**Original Article**

# BIO-SOCIAL FACTORS ASSOCIATED WITH HYPERTENSION IN HILLY POPULATION OF TEHRI GARHWAL

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**ABSTRACT**

**Background:** Hypertension is emerging as a major public health problem in India. The diversity and heterogeneity of distribution of the population makes it difficult to arrive at the precise prevalence. Cardiovascular and other chronic diseases are becoming the major causes of morbidity and mortality in India. Now it is found that prevalence of Hypertension also increasing in rural population[1]. Various risk factors namely age, smoking, salt intake, consumption of alcohol, B.M.I., Diabetes Mellitus are known to be risk factors for many such diseases. The present study was carried out to estimate the prevalence of Hypertension and to identify their biosocial correlates.

**Objectives:** 1.To determines the prevalence of hypertension in rural population.

2. To identify Bio-Social factors associated with hypertension.

**Study Design**: A clinic based study was conducted in Rural Health Training Centre, Block Kirtinagar, District Garhwal of Uttarakhand which is also the field practice area of Department of Community Medicine, V.C.S.G. Govt. Medical Science & Research Institute.

**Material & Methods:** All the patient attending the OPD were interviewed using pretested structured standard questionnaire. Two independent blood pressure reading were taken in sitting position. Hypertension was defined as Systolic blood pressure more than or equal to 140 mm Hg or Diastolic blood pressure more than or equal to 90 mm Hg or those individual currently taking antihypertensive treatment.

**Study Subjects:** A total 1250 rural inhabitant; 19 year and above were screened.

Out of which 562 were male & 688 were female.

**Study Period:** January to July 2011.

**Study Variable:** Age, Sex, Socio-economic status, Smoking, Alcoholism, BMI, Salt-Intake, Type of Family, Marital status, Literacy, Diabetes Mellitus, Family History, Occupation.

**Statistical Analysis:** Chi-Square test, Standard error of difference between two mean.

**Result & Conclusion:** Prevalence of Hypertension in rural population was 21.2%. Prevalence of Hypertension in male was 23.1% & in female it was 19.2%. Age, BMI, Salt-Intake, Smoking, Alcoholism, Diabetes Mellitus, Parental history were found to be significantly associated with hypertension.

**Key words: Hypertension, BMI, Body Weight**

## Introduction

Globally, hypertension is the third leading risk factor for poor health resulting in 13% of total deaths . A meta-analysis of data from India shows increasing prevalence of hypertension amongst the rural population. The prevalence of hypertension increased from 0.52% in 1960 to 7.08% in 1995. South-East Asians are at more risk of these diseases, probably because they have higher body fat deposit at a lower BMI when compared to their western counterparts (2). Epidemiological studies on hypertension are still very few. Hypertension leads to serious disabling consequences such as Stroke, Heart failure, Ischemic heart diseases & Renal Failure. Hypertension is a lifestyle disease can be due to physical inactivity, high salt intake, excess calories intake or substance abuse. Hence this paper is dedicated to examine the bio-social factors that may lead to high blood pressure.

## Material & Methods

A clinic based study was conducted to find out prevalence of hypertension and its various risk factors among adult aged 19 year and above of both residing in rural area of Kirtinagar block of Tehri-Garhwal District, Uttarakhand, the field practice area of V.C.S.G.Govt. Medical Science & Research Institute. The prevalence of hypertension in India is 25% in Urban and 10% in Rural area(3,4). The required sample size was 1241 based on the prevalence of hypertension 7.24% as reported by Todkar et al in rural Maharashtra study with 10% non response error.(4). Average new patient OPD load in RHTC is around 50.Due to limited manpower daily 10 subjects were interviewed. So every 5th patient was included in a systemic random manner. This study was carried out between January to July 2011. Persons of 19 year and above were interviewed and detailed information regarding age, sex, height, weight, educational status, occupation, type of family, marital status, smoking, alcoholism, salt intake, family history, socioeconomic status & diabetes mellitus was collected. Informed verbal consent was taken from each of the participants. A pre-tested structured questionnaire was used to elicit the information regarding biosocial factors.

Hypertension was defined as systolic blood pressure more than or equal to 140 mm Hg or Diastolic blood pressure more than or equal to 90 mm Hg or those individual currently taking antihypertensive treatment. A mercury sphygmomanometer was used for measuring blood pressure. Persons were made to be seated quietly for at least 5 minutes in a chair with feet on the floor and arm supported at heart level. An appropriate-sized cuff (cuff bladder encircling at least 80 percent of the arm) was used. At least two measurements were made. SBP was taken the point at which the first sound is heard (phase 1), and DBP at the point before the disappearance of sounds (phase 5). Average of these two readings was used in the present analyses (5,6,7).

Body weight was measured (to the nearest 0.5 kg) with the subject standing motionless on the weighing scale with feet 15 cm apart, and weight equally distributed on each leg. Height was measured (to the nearest 0.5 cm) with the subject standing in an erect position against a vertical scale of portable stadiometer and with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the bony orbit. Measurements of weight and height were taken and the body mass index (BMI) was calculated as kilograms / (height in meter) $^2$. Based on their BMI, individuals were classified into three

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groups: Low (BMI <18.5), Normal (BMI = 18.5-24.99Kg/m$^2$), Overweight (BMI >25Kg/m$^2$) as per WHO (8) Each weighing scale was standardized every day with a weight of 50 kg..

Modified B.J.Prasad classification was used for rural area Class 1,2,3,are grouped as upper Class 4,5 grouped as lower class.(8)

Smokers were defined as a person who was currently smoking at least once in a day or one who had left smoking less than one year back. Alcohol user was defined as currently consuming alcohol at least thrice in a week or one who had left alcohol less than one year back(9). The salt intake was calculated by asking for the average monthly consumption of salt by whole family and dividing it by the number of persons in the family and then further dividing it by 30 to calculate the average daily intake in g/person/day. The recommended daily intake of salt is not more than 6g/day. Salt intake was analyzed after dividing the subjects into those consuming <6g/day, 6-8g/day and >8gm/day (9).

Chi-square statistic was used to test for the independent distribution of hypertension among the various categories of study variables. Standard error of difference between two mean was used to compare continuous variable. The level of significance was set at p-value 0.05 or less.

## Results and Discussion

**Table-1 Mean SBP & DBP of the 1250 subjects studied.**

| | SBP Mean±SD | DBP Mean±SD |
|---|---|---|
| Male | 124.34±23.56 | 81.32±13.78 |
| Female | 120.89±22.45 | 79.54±12.50 |

**Table-2 Prevalence of Hypertension according to Age & Sex-.**

| Age Group | Male (%) | | Female (%) | | Total (%) | |
|---|---|---|---|---|---|---|
| | Hypertensive | Normotensive | Hypertensive | Normotensive | Hypertensive | Normotensive |
| 19-28 | 12(8.95%) | 122(91.05%) | 8 (3.94%) | 195 (96.06%) | 20 (5.93%) | 317 (94.07%) |
| 29-38 | 18(11.92%) | 133 (88.08%) | 11 (7.80%) | 130 (92.2%) | 29 (9.93%) | 263 (90.07%) |
| 39-48 | 23 (24.21%) | 72(75.79%) | 19 (19.19%) | 80(80.81%) | 42 (21.65%) | 152 (88.35%) |
| 49-58 | 27 (32.14%) | 57 (67.86%) | 40 (35.71%) | 72 (64.29%) | 67 (34.18%) | 129 (65.82%) |
| 59-68 | 26( 46.43%) | 30 (53.57%) | 24 (32.43%) | 50(67.57%) | 50 (38.46%) | 80(61.54%) |
| 69-78 | 18 (62.06%) | 11 (37.94%) | 22 (56.41%) | 17 (43.59%) | 40 (58.82%) | 28 (41.18%) |
| >79 | 06 (46.15%) | 07(53.85%) | 11(55.00%) | 09(45.00%) | 17 (51.51%) | 16 (48.49%) |
| Total | 130 (23.1%) | 432 (76.9%) | 135 (19.3%) | 553(86.92%) | 265 (21.2%) | 985 (85.07%) |

**Table-3 Prevalence of Hypertension according to BMI & Sex**

| | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| BMI | Hypertensive (%) | Normotensive (%) | Hypertensive (%) | Normotensive (%) | Hypertensive (%) | Normotensive (%) |
| <18.5 | 31 (22.62%) | 106(77.38%) | 21 (11.35%) | 164 (88.65%) | 52 (16.15%) | 270 (83.85%) |
| 18.5 – 24.99 | 79 (32.24%) | 268 (67.76%) | 73 (18.48%) | 317 (81.52%) | 152 (20.48%) | 585 (79.52%) |
| ≥25 | 20 ( 25.64%) | 58 (74.36%) | 41 (36.28%) | 72 (63.72%) | 61 (31.93%) | 130(68.07%) |
| Total | 130 (23.1%) | 432(76.9%) | 135 (19.3%) | 553 (70.7%) | 265 (21.2%) | 985 (78.8%) |

**Table-4 Prevalence of Hypertension according to Bio social factors**

| RISK FACTOR | | HYPERTENSIVE | NORMOTENSIVE | P Value, Chi square value, df |
|---|---|---|---|---|
| *AGE* | | | | |
| | 19-28 | 20 (5.93) | 317 | |
| | 29-38 | 29 (9.93) | 263 | |
| | 39-48 | 42(21.65) | 152 | P value=0.000* |
| | 49-58 | 67(34.18) | 129 | Chi square value=188,df=6 |
| | 59-68 | 50(38.46) | 80 | |
| | 69-78 | 40(58.82) | 28 | |
| | ≥79 | 17(51.51) | 16 | |
| *Gender* | Male | 130 (23.1) | 432 | P value=0.1310 |
| | Female | 135(19.3) | 553 | Chi square value=2.281,df=1 |
| *BMI* | <18.5 | 52(4.57) | 270 | |
| | 18.5 – 24.99 | 152(20.48) | 590 | P value=0.000* |
| | ≥ 25.0 | 61(31.93) | 130 | Chi square value=18.4,df=2 |
| *Salt Intake* | <6gm | 0(0) | 10 | P value=0.000* |
| | 6-8gm | 19(9.8) | 171 | Chi square value=16.9,df=2 |
| | >8gm | 229(21.96) | 814 | |
| *Alcoholic* | yes | 49(33.85) | 130 | P value=0.0290 |
| | No | 216(20.54) | 855 | Chi square value=4.767,df=1 |
| *Smoking* | yes | 55(28.06) | 141 | P value=0.0105 |
| | No | 210 (19.92) | 844 | Chi square value=6.550,df=1 |
| *Parental History* | | | | |
| | Yes | 56(28.6) | 141 | P value=0.0069 |
| | No | 209(19.85) | 844 | Chi square value=7.310,df=1 |
| *Diabetes Mellitus* | | | | |
| | Yes | 26(64.60) | 15 | Pvalue<0.0001 |
| | No | 239(20.43) | 1170 | Chi square value =57.56,df=1 |
| *Socio-Economic Status* | | | | |
| | High | 10(19.23) | 42 | P value =0.72 |
| | Low | 255(21.28) | 943 | Chi square value =0.126,df=1 |
| *Family Structure* | | | | |
| | Nuclear | 124(22.67) | 423 | P value =0.2623 |
| | Joint | 141(20.06) | 562 | Chi square value=1.257,df=1 |
| *Marital Status* | | | | |
| | Married | 189(20.34) | 740 | P value=0.2080 |
| | Others | 76(23.68) | 245 | Chi square value=.585,df=1 |
| *Literacy Status* | | | | |
| | Illiterate | 71(19.19) | 299 | |
| | Just literate | 24(19.83) | 97 | |
| | Primary | 38(21.35) | 140 | |
| | High school | 73(23.32) | 240 | P value=0.851 |
| | High secondary | 41(22.04) | 145 | Chi square value=1.98,df=5 |
| | Graduate & above | 18(21.95) | 64 | |
| *Occupation* | | | | |
| | Professional | 4(23.53) | 13 | |
| | Business | 26(26.53) | 72 | |
| | Employee | 40(23.26) | 132 | |
| | Skilled Labourer | 41(18.63) | 179 | P value=0.764 |
| | Semi skilled Labourer | 18(22.50) | 62 | Chi square value=4.14,df=7 |
| | Housewife | 82(19.43) | 340 | |
| | Student | 36(22.08) | 127 | |
| | Unemployed | 18(23.08) | 60 | |

*** P values <0.05 are significant.**

Patient attending the OPD of Rural Health Training Centre were included in the study. Total 1250 persons of 19 year and above were interviewed and detailed information regarding age, sex, height, weight, educational status, occupation, type of family, marital status, smoking, alcoholism, salt intake, parental history of hypertension, socioeconomic status & diabetes mellitus was collected. Informed verbal consent was taken from each of the participants. A pre-tested structured questionnaire was used to elicit the information regarding biosocial factors. Out of total study subjects 562 were male & 688 were female. The mean Systolic blood pressure in male was 124.34±23.56 & in female it was 120.89±22.45. The mean Diastolic blood pressure in male was 81.32±13.78 & in female it was 79.54±12.50.The difference in mean Systolic blood pressure (t value=2.6432,p value=0.0083) & mean Diastolic blood pressure was statistically significant (t value= 2.3914,pvalue=0.0169).

The prevalence of hypertension in the study population was found to be 21.2%. The prevalence of hypertension in male was 23.1% and in female it was 19.3% which was found to be statistically insignificant**.** Gupta et al (10) and Agarwal et al (11) reported higher prevalence in males than females but Malhotra et al (12), Goel et al (13) reported higher prevalence in male as compare to female. The age-wise distribution of study subjects along with prevalence in each group is shown in Table-3.The prevalence of hypertension was increased significantly with

increasing age. The lowest prevalence of hypertension was 5.93% in the age group of 19-28 years, and highest was 58.82% in the age group of more than 69 years. Highly statistically significant association ($p<0.001$) was observed between age group & hypertension. The similar findings have been reported by various studies in India and in other countries too e.g. Malhotra et al (12), Gupta et al (10), Agrawal (14), Deshmukh (16), Shrivastava (17).

There was tendency of increase in Blood Pressure with increasing BMI as shown by this study inTable-3. Prevalence of hypertension in persons having BMI <18.5kg was 16.15%; in male it was 22.62% & in female it was 11.35%. Prevalence of hypertension in persons having BMI 18.5-24.99 was 20.48%; in male it was 32.24% & in female it was 18.48%. Prevalence of BMI in persons having BMI >25 was 31.93%; in male it was 25.64% & in female it was 36.28%. The association between prevalence of hypertension and BMI was statistically significant. Similar finding were reported by Goel et al (13), Malhotra et al (12), Agrawal (14), Deshmukh (15), and Shrivastava (16).

In this study 4.08% study subjects were found with Diabetes Mellitus; of these 64.6% were having hypertension and 35.4% not having hypertension. Higher prevalence of hypertension was observed among study subjects with Diabetes Mellitus as compared with non-diabetics (Table-5). This association has been supported by various studies from India(4,9).

A positive association was observed between Alcohol Intake & development of hypertension. Higher prevalence of hypertension was observed; 33.85% among study subjects with history of alcohol consumption as compared with 20.54% no history of alcohol consumption (Table-3). The difference is statistically significant. Similar association was also observed by Todkar (9),Agrawal (14), Hazarika (17).

The prevalence of hypertension was 21.96 % in subjects consuming salt more than 8 gm/day which was higher as compare to those taking less than 8gm/dl (9.8%) and the difference was statistically significant. Salt intake was found to be a risk factor to cause hypertension (Table-3). Similar association between salt intake and hypertension was observed by Agrawal (11).

Prevalence of hypertension was higher in subjects having paternal history of hypertension as compared to subjects who did not have family history of hypertension (Table-5). The difference was statistically significant ($p<0.001$).

Prevalence of hypertension in subjects belonging to nuclear family was 22.67%. Prevalence of hypertension in subjects belonging to joint family was 20.06% (Table-3). The difference was statistically insignificant ($p>0.05$).

Prevalence of hypertension in married subjects is 20.34%. Prevalence of hypertension in subjects belong to other group is 23.68% (Table-3). The difference was statistically insignificant ($p>0.05$).

The difference was found statistically insignificant with regard to occupation, literacy status, Socioeconomic status ($p>0.05$) as shown in Table-3.

In Table-2 indicate that SBP and DBP levels in both men and women increased with advancing age. There was increase in mean arterial pressure with increasing Age.

Mean arterial pressure increased with increasing BMI & pattern was similar in both sexes (Table-3).

It was found that out of 265 hypertensive 12% were aware of their hypertension; all of those aware, only 21% were under treatment but among treated, only 8% had satisfactory control of their hypertension (i.e. Systolic BP <140 mmHg and Diastolic BP <90 mmHg).

As compare to other studies conducted in various part of rural India this study found fairly high prevalence of hypertension and this might be due to relative high proportion of geriatric population 12.49% which is high as compare to national average 6.9%.

**Conclusion & Recommendation–**

This study showed the prevalence of hypertension is 21.2% which is very high as comparison to other studies conducted in rural India. This is due to significantly high prevalence of Alcoholism, Smoking, High salt intake, relative high proportion of geriatric population (12.49%) (4,10,14).

Only 12% subjects were aware about hypertension. Out of diagnosed, the blood pressure was adequately managed in only 8% of subjects. This situation advocates the community based screening programme for hypertension & inclusion of blood pressure monitoring activity at sub-centre level. At the same time, health education should be directed to reduce the high salt intake, alcoholism & Smoking, maintenance of ideal body weight.

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