

## Distribution and Determinants of Hypertension in Field Practice Area of CMC&H Bungal Pathankot, Punjab, India

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### ABSTRACT

Blood pressure in a population follows Gaussian curve distribution with no real separation between normotension and hypertension.<sup>1</sup> Essential hypertension may be considered to be the result of interactions between genes and environment<sup>2</sup>. Important environmental factors are obesity, smoking, family history, physical inactivity, dietary excess of sodium and fat, high income with sedentary habits, education, occupation etc.<sup>3</sup>.

**Methods:** Present study is a cross sectional one, conducted in field practice area of Chintpurni Medical College & Hospital Bungal, Pathankot (CMC & H), Punjab (India). Criteria of Hypertension were defined using JNC7. It defines hypertension as blood pressure more than 140/90 mm of Hg. The data was collected during the month of October 2014, Results: Illiterate v/s education 12-16 years, prevalence was 57.05 % and 23.52% respectively ( $p=.0001$ , highly significant). In our study prevalence among students was lowest 6.89% and the house wives highest 52.17% ( $p=.008$ , highly significant). Similarly association with respect to education, occupation, monthly income, BMI, family history, table salt intake, non-vegetarian diet, smoking, etc. was highly significant ( $p<.01$  at 99% CI). JMS 2017; 20(1):31-37

**KEYWORDS:** Gaussian curve, cross sectional study, JNC 7, association, BMI.

### INTRODUCTION

Hypertension elicits iceberg phenomena. Only about half of the hypertensive subjects in the general population are aware of the condition, only half of those aware of the problem are being treated<sup>4</sup>. And only half of those treated take complete treatment<sup>5</sup>. Hypertension is the commonest cardiovascular disorder affecting at least 20% of adult populations in several countries. Although blood pressure is easily measurable, it has taken several decades to realize that hypertension is a frequent world -wide health disorder<sup>6</sup>. The prevalence of chronic diseases such as hypertension, diabetes mellitus, CHD etc., is showing a secular upward trend. The main factors responsible for this rising trend are changing life style, obesity, and behavioral pattern of people etc.<sup>7</sup>. The Joint National Committee reports emphasize on prevention, detection, evaluation and treatment of high

blood pressure (JNC VI & VII). Therefore this national guideline should serve as a tool to be adopted and implemented in local and individual situation<sup>8</sup>. It is one of the important risk factors for cardio-vascular mortality accounting for 20-30% of all deaths<sup>9</sup>. If this is the situation with highly developed medical services, the proportion treated in developing countries would naturally be far too less. One of the important elements in the hypertension control is early diagnosis. In the light of the above facts, the present study on hypertension and its risk factors among adults above 18 years of both sexes was conducted.

### METHODS

We studied distribution of hypertension by time (October 2014), place (field practice area of Chintpurni Medical College and Hospital, Bungal, Pathankot, Punjab India.) and person (participants above 18 years of age group). We studied determinants by socioeconomic status (on the basis of Kuppuswamy scale i.e. education, occupation & literacy), and touched other important risk factors like dietary habits, table salt intake, BMI, family history, smoking etc. Sample size was calculated by the formula:

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$N=4SD^2/E^2$  (source, Synedecor GW fifth edition p.512), with E (allowable error) of BP  $\pm 1$  mmHg. We calculated SD on the basis of pilot study in that area which came to 10.16 at 95% CI. As per statistical method of calculating sample size of continuous data our sample size came up to 412. But we studied a sample size of 612, 50% more than required, to be on the safer side of precision. Above 18 years age-group participants were included in our study sample. Only stable population was our study sample and labour - migrants, or any other outsiders were excluded from the study. All the houses were numbered and by systematic random sampling technique, a sample of 612 study subjects was selected for survey. Each participant was screened for hypertension through house-to-house visit. Sources of error observer's error (interpretation of korotokow sounds), instrumental error (leaking valve, in-adequate cuff) and subject error (circumstances of examination) were reduced as far as possible by adequate training of surveyors. Using palpatory and then auscultator method with a standardized calibrated mercury column type sphygmomanometer, two measurements of blood pressure (SBP & DBP) were taken (one in each arm) after subjects had been seated for 2 minutes, with feet on the floor and keeping the cuff at heart - level. "No talking policy" was adhered to strictly during the BP measuring process. The first and fifth Korotkow sounds were recorded. Blood pressure analysis was based on the mean of 2 readings. Hypertension was defined as blood pressure more than 140/90., or who were currently taking antihypertensive medication. Hypertension was diagnosed using the JNC 7 criteria: Optimal Blood Pressure : <115/80, Normal Blood Pressure : <120/80, Pre-Hypertension: 120-139/80-89, Stage 1 Hypertension: 140-159/90-99, Stage 2 Hypertension : >160/100.

Body mass index was calculated as weight in kilograms divided by height in square meters (wt. in Kgs/ht M<sup>2</sup>). Height was calculated by making the subject stand against a wall with feet parallel; heels, buttocks, shoulders and occiput touching the wall and the head kept horizontal in such a way so that lower boarder of the orbit is in line with the external auditory canal and foot-rule strictly touching highest part of head. Cloth tape was used for the purpose to the nearest 0.5 cms. Weight was measured by spring balance (standardized and zero error corrected) to the nearest 500 Gms. Socio- economic status was calculated on the basis of monthly income. Education was bifurcated as illiterate i.e. who can neither read nor write and uses thumb impression

for signatures, other education status was Below 12 years of actual schooling; Others 12-16 years of schooling or college and > 16 years including doctorate (table V). Occupation was considered as unemployed, housewife, student, unskilled worker, skilled worker, professional (doctor, engineer, teacher or professor, army or police, beurocrates, politicians etc.) Other variable under study were: smoking(never smoked, occasional smoker, ex-smoker and current smoker).Salt intake included: table- salt intake (included pickle), type of diet (vegetarian/ non-vegetarian) etc. Data was collected, summarized, expressed in tables & figure forms, and statistically analyzed using software SPSS version 17. The author himself reviewed the survey data to confirm that data was collected systematically and correct protocol of the study-design was strictly adhered to.

## RESULTS

Out of total 612 sample size 350 were normotensives and 262 hypertensive with category-wise distribution is depicted in figure 1 which showed a little skewing of Gaussian curve on the right side. Essential hypertension constituted 53.8% and secondary hypertension only 0.6% and 55.6% normotensives of the sample studied (Fig.2). The results of the determinants we have studied depicted that: education of the study population has highly significant association with hypertension. Illiterate had highest prevalence of 57.05% and 12-16 years education group-- the minimum of 23.52%;  $p = .0001$ , df 12 at 99.9 % CI, (Table I).

Association with occupation of the study group was also highly significant, house wives had highest, while students lowest prevalence, 52.17 and 6.89 % respectively, and  $p = .0001$ , df 24 at 1% level, (Table I). The association with family history of the hypertension has highly significant association,  $p < .0001$  at df 4 at 99% CI (Table 2). Similarly relationship with income was also highly significant  $p = .0001$ , df 12 at 99% CI. In our study, persons with per capita monthly income > 10,000 rupees showed prevalence of hypertension 74.41% and those less than 1000 it was 37.93; and other income groups 42.22 and 36.45% respectively (Table III). So far as Obesity is concerned, BMI 35-39.9 had prevalence of hypertension as 81.81% followed by BMI 25-29.99 depicting 61.61%. Association is highly significant,  $p = .0001$ , df 20 at 99.1% CI (Table IV). We studied the effect of table salt users /non users with hypertension and found table salt user and non-users were having hypertension: 63.49% and 37.97% respectively, the

relationship being highly significant  $p=.0001$ ,  $df4$  at 99.9% CI (Table V). In our study non-vegetarian and vegetarian were having prevalence 48.27% and 42.80% respectively and association with hypertension was highly significant,  $p<.001$ ,  $df 4$  at 1% level (Table V). In the present study, current smokers had higher frequency of hypertension

followed by occasional and ex-smokers; the association of smoking with Hypertension was also highly significant  $p=.0001$ ,  $df4$  at 99.9% CI (Table VI).

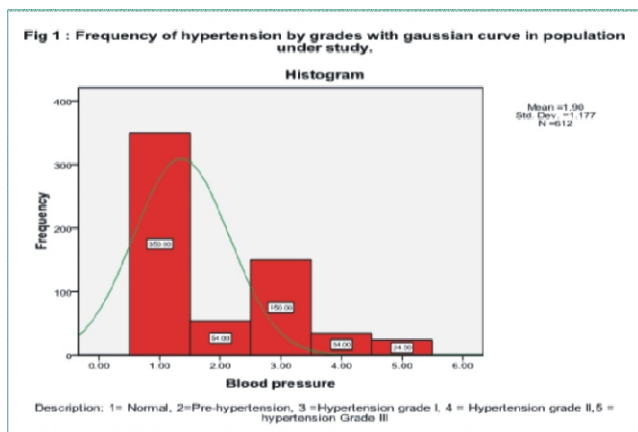


**Figure 2: Types of hypertension in study population**

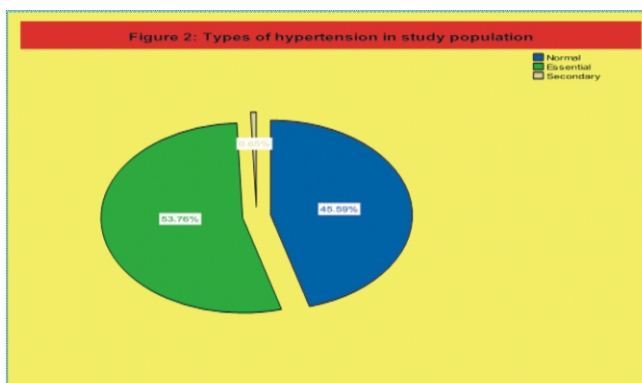


**Table I: Association of education and Occupation with hypertension**

|                    |             | Blood Pressure |                   |                  |                  |                  | Total |                                         |
|--------------------|-------------|----------------|-------------------|------------------|------------------|------------------|-------|-----------------------------------------|
|                    |             | Normal         | Pre-hyper-tension | Hyper-tension-G1 | Hyper-tension-G2 | Hyper-tension-G3 |       | Chi-Square Tests                        |
| <b>Education</b>   | Illiterate  | 149            | 32                | 124              | 26               | 14               | 345   | Value<br>82.85<br>At df 12<br>At 99% CI |
|                    | <12 years   | 163            | 14                | 22               | 8                | 8                | 215   | .0001<br>Highly significant             |
|                    | 12-16 years | 26             | 4                 | 2                | 0                | 2                | 34    |                                         |
|                    | >16 years   | 12             | 4                 | 2                | 0                | 0                | 18    |                                         |
| <b>Total</b>       |             | 350            | 54                | 150              | 34               | 24               | 612   |                                         |
| <b>Occupation:</b> |             |                |                   |                  |                  |                  |       | Value:                                  |
| Student            |             | 149            | 32                | 124              | 26               | 14               | 345   | 82.851                                  |
| Unemployed         |             | 163            | 14                | 22               | 8                | 8                | 215   | df 12                                   |
| House-wife         |             | 26             | 4                 | 2                | 0                | 2                | 34    | P< .001                                 |
| Unskilled worker   |             | 12             | 4                 | 2                | 0                | 0                | 18    | Highly                                  |
| <b>Total</b>       |             | 350            | 54                | 150              | 34               | 24               | 612   | significant                             |

**Table II: Blood pressure and its association with Family history**

| Chi-Square Tests                                                                       |                     |    |                       |                    |
|----------------------------------------------------------------------------------------|---------------------|----|-----------------------|--------------------|
|                                                                                        | Value               | df | Asymp. Sig. (2-sided) | Result             |
| Pearson Chi-Square                                                                     | 37.015 <sup>a</sup> | 4  | .000                  | Highly significant |
| Likelihood Ratio                                                                       | 37.617              | 4  | .000                  |                    |
| Linear-by-Linear Association                                                           | 24.335              | 1  | .000                  |                    |
| N of Valid Cases                                                                       | 612                 |    |                       |                    |
| a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.92. |                     |    |                       |                    |

**Table III: BP and its relationship with per capita monthly income**

| Count                                                                              |                     |        |                       |                  |                    |                  |       |
|------------------------------------------------------------------------------------|---------------------|--------|-----------------------|------------------|--------------------|------------------|-------|
|                                                                                    |                     |        | Blood pressure        |                  |                    |                  | Total |
|                                                                                    |                     | Normal | Pre-hyper-tension     | Hyper-tension-G1 | Hyper-tension-G2   | Hyper-tension-G3 |       |
| Monthly income INR                                                                 | <1000               | 0      | 2                     | 2                | 0                  | 0                | 4     |
|                                                                                    | 1000-4999           | 208    | 22                    | 88               | 14                 | 10               | 342   |
|                                                                                    | 5000-10,000         | 128    | 30                    | 56               | 20                 | 14               | 248   |
|                                                                                    | >10,000             | 14     | 0                     | 4                | 0                  | 0                | 18    |
| Total                                                                              |                     | 350    | 54                    | 150              | 34                 | 24               | 612   |
| Chi-Square Tests                                                                   |                     |        |                       |                  |                    |                  |       |
|                                                                                    | Value               | df     | Asymp. Sig. (2-sided) |                  | Result             |                  |       |
| Pearson Chi Square                                                                 | 30.900 <sup>a</sup> | 12     | .002                  |                  | Highly significant |                  |       |
| Likelihood Ratio                                                                   | 32.034              | 12     | .001                  |                  |                    |                  |       |
| Linear-by-Linear Association                                                       | .880                | 1      | .348                  |                  |                    |                  |       |
| N of Valid Cases                                                                   | 612                 |        |                       |                  |                    |                  |       |
| 9 cells (45.0%) have expected count less than 5. The minimum expected count is 16. |                     |        |                       |                  |                    |                  |       |

## DISCUSSION

In the present study under discussion the first variable under discussion showed that Education of the study subjects was highly significantly associated with hypertension (Table I). Pradeepa R, Reddy SS et al, Suwarna Madhukumar\*, et al, and Joshi et al agree to our findings.<sup>10,11,12</sup> So far as occupation is concerned, its association with hypertension in the present study showed: students, professionals and skilled workers were having lowest prevalence of hypertension and housewives, unemployed and unskilled workers the highest (Table I). Different studies have shown different results for the association of hypertension with profession. Prabhu GR et

al agree to us<sup>13</sup>, but on the contrary Padmavathi and Gupta<sup>14</sup> at Delhi, Gosh & Joshi et al<sup>15</sup> at Simla found that hypertension was more common in professional group as compared to unskilled and semiskilled groups, but Miall W.E et al<sup>16</sup> did not find any significant association between occupational status and hypertension. Probably, the level of occupation may materially affect physical activity and other aspect of life in relation to hypertension. Our study showed that Per-capita monthly income is directly related to high blood pressure - higher the monthly income higher the BP and vice-versa. Association is highly significant (Table III). Todkar SS et al and Jajoo UN et al agree with our study results<sup>17,18</sup>.

Table IV : BMI and its relationship with hypertension

|                                                                                         | Count               |        | Blood pressure        |                 |                    |                 | Total |
|-----------------------------------------------------------------------------------------|---------------------|--------|-----------------------|-----------------|--------------------|-----------------|-------|
|                                                                                         |                     | Normal | Pre-hypertension      | Hypertension-G1 | Hypertension-G2    | Hypertension-G3 |       |
| BMI                                                                                     | <18.5               | 6      | 4                     | 0               | 2                  | 0               | 12    |
|                                                                                         | 18.5-24.99          | 213    | 18                    | 60              | 16                 | 8               | 315   |
|                                                                                         | 25-29.99            | 99     | 24                    | 64              | 6                  | 10              | 203   |
|                                                                                         | 30-34.99            | 26     | 6                     | 12              | 10                 | 4               | 58    |
|                                                                                         | 35-39.99            | 4      | 2                     | 14              | 0                  | 2               | 22    |
|                                                                                         | >40                 | 2      | 0                     | 0               | 0                  | 0               | 2     |
| Total                                                                                   |                     | 350    | 54                    | 150             | 34                 | 24              | 612   |
|                                                                                         |                     |        |                       |                 |                    |                 |       |
| Chi-square                                                                              | Value               | df     | Asymp. Sig. (2-sided) |                 | Result             |                 |       |
| Pearson Chi-Square                                                                      | 82.381 <sup>a</sup> | 20     | .000                  |                 | Highly significant |                 |       |
| Likelihood Ratio                                                                        | 76.394              | 20     | .000                  |                 |                    |                 |       |
| Linear-by-Linear Association                                                            | 24.580              | 1      | .000                  |                 |                    |                 |       |
| N of Valid Cases                                                                        | 612                 |        |                       |                 |                    |                 |       |
| a. 14 cells (46.7%) have expected count less than 5. The minimum expected count is .08. |                     |        |                       |                 |                    |                 |       |

monthly income higher the BP and vice-versa. Association is highly significant (Table III). Todkar SS et al and Jajoo UN et al agree with our study results<sup>17,18</sup>.

Obesity is one of the risk factors for hypertension, and this has been observed in this study also, as increased BMI was resulting in hypertension in the selected subjects (Table IV). Friedman et al agree to our study. They revealed that hypertension and obesity are significantly associated<sup>19</sup>. So far as family history is concerned. In our study, family history is also significantly associated with hypertension (Table II). Lifton RP et al and Perusse L et al showed complete agreement to our results<sup>20,21</sup>. It is an open secret that high salt intake is associated with high blood pressure and our study agree with the voice of the people. The association is highly significant (table V). Association of type of diet and hypertension showed significant difference (Table V). C.L. Melby et al<sup>22</sup> agree to our findings. Only 16% of the VEGs were confirmed to be hypertensive as compared to 35.7% of the SEMIVEGs and 31.1% of the NONVEGs. Independent of differences in the VEGs had significantly lower concentrations of serum total cholesterol (STC), LDL-C, triglycerides, STC/HDL-C, and

LDL-C/HDL-C than the NONVEGs. The SEMIVEGs had lipid values intermediate to the VEG and NONVEG groups. In the present study smoking was highly significantly associated with hypertension (Table VI) our results are in agreement to united Nations study, where they showed that among hypertensives, smoking and tobacco chewers had important risk factor for the association of hypertension and the difference was statistically significant compared to non-smokers and non-tobacco chewers<sup>23</sup>. Studies done by Benovitz Neal L<sup>24</sup> observed that sodium absorption was higher (107 mmol/day) among persons who smoked cigarettes and chewed tobacco as compared to non-tobacco users. This increased sodium absorption in the body due to tobacco use and has got some role in association of hypertension.

The weakness of the present study was that of its cross-sectional nature which lacks depicting incidence and relative risk of hypertension and its trend in the community under survey. However we cannot undermine the merit of the study which showed association of different risk factors with hypertension and exposure rates for these variables.

Table V: Type of food taken, Table salt used and their co-relation with BP

| Crosstab             |     |                |                  |                 |                 |                 |       |                               |
|----------------------|-----|----------------|------------------|-----------------|-----------------|-----------------|-------|-------------------------------|
| Count                |     |                |                  |                 |                 |                 |       |                               |
|                      |     | Blood pressure |                  |                 |                 |                 | Total | Chi-square test               |
|                      |     | Normal         | Pre-hypertension | Hypertension-G1 | Hypertension-G2 | Hypertension-G3 |       | Value 21.352<br>At df 4       |
| <u>Table salt</u>    | yes | 57             | 14               | 46              | 14              | 4               | 135   | P .0001<br>Highly significant |
|                      | No  | 293            | 40               | 104             | 20              | 20              | 477   |                               |
| Total                |     | 350            | 54               | 150             | 34              | 24              | 612   | Value 18.794                  |
| <u>Diet:</u> Non-veg |     | 36             | 7                | 8               | 12              | 6               | 69    | Df 4                          |
|                      |     | 310            | 52               | 140             | 22              | 19              | 543   | P <.01                        |
| Vegetarian           |     | 346            | 59               | 148             | 34              | 25              | 612   | At 99% CI                     |
| Total                |     |                |                  |                 |                 |                 |       |                               |

Table VI: Association of smoking of the individual with Hypertension

| Crosstab |                |                |                  |                 |                 |                 |       |                                           |
|----------|----------------|----------------|------------------|-----------------|-----------------|-----------------|-------|-------------------------------------------|
| Count    |                |                |                  |                 |                 |                 |       |                                           |
|          |                | Blood pressure |                  |                 |                 |                 | Total | Chisquare                                 |
|          |                | Normal         | Pre-hypertension | Hypertension-G1 | Hypertension-G2 | Hypertension-G3 |       | Value 253.72                              |
| Smokers  | Never smoker   | 254            | 26               | 49              | 4               | 10              | 343   | At df 12<br>P .0001<br>Highly significant |
|          | Occasional     | 92             | 6                | 23              | 2               | 4               | 127   |                                           |
|          | Ex-smoker      | 2              | 0                | 2               | 0               | 0               | 4     |                                           |
|          | Current smoker | 2              | 22               | 76              | 28              | 10              | 138   |                                           |
| Total    |                | 350            | 54               | 150             | 34              | 24              | 612   |                                           |

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