# ORIGINAL ARTICLE

# Assessment of Risk Factors for the Development of Hypertension among Class Iii and Iv Employees of GMERS Medical College and General Hospital, Gotri, Gujarat.

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**ABSTRACT**

**BACKGROUND:** Hypertension is an 'iceberg' disease and it is one of the leading causes of global burden of disease approx. 7.6 million deaths. Early diagnosis and effective control of blood pressure can save hundreds of crores in costs and millions of people from subsequent morbidity, mortality and disability. Only a quarter of adults in India are aware of their BP status and the risk factors leading to development of the silent killer disease – hypertension. Class III and IV workers are more exposed to the modifiable risk factors such as smoking, chewing tobacco, alcohol, malnutrition and lack of exercise. **METHODS & MATERIALS:** A cross-sectional study was conducted among 289 class III and IV employees of GMERS Medical College and Hospital, Gotri. A pre designed case sheet was used to collect history of exposure to modifiable and non-modifiable risk factors followed by their physical examination such as height, weight, waist-hip ratio and blood pressure. The participants were given health education and made aware about the risk factors and methods of prevention of hypertension. Those subjects who had blood pressure readings more than 140/90 mmHg were immediately referred to Department of Medicine for further management and also referred for de-addiction to the Department of Psychiatry. **RESULTS:** A total of 60 subjects (20.8%) out of 289 had blood pressure readings above the optimal levels. 30 Subjects had hypertension which includes grade 1 systolic hypertension (5) and Isolated Systolic Hypertension (25).Out of which 15 belong to class III and rest 15 to class IV and 30 subjects were screened as pre-hypertensive, out of which 17 belong to class III of work and 13 belong to class IV. **CONCLUSION:** As per our study, modifiable risk factors play a major role in the causation of hypertension. Diabetes Mellitus and cardiovascular disease have a strong association with the hypertensive status. Thus, these factors can be controlled by spreading awareness on personal and public platforms and making appropriate lifestyle changes.

**Key Words:** Hypertension, Blood Pressure, Risk Factors, Class III & IV hospital employees.

## INTRODUCTION

The 20th century witnessed a great leap in public health with the improvement of the world population's health status and the dramatic decrease in mortality rates. Globalization processes have been the major forces of this public health achievement. Improvement in living standards, nutrition, levels of education, public health measures and breakthroughs in medical science are amongst factors contributing to the health transition in developing countries.[1] But even in 2016, cardiovascular disease is the leading cause of death (including premature death) in India.

- Hypertension is the leading risk factor for cardiovascular disease.
- Its prevalence is rising and approaches a third of all adults in urban India.
- Only a quarter of adults in India are aware of their BP status,
- Only a quarter of hypertensives are on treatment, and only 10-20% of hypertensives have their BP under control.

Prevention, detection, and effective management of hypertension can prevent deaths and serious disability in lakhs of people, and save hundreds of crores in healthcare costs every year.[2] Hypertension is also one of the leading causes of global burden of disease approx. 7.6 million deaths (13-15% of total) and 9.2 million disability adjusted life years worldwide

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were attributable to high blood pressure in 2001. Hypertension doubles the risk of cardio vascular diseases including CHF, CHD, IHD, hemorrhagic stroke, renal failure, PAD. Hypertension is an 'iceberg' disease. It became evident in the early 1970 that only about half of the hypertensive subjects in the general population of most developed countries were aware of condition, only about half of those aware of the problem were being treated and only about half of those treated were considered adequately treated (Rule of halves).[3] It has been estimated that CVD will be the major cause of morbidity and mortality in these countries by the year 2020.[4] Indian studies also revealed that the prevalence of hypertension has increased by 30 times among the urban population over a period of 55 years and about ten times among the rural population over a period of 36 years.[5] Early diagnosis and effective control of BP can save people from much morbidity, mortality and disability.[2] It has been estimated that 60% of hypertensive's are >20% over overweight. Among populations, prevalence of hypertension is related to dietary salt intake. Low dietary intake of calcium and magnesium also contributes to the risk of hypertension. Alcohol consumption, psychological stress and low levels of physical activity may contribute to hypertension.[6] According to the Quick Reference Guide prepared by the Ministry of Health and Family Welfare, Govt. of India hypertension has been classified as follows.

**Classification of Hypertension**

| Category | SBP(mm Hg) and DBP(mm Hg) |
|---|---|
| Optimal | <120 and <80 |
| Normal | 120 − 129 and/or 80 − 84 |
| High Normal | 130 − 139 and/or 85 − 89 |
| Grade 1 Hypertension | 140 − 159 and/or 90 − 99 |
| Grade 2 Hypertension | 160 − 179 and/or 100 − 109 |
| Grade 3 Hypertension | ≥ 180 and/or ≥110 |
| Isolated Systolic Hypertension | ≥ 140 and < 90 |
| Hypertensive urgency | >180 and/or >110 (Severe asymptomatic hypertension with no evidence of acute target organ damage) |
| Hypertensive emergency | >180 and /or >110-120(Severe hypertension associated with cardiovascular (e.g. left ventricular failure, cerebral(e.g. hypertensive encephalopathy, stroke),renal (acute renal failure), Grade III-IV retinopathy) |

(*High Normal = Pre Hypertension)

Risk factors are smoking, obesity, hyperlipidemia, diabetes mellitus, and family history of premature coronary artery disease all of which interact with hypertension.[7]

The cardiovascular risk associated with BP depend upon the combination of risk factors in an individual such as a gender, weight, physical activity, smoking, family history, serum cholesterol, diabetes mellitus and past history of vascular diseases.[8]

Lifestyle modifications are also an integral part of the prevention of hypertension at both an individual and the population level, and may help prevent progression of high normal BP to hypertensive levels.[2]

**OBJECTIVES:**

- To screen class III and IV employees for hypertension.
- To assess the risk factors for the development of hypertension.
- To counsel participants regarding the life style modifications to reduce or prevent hypertension.
- To ensure early initiation of treatment in new cases of hypertension.

**METHODOLOGY:**

**Study Design**: It was a cross sectional study among class III and IV employees of GMERS Medical College and Hospital, Gotri.

**Setting:** GMERS Medical College and Hospital, Gotri.

**Sample Size and Sampling:** Participants were selected from all currently working Class III and class IV institute employees in the GMERS Medical college and Hospital, Gotri. Necessary written consent of the participant was obtained prior to the study.

According to various epidemiological studies carried out across India and as per WHO estimation the prevalence of hypertension is between 20-30%.[9-14]

Considering this prevalence (25%), sample size was calculated with the help of formula $n = 3.84pq/L^2$ w here allowable error L has been taken as 5.

**Sample size = $\dfrac{3.84 \times 25 \times 75}{5 \times 5}$**

Calculated sample size is **288.**

**Study Period:** Data collection was done from September 2016 to December 2016.

**Ethical Clearance:** Was obtained from Institutional Ethical Committee of GMERS Medical College and Hospital, Gotri prior to the study.

**Data Collection:** Participants were enrolled after explaining them the procedure and consent was taken.

**Inclusion Criteria:**

- Age above 18 years
- Those who were willing to participate voluntarily.
- Those who were employees of our institute.

**Exclusion Criteria:**

- Those who had severe medical conditions/problems.
- If a subject is already on antihypertensive medication we did not consider the reading for that subject but we took the history of risk factors and classify him/her as known case of hypertension

**Protocol:** A pre-designed and pre-tested case sheet was used to collect demographic details. Physical measurement, such as height and weight, were recorded to calculate BMI (kg/m$^2$). For measuring weight, standard analog weighing scale was used after proper calibration the subject was asked to stand upright on the weighing scale bare footed and weight was recorded to the nearest 0.5 kg. For measuring height, a standard pull down stadiometer was used and the subject was made to stand erect looking straight on a level surface with heels together and toes apart without shoes. Height was recorded to the nearest 0.5 cm. While examining physical parameters of female participants we ensured the presence of a female attendant. Blood pressure was measured by trained personnel who adhered to the following standard procedure for the measurement of blood pressure.

**Standardized Blood Pressure Measurement Procedure**

| | |
|---|---|
| 1.Patient preparation and position | Patient should be in a relaxed state for 5 minutes before measurement of BP. Patient should not have had caffeine in the past 1 hour or smoked in the past 30 minutes. Patient should be seated comfortably with back supported, with arm at heart level, and legs in an uncrossed position. |
| 2.Choice of BP device | Mercury sphygmomanometer which has been validated using a standard protocol, and has been calibrated regularly. |
| 3.Cuff size and placement | The cuff size should be appropriate for the patient. Length of bladder should be 80% of arm circumference and width should be 40% of arm circumference, and a large adult cuff should be used for an obese patient. Patient should not wear any constrictive clothing. Place the midline of the cuff over the pulsations of the brachial artery, at a distance of 2-3 cm above the cubital fossa. |
| 4. Procedure to measure systolic and diastolic blood pressure (applicable in case of auscultation based BP measurement) | Palpate the radial pulse and then inflate the cuff to 30 mm beyond the disappearance of the radial pulse. Deflate the cuff at 2-3 mm per second and record by auscultation with the stethoscope over the brachial artery, the first and the last sounds as the systolic and diastolic blood pressure respectively. If the patient is diabetic or above 65 years measure the BP in supine position, and 2 minutes after assuming the standing position to check for postural hypotension. |
| 5.No. of measurements and recording the result | At least 2 readings should be taken at an interval of 1 minute. If the readings differ by more than 5 mm Hg takes a third reading. The lower of the readings should be taken as the representative SBP and DBP. |

Next step:

Health education to the patient consisted of awareness on:

- Nature of disease: Hypertension is an asymptomatic condition which can lead to disabling and life-threatening complications like stroke, heart attack and renal failure
- Therapy: Emphasis on need for long-term therapy with regularity of drug intake to prevent damage to target organs and prevent adverse events.
- BP control: Education about the targets for BP control, and encourage patients for regular check-up and monitoring of BP.
- Lifestyle measures: Counseling about the important role of lifestyle measures in reducing hypertension and reducing risks of cardiovascular disease.

Those subjects who had blood pressure readings Above 120 / 80 mmHg during measurements were given advice to adopt non pharmacological measures and follow up BP measurement.

Those subjects who had blood pressure readings more than 140/90 mmHg were immediately referred to Department of Medicine for further management.

All the participants were given health education regarding healthy life style for prevention of non communicable diseases under the following headings:

1. Physical Activity
2. Weight reduction
3. Alcohol consumption
4. Tobacco cessation
5. Dietary recommendations
6. Salt intake
7. Stress management

Necessary advice and referral for de-addiction to the Department of Psychiatry was also done.

All the personal information of participants was kept confidential.

**Data Entry**: Data entry was done in Microsoft Office Excel 2007 .Thereafter analysis was done and necessary statistical tests were applied.

**Data Analysis and Reporting**:

- Proportion of employees with Pre Hypertension, grade I, II and III Hypertension
- Risk factors for hypertension among these employees
- Association of BMI with status of hypertension
- Association of Age with status of hypertension
- Association of Smoking/Tobacco consumption with the status of hypertension

- Association of Family history of CHD, Diabetes Mellitus, Hypertension with the participant's status of hypertension.

**Dissemination of findings:** Findings of this study will be shared with the institute, Government of Gujarat and Govt. of India –NCD cell.

**Observation and Result**

**Table 1: Number of Participants as per Working Class and Gender Specification. (n=289)**

| Class of Work | Class III | Class IV |
|---|---|---|
| Males (n=104) | 53 | 51 |
| Females (n=185) | 126 | 59 |
| Total | 179 | 110 |
| Percentage | 61.9 % | 38.1 % |

This study dealt with 289 subjects out of whom 179 and 110 participants were of class III (61.9%) and class IV (38.1%) respectively. 104 subjects were males and 185 were females. All belonged to GMERS General Hospital and Medical College.

**Table 2: Participants having Hypertension in relation to gender and class of work**

| Class of Work | Pre-Hypertension | | Grade 1 systolic hypertension & isolated systolic hypertension | |
|---|---|---|---|---|
| | Class III(n=179) | Class IV(n=110) | Class III(n=179) | Class IV(n=110) |
| Males | 6 | 9 | 5 | 8 |
| Females | 11 | 4 | 10 | 7 |
| Total (60) | 17 | 13 | 15 | 15 |
| Percentage (%) | 9.5% | 11.8% | 8.4% | 13.6% |

A total of 30 Subjects had hypertension which includes grade 1 systolic hypertension (5) and Isolated Systolic Hypertension (25).out of which 15 belong to class 3 and rest 15 to class 4. 13 were males and 17 were females.

30 subjects were screened as pre-hypertensive. Out of which 17 belong to class 3 of work and 13 belong to class 4. 15 were males and 15 were females.

**Table 3: Number of Participants as per Age Group Specification and their status of hypertension.**

| Age group | Number of participants(n=289) | Percentage (%) (n=289) | Pre-Hypertension (n=30) | Grade 1 systolic & isolated systolic hypertension(n=30) | Percentage (%) |
|---|---|---|---|---|---|
| Age 18-25 | 51 | 17.64 | 2 | 2 | 7.8 (n=51) |
| Age 26-35 | 138 | 47.77 | 13 | 7 | 14.5 (n=138) |
| Age 36-45 | 65 | 22.49 | 8 | 9 | 26.15 (n=65) |
| Age 46-55 | 27 | 9.34 | 3 | 9 | 44.44 (n=27) |
| Age 56-60 | 8 | 2.76 | 4 | 3 | 87.5 (n=8) |

According to TABLE 3 prevalence of hypertension among participants is found to be proportional with the age group involved in the study. This shows increasing cases of hypertension with the advancement of age (i.e. 4+3= 7 out of 8 participants in the age group of 56-60 years had elevated levels of blood

pressure) viz. suggestive of strong association of the non-modifiable risk factor of age with the development of hypertension.

**Table 4: Number of Participants showing variations in Systolic Blood Pressure**

| Systolic Blood Pressure | Number of Subjects | Percentage (%) |
|---|---|---|
| SBP > 140 (Grade 1 HT) | 30 | 10.38 |
| SBP 130-139 – (Pre HT) | 30 | 10.38 |
| SBP 120-129 – (Normal) | 52 | 17.99 |
| SBP <120 – (Optimal) | 177 | 61.25 |

As per TABLE 4, 30 participants (10.38%) were found to have grade 1 hypertension and another 30(10.38%) were detected to be pre hypertensive. Rest 52(17.99%) and 177(61.25%) were found

to have normal and optimal blood pressures respectively.

**Table 5: Number of Participants showing variations in Diastolic Blood Pressure**

| Diastolic Blood Pressure | Number of Subjects | Percentage |
|---|---|---|
| DBP >= 110 – (Grade 3) | 2 | 0.69 |
| DBP 100-109 - (Grade 2) | 10 | 3.46 |
| DBP 90-99 – (Grade 1) | 33 | 11.42 |
| DBP 85-89 – (Pre HT) | 24 | 8.30 |
| DBP 80 - 84 (Normal) | 58 | 20.07 |
| DBP<80 – (Optimal) | 162 | 56.06 |

As per TABLE 5, 2 subjects were detected to have grade 3 hypertension another 10 subjects suffered from grade 2 hypertension and 33 subjects had grade 1 hypertension. Thus total of 45 subjects had hypertension out of 289.

**Table 6: Participants having Hypertension in relation to Risk factors of hypertension**

| Sr. no. | History | Number of participants | Percentage (%) | Pre-Hypertension(n=30) | Grade 1 and ISHT (n=30) | Percentage (%) |
|---|---|---|---|---|---|---|
| 1 | K/C/O DM | 8 | 2.8 | 4 | 1 | 62.5 (n=8) |
| 2 | K/C/O CVD | 13 | 4.5 | 4 | 4 | 61.5 (n=13) |
| 3 | Smoke tobacco | 12 | 4.2 | 5 | 2 | 58.3 (n=12) |
| 4 | BMI above 30 | 20 | 6.9 | 5 | 6 | 55 (n=20) |
| 5 | Drink alcohol | 10 | 3.5 | 2 | 2 | 40 (n=10) |
| 6 | BMI between 25-29.9 | 72 | 24.9 | 7 | 13 | 27.7 (n=72) |
| 7 | Chew tobacco | 44 | 15.2 | 5 | 7 | 27.3 (n=44) |
| 8 | F/H/O NCD | 120 | 41.5 | 20 | 12 | 26.6 (n=120) |
| 9 | Mixed Diet | 115 | 39.8 | 12 | 16 | 24.3 (n=115) |
| 10 | Don't Exercise daily | 234 | 81.0 | 24 | 25 | 20.9 (n=234) |

Same number of subjects (289) was assessed for the risk factors of hypertension. A total of 5 participants out of 8(62.5%) k/c/o/ DM had elevated levels of blood pressure. In contrast to only 49 participants out of 234 (20.9%) developed hypertension which depicts higher level of association of diabetes to hypertension.

## DISCUSSION

High blood pressure is also called the "silent killer." Uncontrollable high blood pressure can lead to stroke, heart attack, heart failure or kidney failure. Hypertension is also one of the leading causes of global burden of disease approx. 7.6 million deaths (13-15% of total) and 9.2 million disability adjusted life years worldwide were attributable to high blood pressure in 2001. Hypertension doubles the risk of cardio vascular diseases including CHF, CHD, IHD, hemorrhagic stroke, renal failure, PAD.

In the study of Prajapati D, et al; in civil hospital, Ahmedabad, hypertension was more found in obese persons. Individuals having waist circumference >90 cm in males and >80 cm in females had a risk of

hypertension in compare to individual with normal waist circumference.[15]

In one of the recent study, the prevalence of self-reported hypertension was 17% in males and 19.67 % in females. However prevalence of hypertension in the general population of India, as estimated by WHO is 23%.[9]Other epidemiological studies in India have found the prevalence of hypertension among the general population from 20% to 37%.[10-14]

A study done by Ismail, et al; in Karnataka among bank employees reported prevalence of Hypertension 39.3% which was higher compare to class III and class IV employees.[16]

In the present study, 10.66 % in males and 11.66 % in females were found hypertensive having Blood pressure more

than 140/90 mm of Hg. This is higher than the prevalence reported by Saxena et al; in rural population of block Doiwala Dehradun.[17]

A study done in Rural Madhya Pradesh , Anshuman Sharma et al; Prevalence of pre-hypertension and hypertension among studied population were 40.8% & 14.2% respectively, hypertensive's & pre hypertensive's shows no significant relationship between smoking but significant relationship found between the amounts of alcohol consumption with hypertension.[18]

**CONCLUSION**

Considering both modifiable and non-modifiable risk factors out of 289 subjects 60 people were found to have hypertension, diabetes mellitus being the most common risk factor involved in our study followed by cardiovascular diseases, smoking and chewing tobacco, overweight and obesity. Mixed diet and lack of exercise are the last two risk factors to affect hypertension.

As per our observation, modifiable risk factors play a major role in the causation of hypertension thus they can be controlled by making lifestyle changes.

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