STUDY OF END ORGAN DAMAGE IN HYPERTENSION IN AN TERTIARY CARE HOSPITAL CATERING MOSTLY RURAL AND HILLY POPULATION IN INDIA

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ABSTRACT
A total of 2000 patients, having hypertensive complications were studied in medicine indoor of Dr. RPGMC Medical College Hospital during the period of nov 2010 to may 2015;1320 were males, 680 were females. Age ranges were 20 to 70 years. Detail history was taken, comprehensive physical examination and relevant investigations were done to detect various target organ damage. These findings were correlated with age, sex, occupation, socioeconomic status, duration of hypertension, drug compliance and other risk factors of cardiovascular disease. Incidence of end organ damage were as follows: 13.33% of males and 15.73% of females developed stroke; 20.65% of total patients developed some forms of cardiac complications, 14% had left ventricular failure, 22.19% of males had left ventricular hypertrophy (LVH) 12.79 % of females had LVH; 17% of patients had renal complications; 14.65% of patients had retinopathies; 1% of patients had malignant hypertension; 2% of patients had peripheral vascular disease.

KEYWORDS: correlated with age, sex, occupation, socioeconomic status, hypertension.

INTRODUCTION
An elevated arterial pressure is probably the most important public health problem in developed and developing countries. It is common, asymptomatic, readily detectable and usually easily treatable and often leads to lethal complications if left untreated. It is one of the
leading causes of morbidity and mortality in the world and will increase in worldwide importance as a public health problem by 2020.1 In addition to Morbidity and Mortality directly attributable to hypertension, high blood pressure (BP) is a powerful risk factor (a condition or characteristic of an individual or population) that increases the likelihood of developing a wide variety of cardiovascular diseases.\textsuperscript{[1]}

All health care providers routinely encounter patients who are likely to benefit from lowered BP. These include not only patients with definite hypertension but also those with pre-hypertension (Systolic BP 120 to 139 mmHg or diastolic BP 80 to 89 mmHg), who have a higher risk of cardiovascular events than individual with “optimal” BP. In the next decade, more patients will likely become candidates for antihypertensive therapy, as clinical trials demonstrate the benefits of treatment and pharmacologic approaches become safer and more effective. Furthermore, many people’s perhaps the majority of those over 40 years of age, who do not yet meet the criteria for drug treatment for hypertension will benefit from lifestyle modifications, a presumably safe and cost-effective public health approach to reducing BP. Many of the therapeautical lifestyle changes that lower BP or slow the rate of rise of BP should be incorporated into everyone's lifestyle very early.\textsuperscript{1}Despite progress in identifying risks associated with elevated BP and development of many ways to lower BP- and demonstration that these methods reduce death and hard endpoints- BP control remains suboptimal.\textsuperscript{1} Improvement is needed in controlling BP to prevent higher morbidity and premature mortality rates.

In majority of patients there are no specific symptoms attributable directly to hypertension. Hypertension in majority of cases is detected on routine physical examination or because of one of its complications. In our country, there are few studies about the types of complications especially in relation to different age groups, sex groups, duration of hypertension and risk factors. The effects of hypertension are widespread and no organ is spared. Higher blood pressures are associated with reduced life expectancy at all ages and in both sexes. Prospective observational studies, most notably the Framingham study, defined the risk in terms of greater incidence of stroke, coronary artery disease, cardiac failure, progressive renal disease and other vascular problems such as dissecting aortic aneurysm.
In our study we have taken hospitalized patients admitted with complications of hypertension for study of the followings

(1) To find out different types of complications those occur in hypertension.
(2) To compare the complications of hypertension in relation to different age groups, occupation and socioeconomic status.
(3) To find out the complications of hypertension in relation to duration of hypertension.
(4) To evaluate the complications of hypertension in relation to common risk factors.
(5) To find out the incidence of malignant hypertension.
(6) To observe the relationship between target organ damage and drug compliance.

Methodology

Selection of Subjects: A total of 2000 patients, having hypertensive complications were studied in medicine indoor of Dr. RPGMC Medical College Hospital during the period of Nov 2010 to may 2015. Among 2000 patients, 1320 were male and 680 were female. Their age ranges were 20 to 70 years. Cases were entirely non selective and random among hypertensive patients with complications and no attempts were made to differentiate between primary and secondary hypertension. The cases were collected from medicine indoor, not from cardiology or neurology or nephrology, to avoid selection bias.

Methods of study

It was an observational study. From each patient, a thorough history was taken with a special emphasis on duration of hypertension, risk factors including smoking, family history of hypertension, diabetes mellitus, ischemic heart disease, stroke, sudden death, peripheral vascular disease, and treatment history, past history of stroke, angina, myocardial infarction, transient ischemic attack and left ventricular failure. Patients were included in this study Whose diastolic blood pressure >90 mmHg and/or systolic blood pressure >140 mmHg. Patients with isolated systolic hypertension (systolic blood pressure >160 mmHg, diastolic blood pressure <90 mmHg) were also included. Patients previously diagnosed as hypertensive and were on antihypertensive medications, were also included, whatever the blood pressure.

Obesity of the patient was detected by measuring the height of the patient in meters, and taking the weight of the patient in kg. Then the body mass index (BMI) was calculated from formula: BMI=weight in kg/ (height in m²). When BMI was greater than 30, patients were designated as obese in case of both male and female.
Patients were designated as diabetic when fasting blood glucose was >125mg%.

The following diagnostic tests were used to detect the complications of hypertension.

(1) The cardiovascular complications were detected by physical examination, x-ray chest and ECG.

(2) The guideline for the diagnosis of cerebrovascular complications was made by
   a) Evidence of focal brain disease: hemiplegia, monoplegia, dysphasia or aphasia were taken as evidence of focal brain disease.
   b) The temporal profile was ascertained by a clear history of the mode of onset, evaluation and course of each symptom taken in relation to the medical status at the time of examination of the patient.

(3) The renal complication were detected by taking the history of the patient, urinalysis, blood urea and serum creatinine estimation and measurement of 24 hrs urinary protein (in selected cases only).

(4) Malignant hypertension were diastolic blood pressure as above 130 mm Hg along with rapid deterioration of renal function, retinal haemorrhages and exudates with or without papilloedema.

(5) Eye complications was detected clinically and by ophthalmoscopic examination of the fundus of the eye.

(6) Following investigations were done in selected cases
   • Echocardiography
   • CT scan of the brain
   • Ultrasonography of abdomen
   • Lumbar puncture and CSF study
   • Estimation of serum lipid profile

RESULTS AND DISCUSSION

A total of 2000 patients were selected randomly, out of them 1320 were males and 680 were females. Forty percent of patients were farmer and 25% were housewives. The maximum incidence was among farmers and housewives, and amongst the low-income group people and higher among smokers and sedentary people. Occupation of the patients were as shown in the table 1.
Table-1: Occupation of patients

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>801</td>
</tr>
<tr>
<td>House wife</td>
<td>453</td>
</tr>
<tr>
<td>Business man</td>
<td>343</td>
</tr>
<tr>
<td>Employees</td>
<td>177</td>
</tr>
<tr>
<td>Labourers</td>
<td>157</td>
</tr>
<tr>
<td>Others</td>
<td>71</td>
</tr>
</tbody>
</table>

Forty two percent of patients were smoker, 54% of patients were betel chewer where as 25% of patients were both smoker and betel chewer.

Total 283 patients developed stroke out of them 176 were males (62.19%) and 107(37.80%) were female. The maximum Incidence of stroke was in the age group 60 to 69 years whereas no stroke case was reported in age group less than twenty years.

Table-2: Age wise incidence of stroke.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>30-39</td>
<td>3</td>
<td>1.06%</td>
</tr>
<tr>
<td>40-49</td>
<td>33</td>
<td>11.66%</td>
</tr>
<tr>
<td>50-59</td>
<td>63</td>
<td>22.26%</td>
</tr>
<tr>
<td>60-69</td>
<td>105</td>
<td>37.10%</td>
</tr>
<tr>
<td>70+</td>
<td>79</td>
<td>27.91%</td>
</tr>
</tbody>
</table>

The higher the level of blood pressure and the greater the incidences of stroke .

Table- 3: Incidence of stroke in relation to duration of hypertension.

<table>
<thead>
<tr>
<th>Duration</th>
<th>Newly detected</th>
<th>&lt;1 year</th>
<th>1-2 years</th>
<th>2-5 years</th>
<th>5-10 years</th>
<th>10-15 years</th>
<th>&gt;15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>66</td>
<td>11</td>
<td>51</td>
<td>61</td>
<td>47</td>
<td>39</td>
<td>8</td>
</tr>
<tr>
<td>Percentage</td>
<td>23.32%</td>
<td>3.88%</td>
<td>18.02%</td>
<td>21.55%</td>
<td>16.66%</td>
<td>13.78%</td>
<td>2.82%</td>
</tr>
</tbody>
</table>

A total of 421 patients developed some forms of cerebrovascular complications. 37 patients suffered subarachnoid haemorrhage.

Incidence of Malignant hypertension was 19 out of them 11 were males and 8 females.

A total of 413 patients developed various forms of cardiovascular complications. Nineteen percent patients developed left ventricular hypertrophy (LVH); 22.19% of males and 12.79% of females had LVH; the higher the levels of BP the greater the incidences of LVH . Fourteen
percent of the patients had left ventricular failure (LVF). LVH and LVF incidences were higher among elderly people, among poor people and among people with longer duration of hypertension as shown in table 4 and 5.

Table-4: Age distribution of LVH

<table>
<thead>
<tr>
<th>Age</th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>16</td>
<td>21</td>
<td>27</td>
<td>91</td>
<td>167</td>
<td>88</td>
</tr>
<tr>
<td>Percentage</td>
<td>4.21%</td>
<td>5.52%</td>
<td>7.10%</td>
<td>23.94%</td>
<td>43.94%</td>
<td>23.15%</td>
</tr>
</tbody>
</table>

Table-5: Incidence of LVH in relation to duration of hypertension

<table>
<thead>
<tr>
<th>Duration of Hypertension</th>
<th>Newly detected</th>
<th>&lt;1 year 1-2 years</th>
<th>2-5 years</th>
<th>5-10 years</th>
<th>10-15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>139</td>
<td>31</td>
<td>23</td>
<td>59</td>
<td>87</td>
</tr>
<tr>
<td>Percentage</td>
<td>36.5%</td>
<td>8.15%</td>
<td>6.05%</td>
<td>15.52%</td>
<td>22.89%</td>
</tr>
</tbody>
</table>

Incidences of ischaemic heart disease were 18%. IHD were higher among people with high BP among older age group and among people with increasing duration of hypertension.

Haque MA2 (1990) in his study of complications of systemic hypertension found 94% of cardiovascular complications in the age group of (41-75) years and only 6% in the age group of (30-40) years. Shaha PR3 (1983) in his study of complications of hypertension found 86.6% of cardiovascular complications in the age group of (40-70) years and only 13.4% in the age group of (30-40) years. Our findings of age group of cardiovascular complications were closer to above two studies.

“Hypertensive target-organ damage in the very elderly”[4], study published in hypertension 2003 Aug, showed that there is uncertainty about the relation between hypertension and cardiovascular morbidity in people aged>80 years, the so called very elderly.

Renal complications were found among 17% of patients. Increasing age, higher levels of BP, longer duration of hypertension all positively correlated with the development of renal complications. Renal involvement occurred in 21.28% of male patients and 8.67% female patients. Our study revealed less renal involvement in female patient to that of Ekram ARMS et al5 where 12.5% of female patients had renal involvements.

Retinopathy was more prevalent among males than females as shown in table 6.
Table-6: Sex distribution of individual retinopathy.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>94</td>
<td>73</td>
<td>21</td>
</tr>
<tr>
<td>II</td>
<td>122</td>
<td>79</td>
<td>43</td>
</tr>
<tr>
<td>III</td>
<td>58</td>
<td>37</td>
<td>21</td>
</tr>
<tr>
<td>IV</td>
<td>19</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

Retinopathy was found in 14.65% of patients and was more prevalent among males than females (15.07% vs. 13.82%), whereas Ekram ARMS et al.\textsuperscript{[5]} have shown 17.5% incidence of retinopathy among female patients. Increasing age and longer duration of hypertension increased the incidence of retinopathy.

PVD was found in 2% of cases and all were diabetics.

Incidences of end organs damage were higher among patients with irregular drug intake and among smokers where as among diabetics the risk of end organs damage is just slightly increased. Risk of end organs damage in obesity could not be established in this study.

Though cases were selected randomly, cerebrovascular complications was found as the most frequent complication 21.05%, followed by Cardiovascular complication 20.65% this was followed by renal complication 17%, retinopathy 14.6% .Malignant hypertension and PVD was found in 0.55% and in 2% respectively.

Both cardiovascular and cerebrovascular complications were found more in older age group and both were found more common in male than female.

It is also found that duration of hypertension enhances the risk of cerebrovascular, cardiovascular, renal complications and retinopathy. Smoking habit is associated with increased incidence of cardiovascular ,cerebrovascular and renal complications. There is a direct correlation between the higher cholesterol and LDL levels and incidences of CHD.

Majority of the patients were non-diabetics. Diabetes mellitus increases the risk of cardiovascular and cerebrovascular complications only a few folds but DM is an important risk factor for PVD.
Incidences of end organ damage is higher among patients who are poor compliant to their medications and a large number of patients were completely unaware about their hypertension.

Incidences of stroke were more among people with less physical activities and cerebrovascular and cardiovascular complications were more in lower socioeconomic group.

Out of 19 malignant hypertension cases, 13 were hypertensive for more than 5 years and 6 were hypertensive for more than 10 years indicating essential hypertension has turned into accelerated and malignant phases.

CONCLUSION
Hypertension is the most important etiologic factor in most of the cardiac and vascular disorders. Some of these e.g. cardiomegaly, congestive cardiac failure, cerebral haemorrhage, dissecting aneurysm of aorta, renal failure and hypertensive crisis are directly related to blood pressure elevation, While others e.g. Myocardial infarction, cerebral infarction.

myocardial infarction, cerebral infarction and peripheral vascular insufficiency are related to effects of hypertension in accelerating atherogenesis. The deleterious effects of any given level of blood pressure are determined to a great extent by other coexisting cardiovascular risk factors. Thus the overall picture dictates the aggressiveness of antihypertensive therapy. There is good evidence that control of blood pressure prolongs life and prevents congestive cardiac failure, disabling stroke, renal insufficiency but modern therapy has not yet provided the expected protection against coronary heart disease the most serious consequence of an elevated blood pressure.[3]

As hypertension is mostly asymptomatic, health education and motivation play a vital role in the continuation of treatment. WHO defined 3 components of hypertension control program i.e. education of public, health care professionals and the patients. Awareness creation and strengthening of motivation strategies to improve adherence to anti-hypertensive drugs through the use of multidisciplinary approaches are necessary.[6]

Behavioural models suggest that the most effective therapy prescribed by the most careful physician will control hypertension only if the patients are motivated to take the prescribed medication and to establish and maintain a health-promoting lifestyle. Motivation improves only when patients have positive experiences with and trust in their physician. Empathy
builds trust and is a potent motivator. Patient attitudes are greatly influenced by cultural differences, beliefs, and previous experiences with the health care system. These attitudes must be understood if the clinician is to build trust and increase communication with patients and families.\cite{7}

Failure to titrate or combine medications, despite knowing the patient is not at goal BP, represent clinical inertia and must be overcome. Decision support systems (i.e. electronic and paper), flow sheets, feedback reminders, and involvement of nurses, clinicians and pharmacists can be helpful.\cite{7}

**CONFLICT OF INTEREST:** None.

**REFERENCES**

7. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. The JNC 7 report. JAMA, may 21, 2003; (289): 19; 2569-70.