	15 (26.8)	1	
Occasionally	324 (67.8)	111 (32.2)	1.2 (0.6 to 2.4)	0.4
Salt intake per day				
Normal	179 (74.3)	62 (25.7)	1	
Increased	96 (60.0)	64 (40.0)	1.9 (1.2 to 2.9)	0.003

The Odds of consuming tobacco and alcohol amongst hypertensive participants were 0.8 (0.5-1.2) and 0.8 (0.5-1.4) respectively as compared to normotensive. Hypertension was found to be more prevalent in vegetarian (p=0.02) and among those who consumed fruits occasionally (p=0.4). Those who consumed increase salt intake were 1.9 (1.2 to 2.9) times more likely to be hypertensive as compared to those who consumed normal salt.

Table 3 shows that the age was significantly associated with diabetes (p=0.001). BMI showed the marginal association with diabetes (p=0.06). Current alcohol consumption (p=0.07), current tobacco use (p=0.5), physical activity (p=0.4) and increase salt intake (0.7) were negatively associated with diabetes and all were found statistically insignificant. The Odds of consuming vegetarian food and occasional fruits amongst diabetic participants were 1.2 (0.5-3.1) and 3.2 (0.3-23.0) respectively as compared to nondiabetic.

Table 3: Bivariate analysis of Risk factors of diabetes

Characteristics	Diabetes Present		OR (95%CI)	P value
	No (n=382)	Yes (n=19)		
	No. (%)	No. (%)		
Age (years)			**1.05 (1.02 to 1.08)**	**0.001**
Body Mass Index (BMI)			**1.08 (0.9 to 1.1)**	**0.06**

Sex				
Male	195 (97.0)	06 (3.0)	0.4 (0.2 to 1.1)	0.1
Female	187 (93.5)	13 (6.5)	1	
Current tobacco users				
No	275 (94.8)	15 (5.2)	1	
Yes	107 (96.4)	04 (3.6)	0.6 (0.2 to 2.1)	0.5
Current alcohol drinking				
No	284 (94.0)	18 (6.0)	1	
Yes	98 (99.0)	1 (1.0)	0.6 (0.02 to 1.2)	0.07
Physical activity				
No	246 (94.3)	15 (5.7)	0.4 (0.15 to 1.4)	0.4
Yes	136 (97.1)	04 (2.9)	1	
Food habit				
Mixed	223 (95.7)	10 (4.3)	1	
Vegetarian	159 (94.6)	09 (5.4)	1.2 (0.5 to 3.1)	0.6
Fruit intake				
Daily	55 (98.2)	01 (1.8)	1	
Occasionally	327 (94.8)	18 (5.2)	3.2 (0.3 to 23.0)	0.2
Salt intake per day				
Normal	229 (95.0)	12 (5.0)	1	
Increased	153 (95.6)	07 (4.4)	0.8 (0.3 to 2.2)	0.7

4. DISCUSSION

Our results indicate that the prevalence of HT (31.4%) is high in a rural hilly area of Nainital and Almora district of Uttarakhand. Males show higher prevalence of HT 33.8% against 29% in females. The extent of problem of HT has been increasing in India. The findings concur this increasing trend with earlier studies. According to the WHO 214 estimates, the prevalence of raised BP in Indians was 22.9% (23.4.2% in men and 22.3% in women).[11] A study conducted at Jabalpur district of India, found the prevalence of HT as 14.8% in rural area.[12] In various studies conducted in rural areas of India the prevalence of HT found to be 38.5%, 33% and 19%. [13-15]

In the present study the prevalence of DM was found to be 4.7% with higher proportion in female (6.5%) as compared to male (3%). A study in Arunachal Pradesh revealed 19.78% prevalence of diabetes among the study participants.[15] According to the WHO 214 estimates, the prevalence of raised blood sugar in Indians was 7.8% (7.8% in men and 7.8% in women).[11] Men and women were almost equally affected with DM in other study.[16] Higher prevalence of DM among female in the present study might be due to increase in psychosocial stress among them. Overall prevalence of DM was found lower in comparison to the other parts of India. This might be due to more physical activity in the hilly regions as people need to move up and down the hills for their daily activities.

The risk factors for HT in this study included age, BMI, vegetarian diet and increase salt intake. Risk factors like tobacco, alcohol, physical activity and fruit intake are known to contribute to HT were found to be insignificant in our study subjects (Table2). Age and BMI were significantly associated with HT. Most of the studies agree with the fact that prevalence of HT increased with age and BMI. [13, 17-18]. High consumption of salt was found to be significantly associated with HT as was found in the present study. [19] Tobacco consumption was found to be significantly associated with HT in other studies. This was also revealed in the other studies.[13, 20-2] Study conducted among Muslim populations of Manipur also did not find smoking, alcohol use and gender difference any risk predictor of HT.[17] Alcohol consumption was not found to be significantly associated with high blood pressure in another study also.[13]

Age was found to be a significant risk factor for DM in the present study. BMI and alcohol consumption was also found marginally significant in our study sample (Table 3). In a study of rural population of Haryana, smoking and alcohol use were not found to be a risk predictor of DM. [23] Significantly higher blood pressure was observed in diabetics compared to non-diabetic participants in the present study. The prevalence of HT among diabetic participants was almost twice that of non-diabetic participants, which is similar to previous studies. [16, 22, 24]

Small sample size is the limitation of the study as many risk factors known to contribute to HT and DM were found to be insignificant.

5. CONCLUSION AND RECOMMENDATION

A high prevalence of HT and DM in rural hilly area of Uttarakhand need immediate action by the Government and health planners to prevent the rising trend of these Noncommunicable diseases in the state. Community outreach campaigns should be conducted regularly for early detection of HT and DM and for proper health education about the HT and DM and their complications.

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