## RESEARCH ARTICLE

## DETERMINATION OF PREVALENCE AND RISK FACTORS OF HYPERTENSION AND ASSESSMENT OF ANTIHYPERTENSIVE DRUG THERAPY BASED ON JNC 8 GUIDELINES

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| **ARTICLE INFO** | **ABSTRACT** |

Hypertension is a chronic medical condition characterized by a systolic BP reading greater than or equal to 140 mmHg and a diastolic reading greater than or equal to 90 mmHg($\geq$140/90 mm Hg).The aim of this project was to assess prevalence and risk factosr of hypertension along with BP control and treatment based on JNC8 guideline. 200 patients in the age group of 18-75 years who were on antihypertensives for at least 6 months were enrolled in the study. Patient demographics, social habits, risk factors and comorbidities were documented andthe overall prevalence rate of hypertensive patients were generated. The assessement of treatment and control of hypertension based on JNC 8 guidelines was also carried out. The results indicated that prevalence of hypertension was 33.3%. Increasing age, diabetes, family history, overweight and smoking were found to be the important predictors of hypertension in this study . Blood pressure control rates in the study was found to be good and the most favoured type of therapy was monotherapy and CCBs were the commonly prescribed class of drugs. The prescription pattern was in accordance with the standard JNC 8 guidelines.

## INTRODUCTION

Hypertension is a chronic medical condition characterized by a systolic BP reading greater than or equal to 140 mmHg and a diastolic reading greater than or equal to 90 mmHg($\geq$140/90 mm Hg) (Krunal C Solanki *et al*., 2013). It is an important public health challenge because of the associated morbidity and mortality and requires continuous monitoring and treatment throughout life. As reported by World Health Organization, hypertension is the third 'killer' disease, accounting for 1 in every 8 deaths worldwide. Analysis showed that about 26% of population globally is suffering from hypertension, and the prevalence is higher among developed as compared to developing countries. The increasing prevalence of hypertension is due to population growth, aging and behavioral risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress. Hypertension has been recognised as a strong independent risk factor for heart

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disease and stroke and a predictor of premature death and disability from cardiovascular complications (Chobanian AV *et al* 2003). Therefore, the early detection, treatment and control of hypertension are the key components of the integrated management of cardiovascular risk (Kamadjeu *et al.,* 2006). Risk factors can be categorized into modifiable and non-modifiable risk factors. The non-modifiable risk factors are attributes or characteristics in the individual that cannot be changed or adjusted, hence they are out of our control and little or nothing can be done to control them; such factors include age, sex, race, family history, genetic composition, etc. On the other hand modifiable risk factors of hypertension are attributes, characteristics, exposures or life style patterns that can be adjusted or changed to prevent the development of the disease. These modifiable risk factors include; obesity, excessive salt intake, inactivity or lack of exercise, high fat diet, tobacco use, alcohol consumption etc (Copper R *et al* 1994, Sani MU *et al* 2010, Abed Y *et al* 2013). JNC 8 guideline has simplified the treatment of hypertension. Patients are categorized according to age and the presence of diabetes (DM) or/and chronic kidney disease (CKD). In the general population, pharmacologic treatment should be initiated when blood pressure is 150/90 mm Hg or higher in adults 60 years

and older, or 140/90 mm Hg or higher in adults younger than 60 years. In patients with hypertension and diabetes, pharmacologic treatment should be initiated when blood pressure is 140/90 mm Hg or higher, regardless of age.Patients with CKDshould be started on an ACE inhibitor or ARB. If patients do not reach goal BP, add another drug from the 4 recommended drug classes, but do not combine an ACE inhibitor with anARB. Note that beta-blockers are not among the initial recommended drug classes. In black hypertensivepatients, initial therapy should include a CCB or thiazide-type diuretic. Pharmacologic treatment should be initiated using one or moreagents from 4 medication classes – ACE inhibitors, ARBs, CCBs or thiazide-type diuretics.

## MATERIALS AND METHODS

The present study was a prospective interventional study conducted in the General Medicine Department of a South Indian Tertiary care teaching hospital within a time period of 6 months after obtaining approval from the Institutional Ethics Committee. Patients of either sex, in the age group 18-75 yrs diagnosed to have hypertension and on antihypertensive therapy for at least 6 months were included in the study. Psychiatric patients, pregnant and lactating women and were excluded. After obtaining written informed consent the necessary data were obtained using outpatient cards, direct interviews and case records of inpatients. Patients details were transcribed on a data entry form which comprises demographic details (age, sex, weight, height, literacy, marital status), social habits (smoking, alcoholism, tobacco), patient medication history, risk factors and drugs.

## RESULTS AND DISCUSSIONS

### Prevalence

The prevalence of hypertension was found to be 33.3 % among study subjects.Studies done all over the world in different setting among different age groups showed widely varying prevalence rates (7.24 - 60.8).

**Table 1. Assessment of prevalence of hypertensive patients in GM department**

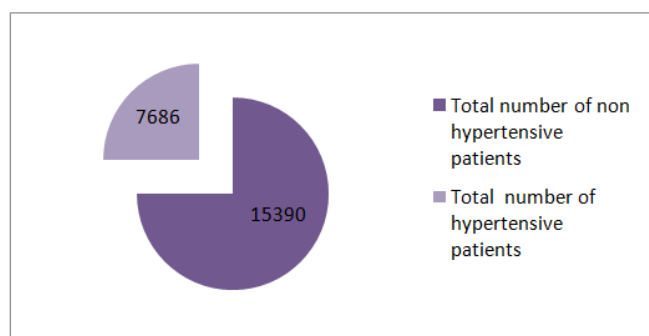| | |
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| Total number of patients in general medicine (IP+OP) | 23076 |
| Total  number of hypertensive patients | 7686 |



**Fig. 1. Assessment of prevalence of hypertensive patients in GM department**

### Demographic details

In this study out of the 200 patients enrolled, a majority of 117 patients belonged to the age group of 61 – 75, and least no. of

patients (16)  were from age group 30 -67. More than half of the patients were over 51 years old showing that higher age was directly related to a higher incidence of hypertension as reported in studies conducted by Khwaja Mir Islam Saeed *et al* 2014 ,Stacey E. Jolly *et al*2015.The result of the present study indicates that the proportion of females with hypertension was significantly higher (63.5 %) compared to males (36.5 %). Other studies Sandeep Kumar Gupta *et al* 2015, Fedila Shukrala and Tesfaye *et al* 2015 have also revealed that there was a high incidence of hypertension among females.

**Table 2. Demographic categorization of hypertensive patients**

| Variables | Subgroups | Frequency | Percent |
|---|---|---|---|
| Age | 30-45 | 16 | 8 |
| | 46-60 | 67 | 33.5 |
| | 61-75 | 117 | 58.5 |
| Gender | Male | 73 | 36.5 |
| | Female | 127 | 63.5 |
| Occupation | Working | 51 | 25.5 |
| | Not working | 149 | 74.5 |
| Marietal Status | Married | 195 | 97.5 |
| | Umarried | 5 | 2.5 |
| Educational status | Iliterate | 141 | 70.5 |
| | Literate | 59 | 29.5 |
| BMI | Below normal | 4 | 2 |
| | Normal | 95 | 47.5 |
| | Over weight | 66 | 33 |
| | Obese | 35 | 17.5 |

**Table 3. Categorisation of hypertensive patients based on social habits**

| Variables | Subgroups | Frequency | Percent |
|---|---|---|---|
| Smoking | Smoking | 28 | 14 |
| | Non smoking | 139 | 69.5 |
| | Ex smoker | 33 | 16.5 |
| Alcohol consumption | Alcoholic | 34 | 17 |
| | Non alcoholic | 166 | 83 |
| Tobacco use | Tobacco chewers | 19 | 9.5 |
| | Non tobacco chewers | 181 | 90.5 |

In our study, 25.5% patients were employed while a greater 75.5% were unemployed. Majority of the respondents (70.5 %) had only primary level of education. The result showed that uneducated and unemployed population were more prone to development of hypertension. The BMI is a crucial parameter to estimate body adiposity, categorized as underweight, normal weight, overweight or obese. Larger proportion of subjects (47.5 %) were in the normal weight category followed by overweight (33%), obese (17.5 %) and underweight (2%). Respondents who were non smokers (139) were significantly higher compared  to smokers (28) and ex smoker (33) groups. The larger proportion of non smokers in the study can be attributed to the increased no. of female respondents in our study group. The percentage of non alcoholics (83 %) were greater than alcoholics (17 %). Tobacco users accounted for only 9.5 % of the population. no significant association was observed between social habits like smoking, alcoholism and tobacco use because in the current study majority of the subjects were females and were having relatively few social habits. While assessing for the presence of co morbities, diabetes mellitus was found to be the most prevalent comorbid illness (56.5 %) as suggested by the results of many studies Sandeep Kumar Gupta *et al* 2015, Fedila Shukrala *et al* 2015.The other comorbidities distributed were as follows : Dyslipidaemia(28 %), CAD (16.5 %), CVA(7.5 %), Thyroid (7.5 %), COPD (6.5 %) and CKD  (3 %).

**Table 4. Categorisation of study population based on presence of co-morbidities**

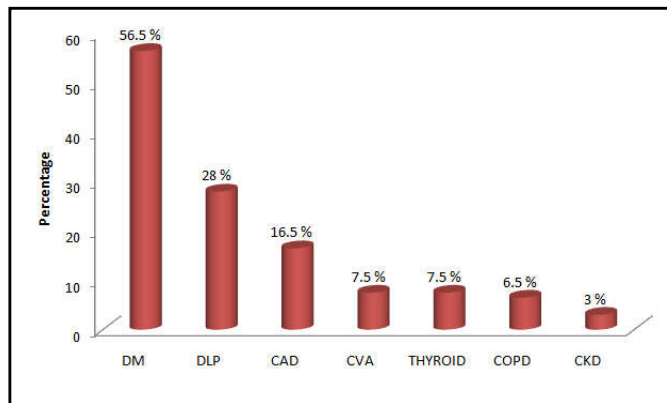| Comorbidity | No | Percent |
|---|---|---|
| DM | 113 | 56.5 |
| DLP | 56 | 28 |
| CKD | 6 | 3 |
| CVA | 15 | 7.5 |
| CAD | 33 | 16.5 |
| COPD | 13 | 6.5 |
| Thyroid | 15 | 7.5 |



**Fig. 2. Categorisation based on presence of co- morbidities**

**Table 5. Distribution of risk factors**

| Risk factors | Frequency | Percent |
|---|---|---|
| Age | 125 | 62.5 |
| DM | 71 | 35.5 |
| FH | 62 | 31 |
| Overweight | 61 | 30.5 |
| Smoking | 60 | 30 |
| PMNP | 43 | 21.5 |
| Diet | 41 | 20.5 |
| Stress | 40 | 20 |
| Obese | 36 | 18 |
| Alcoholic | 33 | 16.5 |
| DLP | 23 | 11.5 |
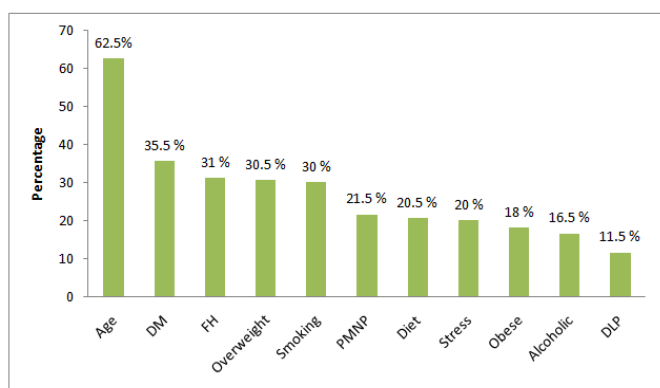


**Fig. 3. Distribution of risk factors**

In the current study, increasing age was found to be the most contributing risk factor for hypertension (62.5 %). We observed a significant relationship between diabetes mellitus (35.5 %) and hypertension. Hypertension in diabetics interferes with the rate of development and progression of diabetic complications, which in turn aggrevates the hypertensive disease. Our results clearly demonstrate that family history of hypertension (31%) also had a graded association with hypertension . Previous studies from different countries have shown similar increased risks when compared to people

without a family history of hypertension. The other risk factors were in the order overweight (30.5%) > smoking (30%) > postmenopause (21.5%) > diet (20.5%) > stress (20%) > obesity (18%) > alcohol (16.5%) > dyslipidaemia (11.5 %).

**Table 6. Categorization based on type of therapy**

| Therapy | Monotherapy | Polytherapy | |
|---|---|---|---|
| | | Dual therapy | Triple Therapy |
| Frequency | 122 | 65 | 13 |
| Percentage | 61 | 32.5 | 6.5 |



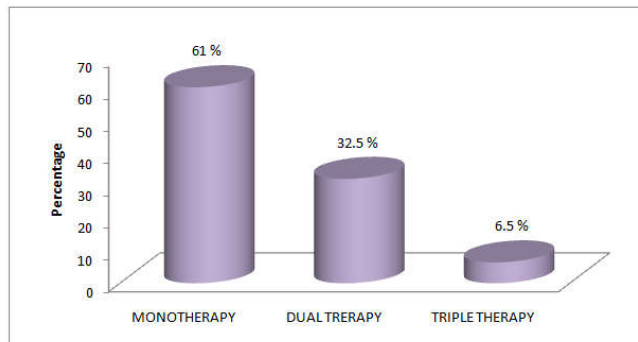**Fig. 4. Categorisation based on type of therapy**

**Table 7. Drug therapy characterization**

| Variables | Subgroups | Frequency | Percent |
|---|---|---|---|
| Monotherapy | Amlodipine | 49 | 31.81 |
| | Telmisartan | 46 | 29.87 |
| | Metoprolol | 17 | 11.03 |
| | Clinidipine | 13 | 8.44 |
| | Losartan | 12 | 7.8 |
| | Furosemide | 5 | 3.24 |
| | Nebivilol | 4 | 2.6 |
| | Atenolol | 3 | 2 |
| | Olmesartan | 2 | 1.3 |
| | Ramipril | 2 | 1.3 |
| | Enalapril | 1 | 0.64 |
| Dualtherapy | Telmisartan+ Amlodipine | 16 | 22.85 |
| | Telmisartan+ Chlorthalidone | 16 | 22.85 |
| | Telmisartan+ Clinidipine | 14 | 20 |
| | Telmisartan+ Hydrochlorothiazide | 10 | 14.3 |
| | Amlodipine+ Hydrochlorothiazide | 7 | 10 |
| | Olmesartan+ Hydrochlorothiazide | 2 | 2.85 |
| | Telmisartan+ Torsemide | 2 | 2.85 |
| | Atenolol + Amlodipine | 2 | 2.85 |
| | Amlodipine+ Torsemide | 1 | 1.42 |
| Triple Therapy | Amlodipine,Telmisartan+ Hydrochlorothiazide | 4 | 36.36 |
| | Atenolol,Telmisartan+ Hydrochlorothiazide | 3 | 27.27 |
| | Atenolol, Telmisartan+ Chlorthalidone | 1 | 9.1 |
| | Telmisartan,Hydrochlorothiazide+ Nifedipine | 1 | 9.1 |
| | Torsemide,Telmisartan+ Hydrochlorothiazide | 1 | 9.1 |
| | Clinidipine,Telmisartan+ Hydrochlorothiazide | 1 | 9.1 |

Of the total 200 prescriptions monotherapy accounted for 61 % dual therapy 32.5% and triple therapy 3.5 %. Among monotherapy, the most commonly prescribed class of antihypertensive drugs were calcium channel blockers (27.7 %) followed by ARBs (26.8%) and beta blockers(10.8). In dual therapy, the frequently prescribed combination was ARB + CCB and ARB + Diuretics (13.4 % each). In triple therapy,CCB + ARB + Diuretics accounted for 36.36 %

followed by beta blocker + ARBs + Diuretics (27.27 %). It was noted that the most favoured class of antihypertensive drugs, either as monotherapy or combination therapy in hypertensive patients with or without comorbidities was CCBs. Among the antihypertensive agents prescribed individually, on the basis of their generic names the commonly seen drugs were. Amlodipine (31.81 %), followed by Telmisartan (29.87 %), Metoprolol (11.03 %), Clinidipine (8.44 %), Losartan (7.8 %), Furosemide   (3.24 %)  and other drugs (Nebivolol, Atenolol, Olmesartan, Ramipril, Enalapril) covers remaining 7.84 %.

The larger proportion of prescription of CCBs may be due to the type of patients who referred this hospital with complications related to cardiovascular, renal and other systems. Also, because in this study majority of the subjects were above 50 years of age, the extensive use of CCB was noted because drug of choice for the elderly patient is CCB or diuretics. It was however noted that though the use of diuretics was present it was  less in proportion. In this study Diuretics was part of most of the combination regimen. As Diuretics are known to complement the antihypertensive efficacy of multidrug regimen, they can be valuable in accomplishing BP control and moreover they are cheaper than other AHAs. The addition of diuretics in multidrug regimens has been reported to be useful for BP control due to their competence to reduce blood volume and vascular resistance.

**Table 8. Categorisation based on JNC 8**

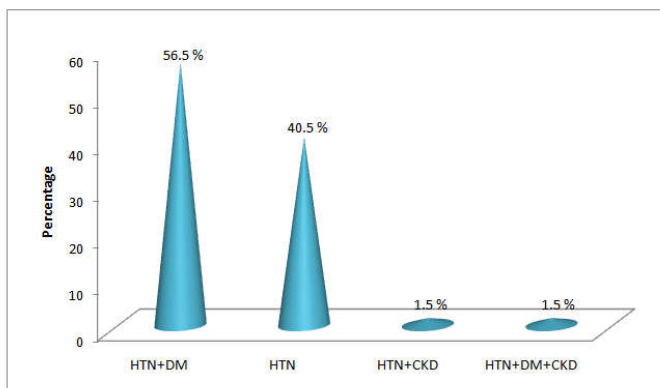|            | Frequency | Percent |
|------------|-----------|---------|
| HTN        | 81        | 40.5    |
| HTN+DM     | 113       | 56.5    |
| HTN+CKD    | 3         | 1.5     |
| HTN+DM+CKD | 3         | 1.5     |



**Fig. 5. Categorisation based on JNC 8**

The 200 patients enrolledwere categorized into 4 groups as those with hypertension alone  (n=81;40.5%),HTN +DM (n=113;56.5%),HTN+CKD (n=3;1.5% ) and HTN+DM+CKD (n=3;1.5% )

**Table 9.  Nature of drug therapy in JNC 8 study group**

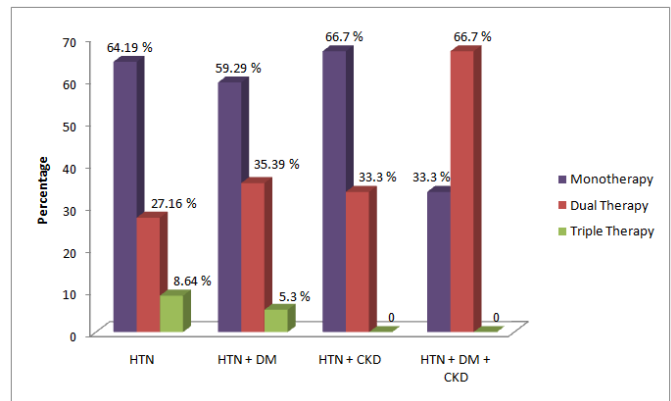|              | Therapy | | |
|--------------|--------------|--------------|----------------|
|              | Monotherapy  | Dual Therapy | Triple Therapy |
| HTN          | 52           | 22           | 7              |
|              | 64.19%       | 27.16%       | 8.64%          |
| HTN + DM     | 67           | 40           | 6              |
|              | 59.29%       | 35.39%       | 5.30%          |
| HTN + CKD    | 2            | 1            | 0              |
|              | 66.7%        | 33.3%        | 0              |
| HTN + DM + CKD | 1          | 2            | 0              |
|              | 33.3%        | 66.7%        | 0              |



**Fig. 6. Nature of drug therapy in JNC 8 study group**

- Among the 81 hypertensive patients, 52 received monotherapy (64.19%), 22 received dual therapy (27.16%) and 7 received triple therapy(8.64%)
- Among the 113 diabetic hypertensive patients, 67 patients received monotherapy (59.29%), 40 received dual therapy (35.39%) and  6 received triple therapy(5.30%)
- Among the 3  hypertensive patients who had CKD,2 patients received monotherapy (66.7%) and the remaining 1 received dual therapy.
- Among the 3 hypertensive patients who had both DM and CKD,1 patient received monotherapy (33.3%) and 2 received dual therapy (66.7%).

**Table 10.  Correlation between BP control and Age**

| Age     | BP CNTRL | |
|---------|-------|--------|
|         | No    | Yes    |
| 30 – 45 | 4     | 12     |
|         | 7.40% | 8.21%  |
| 46 – 60 | 23    | 44     |
|         | 42.5% | 30.13% |
| 61 – 75 | 27    | 90     |
|         | 50    | 61.64% |
| Total   | 54    | 146    |

During the 6 month period , in our study population blood pressure control was observed in 146 (73 %) patients while failure to attain blood pressure control was seen in the remaining 54 (27 %) patients Analysis of blood pressure control revealed that older participants tended to have better hypertension control than the younger group as recorded by a similar study by Fangjian Guo *et al* 2012 higher control rates were observed in age group 61-75(61.64 %) and least control rates were seen in age group 30-45(8.21 %). Of the total 200 subjects 146 (73%) had blood pressure under control of which 62.33 % were females and 37.67 % were males. In this study, out of the 200 subjects enrolled, 81 patients had hypertension only, 113 patients had hypertension with diabetes and 3 patients had CKD along with hypertension and 3 had hypertension with diabetes and CKD. Among the 81 hypertensive patients, 52 received monotherapy, 22 received dual therapy and 7 received triple therapy. Among the 113 diabetic hypertensive patients, 67 patients received monotherapy, 40 received dual therapy and 6 received triple therapy.

Among the 3 hypertensive patients who had CKD, 2 patients received monotherapy and the remaining 1 patient received dual therapy. Out of the 3 hypertensive patients who had both

DM and CKD, 1 patient received monotherapy and 2 received dual therapy. The results from our study showed that monotherapy was the most favoured choice of therapy in all the 3 group, and dual therapy was generally preferred in the group that comprised of hypertension +diabetes +CKD patients.

## Conclusion

This prospective observational interventional study on assessment of riskfactors, treatment and control of hypertension concluded that the prevalence of hypetension was found to be as 33.3 %.Increasing age, diabetes, family history ,overweight and smoking ,stress and diet were found to be the important predictors of hypertension in this study. Blood pressure control rates in the study was found to be good and the most favoured type of therapy was monotherapy and CCBs were the commonly prescribed class of drugs. The prescription pattern was in accordance with the standard JNC 8 guidelines.

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