

## Blood Pressure in Relation to Age and Gender

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### Abstract

Hypertension is a disease defined as persistently elevated arterial blood pressure (BP) with systolic blood pressure of less than 120 mm Hg and diastolic blood pressure of less than 80 mm Hg. Age is one the most common predictor and non-modifiable risk factor of hypertension. Hypertension is more common among older adults than adults of 40-59 years of age. Gender is another common non-modifiable risk factor of hypertension. On average, hypertension is more common among men than in women. A Prospective observational study was carried out where all the patients of either sex attending general medicine department with established hypertension above 35 years of age were included. A Chi-square test was used to find a significant association between age & gender with hypertension. A p value of or lower than 0.05 was considered to be statistically significant. Majority of the patients 65% were males and 35% were females and common age group was  $\geq 60$  years. CNS disorders were found in majority of the patients. Diuretics were the most prescribed class of drugs. There was a steady rise in the number of hypertensive patients with increase in age. Hypertension was more prevalent among males than in females. Factors like age and gender were found to be statistically significant associated with hypertension. Clinical pharmacist at an early stage need to monitor the BP and related risk factors and achieve the therapeutic goals, thereby enhancing the quality life span of the patient.

**Keywords:** Hypertension, Gender, Age distribution, Clinical Pharmacist, Statistical, Blood Pressure

## INTRODUCTION

Hypertension is a disease defined as persistently elevated arterial blood pressure (BP) with systolic blood pressure of less than 120 mm Hg and diastolic blood pressure of less than 80 mm Hg.<sup>1</sup> Hypertension is one of the most common non communicable disease worldwide. Though hypertension is modifiable, it remains one of the leading causes of increasing deaths worldwide. Hypertension is caused by various modifiable risk factors like alcohol, smoking, tobacco, diet, comorbidities etc and non-modifiable risk factors like age, gender, ethnicity etc.<sup>2,3</sup>

Age is one the most common predictor and non-modifiable risk factor of hypertension. Hypertension is more common among older adults than adults of 40-59 years of age. On average, systolic blood pressure increases with age whereas diastolic blood pressure increases then declines at latter ages. Aging affects the structure, vasculature and function of human heart causing arterial stiffness leading to reduced arterial buffering capacity thereby causing hypertension.<sup>4-6</sup>

Gender is another common non-modifiable risk factor of hypertension. Although both men and women can develop hypertension, gender differences can affect the incidence and prevalence of hypertension. On average, hypertension is more common among men than in women. Gender differences include presence of male hormones like androgens and testosterone and female hormones like estrogens. Presence of androgens and testosterone in males have contributed to increase in blood pressure (BP). Estrogens play a role in protecting against salt-induced increase in BP in women.

Whereas menopausal women are characterized with more incidence of hypertension due to lack of female hormones.<sup>7-9</sup>

Therefore, the aim and objective of this study is to determine a statistically significant association of age and gender with hypertension among adults.

### Objectives:

- To study the risk factors of hypertensive patients
- To study age and gender trends among hypertensive patients
- To determine a significant relationship of age and gender with hypertension

## METHODS AND MATERIALS

### Study design and subjects:

A prospective and observational study was carried out at Osmania General Hospital, Hyderabad for six months. The source population included all the hospitalized adult patients with controlled or uncontrolled hypertension however, the study population was based on the inclusion and exclusion criteria. Inclusion criteria included patients above 35 years of age, willing to participate, admitted in-patient (IP) ward, with early or delayed diagnosis of hypertension, with family history of hypertension and with discharge summary. A total of 150 patients were included in the study. Exclusion criteria included patients of out-patient (OP) and dermatology wards, pregnant and lactating women and those not discharged or discharged before collecting or cross-checking the data.

**Data collection:**

A data collection form was prepared to collect patient data such as

- Sociodemographic details: age, gender, marital status, type of diet, employment status and details of addictions like smoking, alcoholic or tobacco chewer
- Clinical details: diagnosis along with comorbid conditions
- Drug therapy details: details of all the anti-hypertensive drugs prescribed as monotherapy or combined therapy

The classification of hypertension in adults was based on the recommendations of JNC 7 as follows: <sup>1</sup>

Normal Blood Pressure: <120 mm Hg (systolic) & <80 mm Hg (diastolic)

Prehypertensive patients: 120-139 mm Hg (systolic) or 80-89 mm Hg (diastolic)

Stage 1 Hypertensive patients: 140-159 mm Hg (systolic) or 90-99 mm Hg (diastolic)

Stage 2 Hypertensive patients:  $\geq$ 160 mm Hg (systolic) or  $\geq$ 100 mm Hg (diastolic)

**Statistical analysis:**

Frequency tables along with percentages of patients' demographic and clinical characteristics as well as graphical representation of data results were calculated and prepared using MS excel. A Chi-square test was used to find a significant association between age & gender with hypertension. Odds ratio (OR) and confidence interval (CI) of 95% were used to see the strength of association. A p value of or lower than 0.05 was considered to be statistically significant. Data were entered and statistical analysis was done using SPSS version 22.0 (copyright IBM Corporation and other(s) 1989, 2013). The collected data were followed up, checked, and assessed thoroughly before concluding the results.

**RESULTS**

The description of 150 adult patients included in the study is represented in Table 1 which shows that more than half of the patients were found in the age group of  $\geq$ 60 years [79 (52%)] and majority were found to be males [98 (65%)]. Maximum number of patients were married [145 (96%)], vegetarian [129 (86%)] and employed [98 (65%)]. Based on addictions, majority were non-smokers [105 (70%)], non-alcoholic [91 (61%)] and non-tobacco chewers [129 (86%)].

Based on comorbidities diagnosed, central nervous system (CNS) disorders were found in majority in 85 patients (57%) followed by cardiovascular (CV) disorders in 33 patients (22%). (Table 2)

Table 1: Description of the patients

Variable	Frequency; N=150 (%)
<b>Age:</b>	
35-40 years	10 (7%)
41-59 years	61 (41%)
$\geq$ 60 years	79 (52%)
<b>Gender:</b>	
Males	98 (65%)
Females	52 (35%)
<b>Marital status:</b>	
Single	5 (3%)
Married	145 (97%)
<b>Diet:</b>	
Vegetarian	21 (14%)
Mixed	129 (86%)
<b>Employment status:</b>	
Employed	98 (65%)
Unemployed	52 (35%)
<b>Addictions:</b>	
Smokers	45 (30%)
Non smokers	105 (70%)
Alcoholic	59 (39%)
Non alcoholic	91 (61%)
Tobacco chewer	21 (14%)
Non-Tobacco chewer	129 (86%)

Table 2: Distribution of patients based on comorbidity

Comorbidity	Frequency; N=150 (%)
CNS Disorders	85 (57%)
CV Disorders	33 (22%)
Endocrinology Disorders	20 (13%)
Respiratory Tract Infections	16 (11%)
GI Disorders	7 (5%)
Blood Disorders	7 (5%)
Liver Diseases	6 (4%)
Urinary Tract Infections	2 (1%)
Other Infections	3 (2%)

As shown in Figure 1, various classes of anti-hypertensive drugs like Angiotensin-converting enzyme inhibitors (ACE I), Angiotensin II receptor blockers (ARBs), Calcium channel blockers (CCBs), Alpha and beta blockers ( $\alpha$ + $\beta$  Blockers), Beta-blockers ( $\beta$ -Blockers), Centrally acting and Diuretics were prescribed either in monotherapy or in combined therapy with other anti-hypertensive drugs. Diuretics was found to be majorly prescribed in both monotherapy (58%) and combined therapy (38%) followed by calcium channel blockers (CCBs).

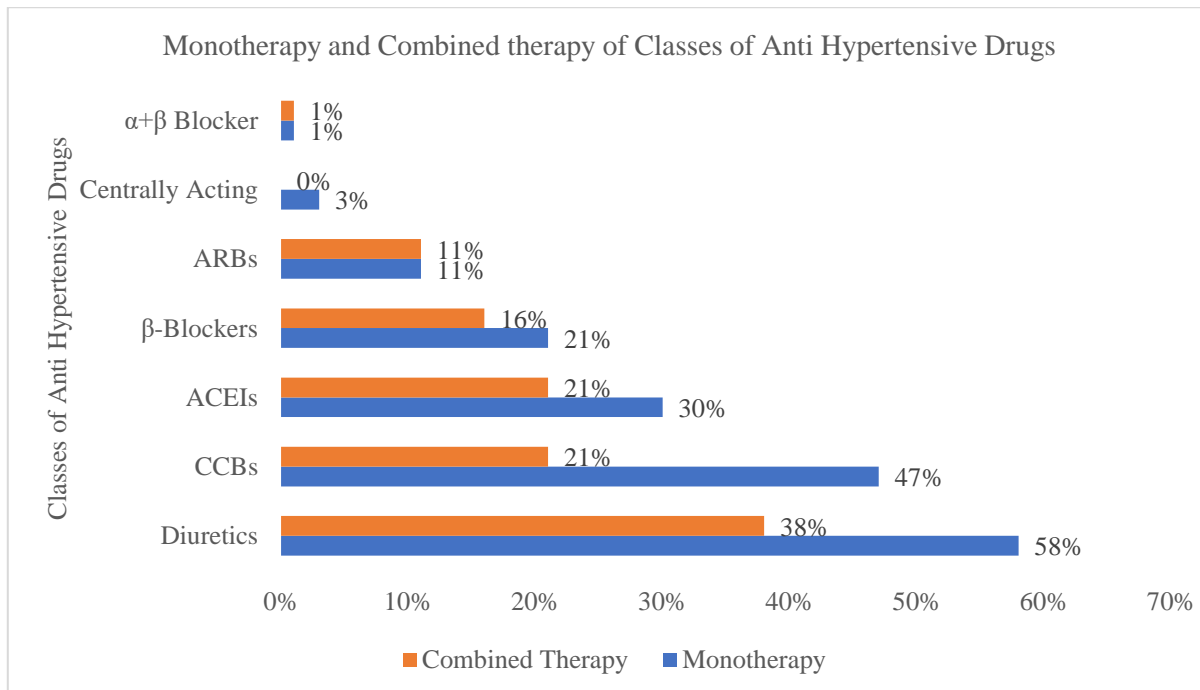


Figure 1: Distribution of classes of hypertensive drugs based on Monotherapy and Combined Therapy

As shown in Table 3, the total number of patients with prehypertension, stage 1 and stage 2 hypertension in age groups 35-40 years, 41-59 years and ≥60 years are 7 (5%), 43

(29%) and 62 (41%) respectively. There is an increase in the total number of hypertensive patients with increase in age which is shown in the Figure 2.

Table 3: Age-wise distribution of patients based on their systolic and diastolic pressure

Category	Normal	Prehypertension	Stage I HTN	Stage II HTN
SBP Values	<120	120-139	140-159	≥160
DBP Values	<80	80-89	90-99	≥100
<b>Age group (in years)</b>				
35-40	3 (2%)	3 (2%)	1 (1%)	3 (2%)
41-59	18 (12%)	22 (15%)	11 (7%)	10 (7%)
≥60	17 (11%)	38 (25%)	16 (11%)	8 (5%)

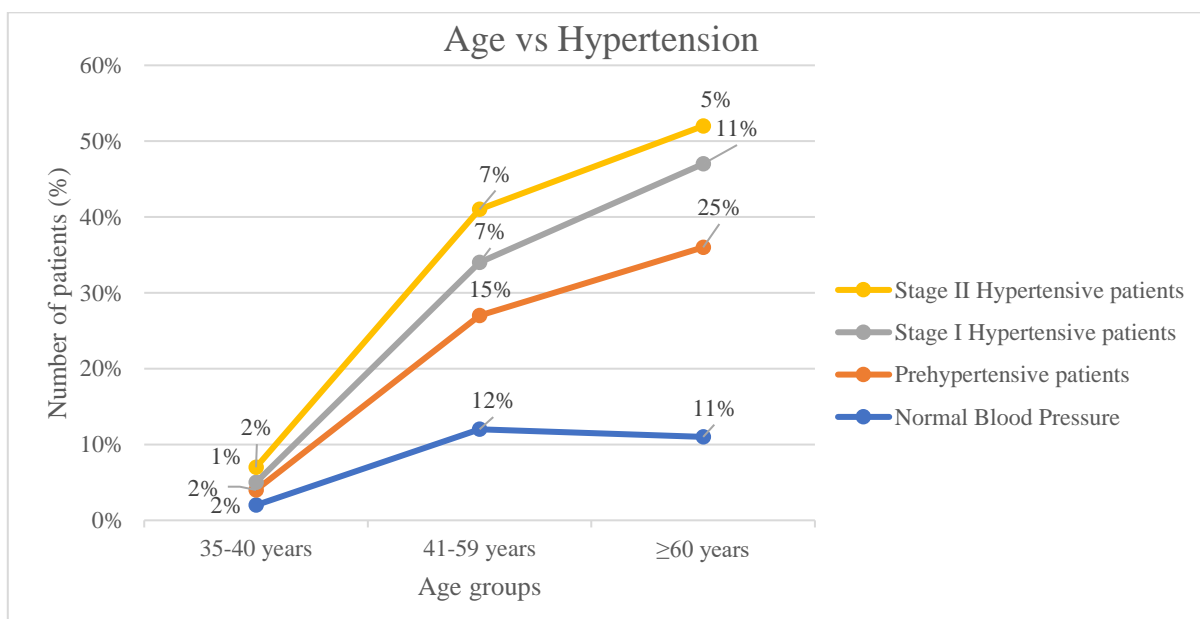


Figure 2: Relationship between age and hypertension

As per Table 4, the total number of prehypertensive, stage 1 and stage 2 hypertensive male and female individuals are 76 (50%) and 36 (24%). There is decrease in the total number of female

hypertensive patients whereas there is increase in total number of male hypertensive patients as shown in Figure 3.

Table 4: Gender-wise distribution of patients based on their systolic and diastolic pressure

Category	Normal	Prehypertension	Stage I HTN	Stage II HTN
SBP Values	<120	120-139	140-159	≥160
DBP Values	<80	80-89	90-99	≥100
<b>Gender</b>				
Males	22 (15%)	42 (28%)	17 (11%)	17 (11%)
Females	16 (11%)	21 (14%)	11 (7%)	4 (3%)

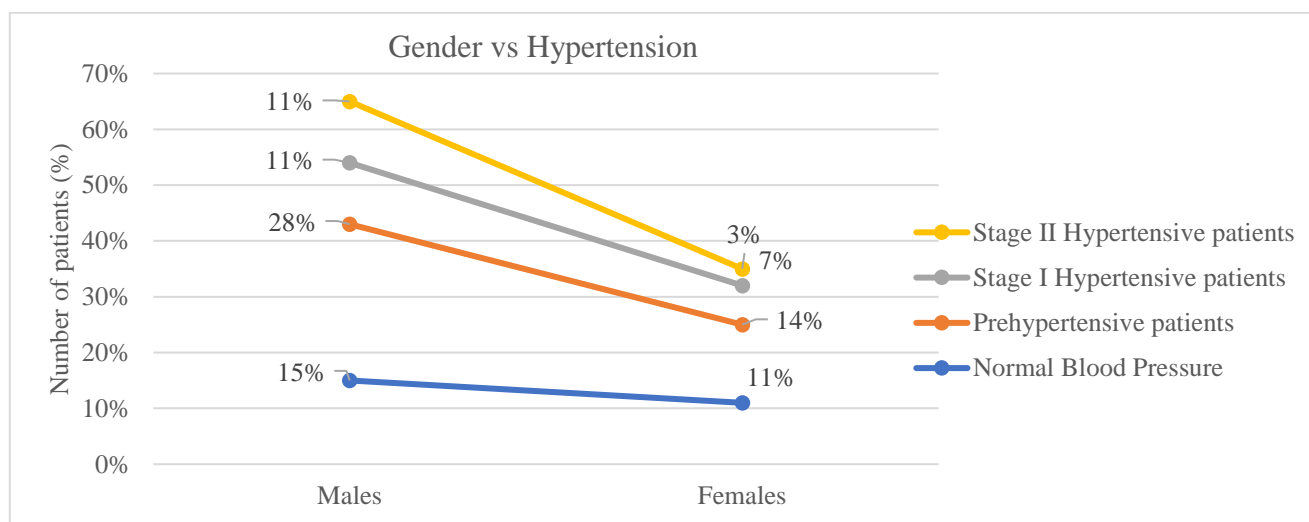


Figure 3: Relationship between gender and hypertension

The statistical analysis of age and gender with hypertension showed that age ( $p = 0.000$ ) and gender ( $p = 0.012$ ) were significantly associated with hypertension. (Table 5)

Table 5: Statistical analysis of age and gender with hypertension

Factor	Non-Hypertensive patients	Hypertensive patients	OR (CI)	<i>p</i> value
<b>Age</b>				
35-59 years	21	50	1.53 (0.73—3.21)	0.000*
≥60 years	17	62		
<b>Gender</b>				
Males	22	76	0.65 (0.305-1.38)	0.012*
Females	16	36		

\*Statistical significant

## DISCUSSION

In our study, maximum number of patients belonged to the age group 41-59 years. This trend was similar to several previous studies. <sup>2,3,10-12</sup> Maximum number of hypertensive patients were males. This result was similar in a few previous studies <sup>3,13</sup> but several prior studies showed contrasting results. <sup>4,7,10-12,14,15</sup> Most of the hypertensive patients were married which was comparable to various prior studies. <sup>2,3,10,12-15</sup> Majority of the hypertensive patients in our study were found to have mixed diet. This result was comparable to a study in India. <sup>13</sup>

In the present study, hypertension seem to be associated with employment status, as maximum number of hypertensive patients were employed. This outcome was similar in various prior studies. <sup>2,3,10,13</sup> but a study conducted in Sudan showed contrasting outcomes. <sup>15</sup>

When analysed addictions among hypertensive patients, maximum number of patients were non-smokers, similar to prior studies conducted in Nepal, Dubai, Morocco and Kenya. <sup>10,12-14</sup> Majority of the hypertensive patients in our study were non-alcoholic which was similar to earlier studies conducted in Nepal, Morocco and Kenya <sup>10,12,14</sup> but contrasting in India and Dubai. <sup>3,13</sup> Non tobacco chewers were common in present study, which was differing to outcomes of earlier studies conducted in India and Dubai. <sup>3,13</sup>

The comorbid conditions belonging to central nervous system [CNS] disorders and followed by cardiovascular [CV] disorders were most prevalent among the study population, whereas a study conducted in Nepal showed that hypertensive patients having cardiovascular comorbid conditions were in minority. <sup>10</sup>

The most common classes of anti-hypertensive drugs prescribed in monotherapy as well as in combination therapy

was diuretics followed by calcium channel blockers. This trend was similar in a few prior studies.<sup>9,16</sup>

The assessment of relationship between hypertensive patients and age showed an increase in the total number of hypertensive patients with increase in age. The relationship between gender and hypertension showed that there is a steady decline in the number of female hypertensive patients with a steady increase in the number of male hypertensive patients. This trend was similar in a few previous studies.<sup>8,14</sup>

Our study showed statistically significant association of age and gender with hypertension. This trend was similar in several previous studies.<sup>3,7,10-15,17</sup>

## CONCLUSION

The number of hypertensive patients increased with increase in age. Male hypertensive patients were in majority. The study showed a statistically significant association between hypertension and age, gender of the patients. Diuretics were most prescribed class of drug in both monotherapy and combination therapy. Clinical pharmacist at an early stage need to monitor the BP and related risk factors and achieve the therapeutic goals, thereby enhancing the quality life span of the patient.

## Acknowledgement

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## Ethical approval

The study was approved by the Institutional Ethics Committee (IEC) of MESCO College of Pharmacy, Hyderabad, Telangana with the IEC approval number MCP/IEC/PD/PR/37.

## Conflicts of Interest

The authors declare that they are no conflicts of interest.

## Funding Source

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## Authors contributions

Dr. Syed Areefulla Hussainy – critical revision of manuscript and approval

Dr. Shaima Shereen – conception, literature review, design of the research and manuscript writing

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